Services Supporting User Participation on One-Stop Public Digital Cultural Service Platforms: Current Status, Major Issues, and Optimization Recommendations (Postprint)

Authors: Chen Zeqian, Zheng Najing, Li Yacan, Zhang Xiao

Date: 2023-04-01T16:02:48+00:00

Abstract

[Purpose/Significance] Comprehensive support for user participation is an inherent requirement for public digital culture service platforms to exert their service functions and improve service efficacy. Service research from the perspective of user participation can yield new insights and offer novel perspectives for the construction of one-stop public digital culture service platforms.

[Method/Process] Through web surveys, an analytical framework for multi-role user participation in one-stop public digital culture service platforms was established to uncover the current state of user participation support services. Service platforms were selected and user participation tasks were formulated; user testing and semi-participatory observation methods were employed to record and analyze the process of users completing participation tasks. Finally, various problems were identified and analyzed, and optimization recommendations were put forward.

[Results/Conclusion] The service functions supporting user participation in one-stop public digital culture service platforms are inadequate, with numerous usability and availability issues. Optimization can be undertaken from three aspects: top-level design, service functions, and user experience.

Full Text

Preamble

Volume 65, Issue 7, April 2021

ChinaXiv Partner Journal

Current Status, Main Problems, and Optimization Suggestions for User Participation Support in One-Stop Public Digital Culture Service Platforms

Authors: Chen Zeqian, Zheng Naijing, Li Yacan, Zhang Xiao
Affiliation: School of Management, Hebei University, Baoding 071000

Abstract:
[**Purpose/Significance**] Fully supporting user participation is an inherent requirement for public digital culture service platforms to fulfill their service functions and enhance service effectiveness. Service research from the perspective of user participation can bring new discoveries and provide new ideas for the construction of one-stop public digital culture service platforms. [**Method/Process**] Through network investigation, this study constructs an analytical framework for multi-role user participation in one-stop public digital culture service platforms to reveal the current status of user participation support. Selected platforms were identified and user participation tasks were formulated. User testing and semi-participatory observation methods were employed to record and analyze the process of users completing participation tasks. Finally, various problems were summarized and analyzed, and optimization suggestions were proposed. [**Result/Conclusion**] The service functions supporting user participation in one-stop public digital culture service platforms are imperfect, with numerous usability and accessibility issues. Optimization can be achieved from three aspects: top-level design, service functions, and user experience.

Keywords: One-stop public digital culture service platform; User participation; User role; Optimization suggestions
Classification Number: G247
DOI: 10.13266/j.issn.0252-3116.2021.07.008

One-stop service can be traced back to the late 1920s and early 1930s, with its practical concepts, management models, and operational methods all originating from the commercial sector [1]. It emphasizes meeting customers' centralized, one-time, and integrated needs through integrated management and supply of resources (goods and services), thereby achieving convenience, time-saving, and labor-saving benefits. In the 1970s, one-stop service began to be introduced into the public sector, with Western countries developing the concept of government departments working in a "centralized" or "one-stop" office. Since then, it has roughly followed an evolutionary trajectory through four stages: spontaneous emergence, state promotion, technological empowerment, and organizational reshaping, continuously developing and maturing [2]. The essence of one-stop service is the systematic integration of decentralized service functions, with "public-centered" and "problem-oriented" as its core concepts [1]. With the development requirements of government informatization and networking, and the use of advanced technology to disseminate advanced culture, the Ministry of Culture and the Ministry of Finance jointly organized and implemented key public digital culture projects such as the National Cultural Information

Resource Sharing Project, the Digital Library Promotion Project, and the Public Electronic Reading Room Construction Plan. Public digital culture services have become a new platform and new front for cultural construction in China. The rise of digital museums, digital cultural centers, and digital art galleries has further improved the public digital culture service system and enhanced the overall capacity and level of public cultural services. As the social environment changes and public demands become more diverse, digital resources and services provided by a single public cultural service institution have become increasingly unable to meet the public's demand for diversified, efficient, and convenient cultural services. In 2015, with the continuous improvement of informatization and social informatization levels, providing internet-based one-stop government services and public services to meet public demand became an inevitable choice for governments at all levels to improve administrative efficiency and service effectiveness.

In 2015, the General Office of the CPC Central Committee and the General Office of the State Council issued the "Opinions on Accelerating the Construction of a Modern Public Cultural Service System," proposing that the digitalization of public cultural services should be accelerated to achieve one-stop services [3]. In 2017, the "Ministry of Culture's 13th Five-Year Plan for Public Digital Culture Construction" clearly required that, guided by public demand, integrated and one-stop public digital culture services should be provided, and key tasks for constructing regional comprehensive one-stop public digital culture service platforms were formulated [4].

1. Basic Problem Definition of One-Stop Public Digital Culture Service Platforms and User Participation

Public cultural services aim to meet citizens' basic cultural needs and represent an important function of service-oriented government. To adapt to the requirements of informatization and digitalization, one-stop public digital culture service is a service model formed by introducing one-stop service into the public digital culture field. Compared with public digital culture services provided by a single (type of) public cultural service institution (such as a digital library), one-stop public digital culture service can achieve the aggregation, integration, and provision of various public cultural resources and services within a specific scope, meeting users' needs for diversified, integrated, and personalized services.

Based on service scope, one-stop public digital culture services can be divided into national and regional types; based on service content, they can be divided into industry-specific and comprehensive types. A typical one-stop public digital culture service should have five basic characteristics: Services are provided through a unified portal (usually an interactive digital service platform/interface); Cross-institutional and cross-regional integrated supply is

achieved through resource aggregation and service integration; User-centered, emphasizing effective docking between cultural services and public demand, valuing user experience and feedback, and continuously optimizing resources and services; Diverse service subjects, with cultural enterprises, social organizations, and citizens also being providers of resources and services in addition to government and public cultural service institutions; Services are accessible to all citizens, who can conveniently and quickly obtain needed resources and services at their designated time and place.

A one-stop public digital culture service platform (referred to as "service platform" in this study) is the practical form of one-stop public digital culture service. It uses network technology and digital methods to integrate information, book reading, art appreciation, exhibitions, service delivery, reservations, and other services and resources provided online and offline by different public cultural service institutions into one service system. Users can obtain all needed services by entering this system. The National Digital Culture Network, National Public Culture Cloud, and various provincial and municipal culture clouds and culture-tourism clouds with comprehensive service functions are specific forms of such platforms.

Users are typically the users of services (or products). User-centered design (UCD) and value co-creation theory emphasize the multiple roles of users as service demanders, evaluators, and producers on the basis of the user role. Extensive and effective user participation can help service providers improve the lack of targeted and effective service supply, enhance users' acceptance and satisfaction with services, and is an indispensable part of the value creation and service innovation process. User participation in this study refers to the systematic interactive activities of one-stop public digital culture service platform users based on specific tasks and purposes, including both behavioral performance and psychological state. Different from public participation that emphasizes citizens' rights and social force participation that emphasizes government function transformation, user participation focuses more on user participation behavior and service experience from a service perspective to build a more useful and usable service platform. Encouraging and supporting user participation is an inherent requirement for one-stop public digital culture service platforms to improve service systems, fulfill service functions, and enhance service effectiveness. Existing research mainly studies user usage behavior and service evaluation based on the roles of service users and service demanders, with insufficient research on users participating in service platforms in other roles, failing to systematically reveal the significance of users for public digital culture service construction. This study starts from analyzing the multiple relationships between users and service platforms, establishes a framework for multi-role user participation, uses network investigation and user testing methods to analyze the current status of one-stop public digital culture service platforms in supporting user participation and problems in the service process, and proposes corresponding suggestions for improving service platform construction.

2. Literature Review

Chinese scholars attach great importance to the construction of public digital culture service platforms and have conducted considerable research on the design [5-7] and operation [8-11] of public digital culture service platforms, surveys [12-15] and evaluations [16-18] of public digital culture service platforms, service innovation [19-20] and marketing [21-24] of public digital culture service platforms, organization and integration of public digital culture resources [25-28], and social force participation in public digital culture construction [29-30]. These achievements reflect scholars' insightful views and provide necessary foundations and references for this study.

Public digital culture services and their carriers are unified in the process of users using the services. Ignoring user demand expression and participation of various subjects can easily lead to a disconnect between service supply and demand [31]. In response to the current situation where services are detached from user needs, Wang Meng, Chen Ya, and Zheng Jianming proposed a public digital culture service user acceptance model composed of perceived usefulness, ease of use, attitude, and behavioral intention from the perspective of user perception [31]. Qian Dan and Chen Ya constructed a planned behavior theory model affecting user adoption of public digital culture services based on the actual demand for public digital culture services, which includes five elements such as information awareness and information skills [32]. Dai Yanqing and Li Yuyu investigated users' purposes for using public digital culture websites, obstacles encountered, and degree of demand satisfaction, and proposed optimization measures for websites [15]. Public digital culture services involve both service supply quality and public service experience [33]. Qian Dan and Chen Ya constructed and verified a framework of accessibility elements for public digital culture services using digital platforms in public digital culture projects as the carrier [34]. Dai Yanqing et al. evaluated the user experience of the National Digital Culture Network from six dimensions including sensory experience and found that users were dissatisfied in multiple aspects, thus needing to focus on optimizing platform interface and performance and enhancing user interaction functions [23].

Users are both users and demanders of one-stop public digital culture service platforms, as well as their evaluators and builders. Existing research mainly focuses on the roles of service users and service demanders to study user usage behavior and service evaluation, with insufficient research on users participating in service platforms in other roles, failing to systematically reveal the significance of users for public digital culture service construction. This study starts from analyzing the multiple relationships between users and service platforms, establishes a framework for multi-role user participation, uses network investigation and user testing methods to analyze the current status of one-stop public digital culture service platforms in supporting user participation and problems in the

service process, and proposes corresponding suggestions for improving service platform construction.

3. Investigation of Current Status of Service Platforms Supporting User Participation

This study used hyperlinks provided on the National Digital Culture Network and National Public Culture Cloud websites to directly access and record corresponding provincial and municipal public digital culture service sites. Simultaneously, search functions on Baidu, 360 Search, WeChat, Sina Weibo, Douyin, and Android app markets were used with keywords such as "culture cloud," "public culture cloud," "culture-tourism cloud," "public digital culture service," and "public digital culture service platform" for comprehensive searches. Based on search results, corresponding sites were accessed (or more specific keywords such as region names/platform names were selected for precise searches based on clues provided by search results), and relevant public digital culture service sites and content were recorded through direct access, download access, and follow access. To ensure systematic and accurate data collection, data collection was independently completed by two researchers from May 15 to June 20, 2020, yielding 196 and 212 data points respectively. After merging and removing duplicates, 238 data points were obtained. Referring to the previously described basic characteristics of one-stop public digital culture service platforms, three specific criteria were refined to screen the obtained results: Provided resources and services are comprehensive, not limited to a single (type of) public cultural service institution; Service functions are diversified, not limited to information release and resource display; System operation is stable, services can be used normally, and content is updated in a timely manner. Ultimately, data from 154 service platforms that basically met the characteristics of one-stop public digital culture services were obtained.

The National Public Culture Service Cloud is a public digital culture service master platform and main front led by the Ministry of Culture and Tourism, aiming to provide menu-style, order-style, and reservation-style one-stop services for grassroots masses [35]. This study used the six types of content set up on this platform—shared live streaming, audio-visual space, digital library resources, activity reservation, venue navigation, and online training—as basic categories. Supplementary categories were added based on requirements such as soliciting user participation satisfaction surveys in the "Implementation Plan for the Integrated Innovation and Development of Public Digital Culture Projects" and establishing and improving public evaluation and cultural demand feedback mechanisms in the "Ministry of Culture's 13th Five-Year Plan for Public Digital Culture Construction." Based on comprehensive network survey results, all obtained categories were compared pairwise at the same level and summarized level by level according to their service content, resulting in an analytical framework for service functions supporting user participation and multi-role

user participation in one-stop public digital culture service platforms, as shown in Table 1 .

3.1 Regional Distribution and Service Paths of Service Platforms

The Ministry of Culture and Tourism has currently built three national-level public digital culture service platforms: National Public Culture Cloud, National Digital Culture Network, and Culture e-Home. The National Public Culture Cloud coordinates the construction of national digital culture centers, opening ports and setting interfaces with the National Digital Library; the National Digital Culture Network is the master station of the Cultural Information Resource Sharing Project, with main functions being the aggregation and digital dissemination of cultural resources; Culture e-Home faces the mobile environment of integrated innovation, serving as a new front for aggregating and displaying public digital culture project resources. The three platforms have their own characteristics, complement each other, and form the central architecture of China's public digital culture service network. Thirty regions in China have launched one-stop public digital culture services (see Figure 1 [Figure 1: see original paper]). The distribution of service platforms across regions shows significant disparities, with Hunan, Jiangsu, Shanghai, and Shandong having the largest numbers, while Qinghai, Ningxia, Jilin, and Hainan have the smallest numbers, indicating obvious development imbalances.

From the perspective of service scope (see Table 2), 17 regions (with 2 in Shandong and 2 in Henan) have launched provincial-level service platforms, accounting for more than half of China's provincial-level administrative divisions. Municipal (district)-level service platforms are the main body, indicating that large and medium-sized cities with concentrated populations and resources remain the most active areas for public digital culture service demand and supply. County (district)-level service platforms are relatively few in number but have experienced rapid growth, which is directly related to China's policy orientation of emphasizing service effectiveness and sinking services to the grassroots level in public digital culture construction.

Service paths affect service accessibility. Public digital culture service paths (see Table 2) mainly include PC 端 (websites), mobile clients (APPs), WeChat (mini programs and official accounts), official Weibo, and short video platforms. Among them, WeChat and PC 端 account for the largest proportions, followed by mobile clients and official Weibo, with short video platforms (Douyin) accounting for the smallest proportion. PC 端 has always been the main front for China's public digital culture services, and survey results indicate that the situation where public cultural service institutions mainly rely on websites to provide PC 端 digital services has not fundamentally changed. The main method for mobile clients is that some regional service platforms (such as Heilongjiang Culture and Tourism Cloud) currently only provide services through WeChat. Additionally, the rise of short video platforms has opened new paths for public digital culture services, attracting more user attention and expanding the

influence of public digital culture services.

3.2 Service Functions in Service Platforms

One-stop public digital culture service platforms have diversified service functions (see Table 1). Information release and resource browsing are basic services through which users can obtain rich and diverse information content; shared live streaming enables real-time viewing and playback of cultural activities, meeting users' needs for synchronous viewing; learning and training mainly provide popular cultural knowledge and skills to enhance users' cultural literacy; reservation and delivery include activity and venue reservations and service delivery, featuring menu-style and order-style services that can achieve effective docking between cultural supply and demand; culture-tourism consumption integrates public welfare cultural services and commercial cultural services to meet users' diverse consumption needs; venue navigation achieves online integration of service spaces of different public cultural service institutions, facilitating users' understanding of the distribution and service status of cultural facilities in the region; user management refers to users entering the personal space provided by the service platform through registration and login to uniformly manage personal information such as orders, reservations, comments, and collections; content solicitation is the service platform's invitation to its users regarding content creation or resource uploading, where users can upload personal works to the service platform. It differs from demand solicitation in that the former treats users as service or content providers, while the latter provides users with channels to express real needs, treating user demand as the logical starting point for service design and optimization; comment evaluation and interactive communication emphasize online interaction between the system, services, and users, with the former facilitating users' timely feedback on activity and service experiences and the latter facilitating communication and dialogue when users use services; opinion solicitation is a channel for users to provide feedback and service complaints, guaranteeing users' right to supervise services.

From the survey results (see Figure 2 [Figure 2: see original paper]), as basic services, information release, user management, and resource browsing are the most common in service platforms. Most platforms provide venue navigation, reservation and delivery, and learning and training services with online-offline interaction functions. The differences lie in: whether the digital resources for learning and training in different platforms are rich and systematic; whether the activities and projects for reservation and delivery are complete in categories and meet users' needs; whether venue navigation information is timely, comprehensive, and authentic. Shared live streaming has special requirements for technical support and platform performance, accounting for a low proportion in platform services, with some service platforms' live streaming functions only providing video browsing without obvious live streaming characteristics. Culture-tourism consumption has a low proportion in service platforms that are mainly characterized by free services due to its "payment" attribute. For the

same online interaction service, the proportion of comment evaluation is much higher than that of interactive communication, with more dialogue channels between users and service resources than between users and service providers. The survey found that user comments and interactive content in most platforms are relatively few, with zero comments (messages, likes) being common. Content solicitation usually involves exhibitions and competitions of literary and artistic works, requiring users to create and pass review before being used as platform resources for other users to browse, highlighting users' role as content producers but accounting for a low proportion in service platforms. Opinion feedback and demand solicitation are the two types of services with the lowest occurrence rates. The former often has critical and negative content, while the latter poses challenges to existing services due to content uncertainty. They are usually placed at the bottom of the website homepage and the last item of personal space services. Most of the above functions require login to use.

3.3 User Participation Behaviors and User Roles in Service Platforms

User participation is a necessary condition for realizing service value. The completeness of service functions determines whether corresponding user participation behaviors can be realized, which further reflects the platform operators' cognitive understanding and positioning of users. User participation behaviors include six types: service acquisition, space management, content creation, online interaction, opinion feedback, and demand expression (see Table 1). As service recipients, users obtain text, images, videos, activities, venues, and other services and resources that have been pre-selected, organized, and designed by the service platform through browsing, watching, reserving, and purchasing. Personal space is an inevitable requirement for platform operators to consider personalized services and security. Users can obtain more usage permissions after completing registration and login, and effectively managing personal space can help users quickly and accurately obtain needed resources. Online interaction and opinion feedback are the externalization of users' experiences after using services and resources. From message comments and interactive Q&A to likes, forwards, and opinion complaints, all are different forms of user evaluation. Content creation is a cooperative behavior between users and service platforms, where the platform provides opportunities and channels for users, and users contribute resources and content to the platform. User demand is the starting point of services. Continuously perceiving user demand and its changes can promote continuous service optimization and upgrading. Ways to support users' active expression of demand include questionnaires, messages, emails, etc.

From the survey results (see Figure 3 [Figure 3: see original paper]), service acquisition and space management are the most common user participation behaviors in service platforms, followed by online interaction, then content creation and opinion feedback, and finally demand expression (see Figure 3 [Figure 3: see original paper]). Based on the nature and characteristics of user participation behaviors, service platforms primarily position users as service users,

corresponding to service acquisition and space management behaviors and various service functions such as information release, resource browsing, and user management. This emphasizes that service platforms are service providers responsible for meeting users' diverse cultural needs. This positioning aligns with the purpose and requirements of public cultural services and is internally consistent with the original intention of service platform construction. The role of service evaluator corresponds to online interaction and opinion feedback behaviors and service functions such as comment evaluation and opinion solicitation. Users as service evaluators can help service platforms improve service quality through various forms of active feedback. The role of service provider requires users to have certain creative or service capabilities, corresponding to content creation behavior and content solicitation function, serving as a beneficial supplement to supply entities such as public cultural service institutions. The role of service demander corresponds to demand expression behavior and demand solicitation function, representing an important way for users to actively express real needs. As shown in Figure 4 [Figure 4: see original paper], current service platforms mainly position users as service users and evaluators, enabling them to select and provide feedback on prepared services and resources. This seemingly clear and reasonable supply-demand relationship is essentially still a supply-centered service model, where the provider "gives what" and the demand side "uses what." Although comment feedback can theoretically provide decision-making assistance for service optimization by providers, in practice, due to the lack of incentive mechanisms, users rarely comment and provide feedback on specific services. Therefore, providers need to comprehensively consider users' multiple roles, fully recognize the significance of users as service providers and demanders for service platform construction, and actively build new partnership relationships between service platforms and users.

In summary, China's one-stop public digital culture service platforms have grown rapidly in number and are widely distributed. The four-level platform architecture at the national, provincial, municipal, and county levels has basically taken shape, with municipal (district)-level service platforms being the most numerous and county (district)-level service platforms growing the fastest. Regional imbalances are prominent, with eastern and central regions surpassing western regions in both quantity and quality. In particular, leading regions such as Hunan have maintained good growth rates and development levels. In terms of user habits and development trends, WeChat has surpassed PC 端 as the main path for users to obtain one-stop public digital culture services. The emergence of official Douyin accounts has provided new service paths for service platforms, but currently, the number is small, user attention is not high, and there is still room for improvement in content organization and influence. Most service platforms do not have perfect service functions to support comprehensive user participation in platform construction. Users mainly serve as service users and evaluators, selecting and providing feedback on prepared services and resources. This seemingly clear and reasonable supply-demand relationship is essentially still a supply-centered service model. Although comment feedback

can theoretically provide decision-making assistance for service optimization by providers, in practice, due to the lack of incentive mechanisms, users rarely comment and provide feedback on specific services. Therefore, providers need to comprehensively consider users' multiple roles, fully recognize the significance of users as service providers and demanders for service platform construction, and actively build new partnership relationships between service platforms and users.

---

4. Main Problems of Service Platforms in Supporting User Participation

China's one-stop public digital culture service platforms are in a period of rapid development, with considerable room for improvement in service functions and service levels supporting user participation.

4.1 Task Testing of Service Platforms Supporting User Participation

Observation method refers to a research method where researchers purposefully and systematically observe or use certain auxiliary tools to study observed objects under natural conditions to obtain research data [36]. User testing is a design verification method in user-centered design processes that records real product usage by observing and questioning users (test subjects) to identify usability problems [37]. This study used semi-participatory observation and user testing methods to systematically analyze users' performance in completing test tasks on one-stop public digital culture service platforms by setting task environments, formulating test tasks, selecting test subjects, and observing test task completion, thereby summarizing main problems in service platforms' support for user participation.

Setting the task environment means selecting service platforms. Different service platforms have differences in system design and service functions. Based on network survey results, no service platform with complete service functions currently exists. Limiting the task environment to one platform might lead to incomplete test tasks and insufficient reflection of existing problems in test results. Therefore, this study used multiple platforms for task testing. Based on service scope and the completeness of PC 端 service functions, three regional, comprehensive service platforms with relatively complete service functions were selected as the system environment for supporting user task testing: Hunan Public Culture-Tourism Cloud (provincial level), Haidian Public Culture Service Digital Platform (municipal/district level), and Zhangjiagang City Culture-Tourism Cloud Platform (county/district level) (see Table 3).

Formulating test tasks needs to align with user participation behaviors. Based on the six types of user participation behaviors and their corresponding service functions summarized earlier, and referring to the service status of the three ser-

vice platforms, six categories totaling nine user participation tasks were formulated (see Table 3). Users needed to access the corresponding service platforms in sequence and complete the predetermined tasks item by item.

The observed objects (i.e., test subjects) are the service targets of service platforms. One-stop public digital culture service platforms face all groups, with very broad service targets. Considering practicality, economy, and scientificity, this study selected potential users familiar with computer operations and with willingness to use service platforms as test subjects through social media recruitment and friend recommendations. Referencing individual characteristics such as age and gender, nine test subjects were finally selected and divided into youth group (18-39 years old), middle-aged group (40-59 years old), and elderly group (60 years and above) according to the World Health Organization's age classification standards (see Table 4).

Task time refers to the time consumed between the start and end states of a task. In most cases, the faster the task is completed, the shorter the time. As shown in Table 4, among the nine tasks, T2 took the shortest time, while T6 took the longest. From the perspective of task completion rates (see Table 5), T2 had the lowest completion rate, indicating that the reason for its shortest time was that test subjects abandoned the operation of the corresponding task, reducing task time; T6 had a higher completion rate, but because the task specified a minimum time, it objectively led to longer task times. There are significant differences in task completion time between different test subjects, with Y1 taking the shortest time, followed by Y3, Y2, and M1; S2 took the longest time, followed by S3, S1, M3, and M2. In terms of task completion time by group, the youth group took the shortest time, followed by the middle-aged group, and finally the elderly group (i.e., $Y < M < S$). The time gap between the youth and middle-aged groups is small, while the gap between the elderly group and the other two groups is large, showing a phenomenon of time surge.

Task completion rate is the ratio of the number of tasks successfully completed by users to their total number of tasks. As shown in Table 5, the overall task completion rate is 0.65, with T1 having the highest completion rate, T2 and T9 having the lowest completion rates, and the completion rates of all other tasks being greater than 0.5. The task completion rates of test subjects, except for S2 and S3, are all higher than 0.6. The average task completion rates by group show the youth group slightly higher than the middle-aged group, and the elderly group the lowest (i.e., $Y > M > S$). Comparing with Table 4 reveals that the youth group has high task completion rates and short task times, while the elderly group has low task completion rates and long task times. Looking at each service platform, Platform 3 has the highest task completion rate, while Platform 1 has the lowest. The reasons for low completion rates are twofold: first, incomplete service functions lead to task failure (e.g., the completion rates of T2, T3, T4, and T9 in Platform 1 are 0 because the platform lacks corresponding service functions); second, test subjects cannot find service entry points and thus abandon tasks (e.g., M3, S1, and S2 failed to complete

T7).

4.2 Typical Problems of Service Platforms in Supporting User Participation

The main purpose of user testing is to discover as many problems as possible in service platforms' support for user participation. Based on researchers' observation records of test subjects' typical behaviors and interviews, test subjects encountered eight main types of problems during task testing, with a probability of 0.6 (see Table 6).

Problems and mainly occurred in the older elderly and middle-aged groups, with obvious group characteristics. The main reasons are related to operational skills and input habits. As the environment changes, more and more elderly people are accustomed to voice input and handwriting input on mobile phones and are relatively unfamiliar with content input methods requiring keyboard input, resulting in lower input speed and accuracy and longer task times. Reading 障碍 problems are related to both declining vision and reaction speed among the elderly and the unfriendliness of service platform design and visual communication to the elderly group, such as small font sizes, oversized images, and chaotic text-image layouts.

Problem was common among test subjects. Most test subjects reported that the registration and login interface verification information on service platforms was extensive and the operation steps were cumbersome. This verification information includes but is not limited to usernames, passwords, mobile phone numbers, mobile verification codes, and login verification codes. From a user experience perspective, test subjects are prone to impatience due to the time and steps spent on registration and login. Especially for Platform 3, the login verification code includes irregular letters and numbers accompanied by random white lines, making it extremely difficult to recognize, which particularly increases the visual burden and time cost for middle-aged and elderly users.

Problem mainly appeared on the homepage and other pages of Platform 1, where a set of QR code images were set on both left and right sides of the page that could not be closed. When test subjects browsed page content and scrolled the page progress bar, some content was blocked by images, causing user 反感.

Problem was also common. The column settings and column names in the navigation bar have significant impacts on users' participation behaviors and task times. Most test subjects would first browse the navigation bar when looking for service entry points to complete participation tasks. If column settings are overlapping, and column names are similar, close, or difficult to understand, users will repeatedly compare, click, and confirm whether a service supports the corresponding participation behavior, greatly increasing the time and effort required to complete tasks and causing significant cognitive and psychological burdens. For example, in Platform 1, the first-level column "Cultural Market" contains "Drama Brands," which when clicked displays various performance ac-

tivities for “I want to participate,” similar in content and function to “Activity Reservation” in another first-level column “Reservation,” causing confusion for test subjects completing corresponding tasks.

Problem is a problem encountered and reported by all users. Incomplete service functions have a significant impact on task completion and task time. Test subjects continuously browse, query, and confirm service functions and service entry points, generating strong negative emotions such as irritability and complaints, and ultimately abandoning tasks. All three service platforms have missing service functions to varying degrees. For example, Platform 1 lacks “Collection” and “Venue Reservation”; Platform 2 lacks “Demand Solicitation” and “Content Solicitation”; Platform 3 lacks “Comment Evaluation” and “Opinion Solicitation.”

Problem is reflected in all three service platforms to varying degrees. Information is not updated in a timely manner, cultural activity classification is incomplete, and activities that have not started, are in progress, and have been completed are mixed together with activity announcements, affecting users’ cognition and selection of information content. The main reason for this problem is the platform operators’ lack of effective organization and management of activity information. The limited number of cultural activities also reduces the necessity of information organization work to some extent.

Problem is a concern for test subjects in the youth and middle-aged groups, reflecting the improvement of people’s information security awareness and privacy protection concepts. Especially when the youth group completed the “Opinion Solicitation” task, all three test subjects expressed concerns about providing personal real information. They only chose to continue completing the task after confirming relevant matters with researchers. In contrast, the elderly group’s reaction to this type of problem was not obvious, which is related to both their generally lower information security awareness and their greater focus on completing tasks quickly and the pressure of correctly inputting content.

The study found that there are significant differences between individuals and between groups in task time and task completion rate, with the overall characteristic being youth/group better than middle-aged/group, and middle-aged/group better than elderly/group. The service environment is not friendly enough to support elderly users’ participation behaviors, and service content and system usability need improvement. Service platforms have various problems in verification login, page browsing, navigation design, content classification, information organization, and privacy security, which greatly affect test subjects’ task time and task completion rate.

5. Service Optimization Suggestions for Supporting User Participation in One-Stop Public Digital Culture Service Platforms

Based on the analysis results of network surveys and user testing in this study, from the perspective of supporting user participation and ensuring service fairness, China's one-stop public digital culture service platform construction generally has problems such as unbalanced regional distribution, dispersed service paths, incomplete service functions, and unfriendly service design. For one-stop public digital culture service platforms and their construction entities that need to be improved in supporting user participation, several suggestions are proposed from three aspects—top-level design, service functions, and user experience—to provide references for platforms to identify gaps and achieve service iteration.

5.1 Improve Top-Level Design of Service Platforms and Optimize Service Paths

Top-level design affects the system architecture and overall layout of service platforms within a region. Due to the lack of scientific and unified top-level design, the construction progress of one-stop public digital culture service platforms in most regions is slow, and there is a certain degree of confusion among different service platforms in terms of service scope and positioning. Common situations include: first, provincial, municipal, and county-level service platforms are built separately, each integrating service resources within their jurisdiction, with service platforms being unrelated to each other; or provincial and municipal service platforms are only positioned for a certain central city with limited service scope, while county-level service platforms are built independently with serious insufficiency in service resources and functions. Second, different service institutions each have their own public digital culture service platforms, making it difficult to integrate service resources among institutions and unable to form a joint force for one-stop cultural services. Solving this problem requires government departments to take the lead, form overall plans and promotion strategies for the construction of one-stop public digital culture service platforms within the region based on relevant laws and policies, rationalize the service positioning of different service platforms, establish cooperation mechanisms among different service institutions, establish corresponding work assessment standards, and actively accept social supervision. In addition, actively promoting inter-regional public cultural service exchanges can drive the construction of service platforms in backward regions through the exemplary and leading role of advanced regions' experiences.

Service path diversification is an inevitable requirement for diverse user needs in the network environment and plays a positive role in improving service accessibility and expanding user scale. One-stop public digital culture service platforms have the broadest user groups, and diversified service paths can maximize the

convenience needs of users in different situations and with different usage habits. Service path optimization does not simply pursue quantity or 贪多求全. Some Weibo accounts and APPs that have stopped updating have already proven the unsustainability of this approach. Optimization also does not mean 全线收缩 and minimizing. A single service path would largely create accessibility barriers and lead to massive user loss. Scientific service path optimization should set service paths according to the service capabilities of operators, reduce users' path burden in obtaining service resources through dynamic collection of user data and service feedback, continuously exploring changes in user needs and usage habits, and adhering to the principle of dynamic adjustment to reasonably allocate service resources and functions loaded on different service paths.

5.2 Comprehensively Integrate Various Service Functions in Service Platforms and Optimize Services

Service functions are the implementation methods for supporting user participation and meeting user needs. Existing one-stop public digital culture service platforms have varying degrees of missing service functions, which affect user participation and usage experience. Improving service functions is key to optimizing service platforms. Specifically: first, determine the service positioning of the platform, analyze the types of user participation behaviors that can be supported, then clarify corresponding service functions, and refine corresponding service columns and content in combination with service resources in the region; second, service process design should truly reflect user-centeredness, emphasize scenario-based setting of service scenarios and service content, focus on the correlation and connection between different service functions, and ensure the continuity and integrity of the service process; third, establish service resource catalogs and service lists to achieve integration and complementarity of service resources from different service institutions, redesign navigation column names and their secondary column names based on determined service functions and content to facilitate ordinary users' intuitive understanding of the correspondence between service columns and participation needs and quickly discover service entry points.

5.3 Optimize Service System Design and Emphasize and Improve User Participation Experience

User experience is users' overall feelings when using a system, affecting users' evaluation and willingness to use the system. When using service platforms, users generate sensory experiences in audio-visual aspects, interactive experiences in operations, and emotional experiences psychologically. Negative experiences in these three aspects manifest as various burdens in user behavior and emotions, such as repeatedly confirming service entry points, spending long times screening activity information, having questions about submitting personal information, abandoning task execution, and resulting psychological activities such as irritability, anxiety, doubt, and disappointment, which ad-

versely affect continuous participation behavior and willingness. Currently, the construction entities of service platforms mainly complete corresponding system design and implementation centered on the needs of service providers, with insufficient emphasis on user participation experience. Coupled with unsmooth user feedback channels, existing problems cannot be dealt with in a timely manner. Construction entities need to establish service optimization mechanisms, regularly collect and organize user feedback, assess the severity and priority of service system usability problems, and timely complete service system iteration to continuously improve user participation experience.

The elderly are currently the main group among the service targets of China's public digital culture services. Due to this group's special physiological and psychological characteristics, service platforms that are liked and accustomed to by young and middle-aged users are not friendly enough to elderly users in terms of service design and content organization, such as small font sizes affecting reading speed, cumbersome login settings affecting input efficiency, and disordered arrangement of activity information causing screening difficulties. Service platform construction entities should pay special attention to the service needs and usage experiences of elderly user groups, simplify registration and login steps, reduce unnecessary verification information, and make page design and text-image layout as simple and clear as possible to improve the comfort of service interfaces. They should also optimize service navigation bar design, establish practical classification systems for information content and activity information to improve service system usability, and adhere to the principle of minimum personal information collection. When necessary, privacy protection statements and information security prompts can be used to inform users of potential risks and corresponding security guarantees.

References

[1] Liu Hongbo. The Evolution Trajectory and Transformation Mechanism of One-Stop Government [J]. E-Government, 2012(12): 22-29.
[2] Zhang Ruixin. The Evolution of the E-Government Concept: From Virtual Government to Smart Government [J]. Journal of Shanghai Administration Institute, 2016, 17(6): 4-13.
[3] Opinions on Accelerating the Construction of a Modern Public Cultural Service System [EB/OL]. [2020-07-21]. http://www.gov.cn/xinwen/2015-01/14/content_{2804250}.htm.
[4] Ministry of Culture's 13th Five-Year Plan for Public Digital Culture Construction [EB/OL]. [2020-07-21]. http://zwgk.mct.gov.cn/auto255/201708/t20170801_{688980}.html.
[5] Zhang Shuchen, Chen Wei, Gao Changyuan. Research on the Construction of Public Digital Culture Service Cloud Platform Under Big Data Environment [J]. Information Science, 2021, 39(4): 112-118.
[6] Wang Miao, Jing Yuan. Research on the Construction of Smart Public Cultural Service Cloud Platform [J]. Digital Library Forum, 2019(2): 43-50.

[7] Tang Yi, Wang Danxue. Research on the Construction of WeChat Public Platform for National Digital Culture Network [J]. Library, 2017(2): 102-107.
[8] Yan Xin. The Construction of Multi-Sided Platforms for Public Digital Culture Services [J]. Library Forum, 2020, 40(9): 36-41.
[9] Chen Tong, Xia Hongmei, Hou Guanghui. Cooperative Platform, Shared Control Rights, and Public Digital Culture Service Provision—Taking "Culture Appointment" in Jiaxing as an Example [J]. Journal of Northeastern University (Social Science Edition), 2019, 21(6): 599-606.
[10] Tang Yi, Xu Wei. Research on the Application of PPP Model in Public Digital Culture Service Platforms—Taking "Yundong Zhuzhou" Cloud Platform as an Example [J]. Journal of the National Library of China, 2020, 29(2): 3-10.
[11] Dai Yanqing, Nan Shenglin, Wan Yan Dengdeng. Application of PPP Model in Public Digital Culture Services [J]. Library Forum, 2020, 40(7): 94-102.
[12] Hua Fangyuan, Chen Siren, She Anqi. Investigation and Analysis of the Current Status of Domestic Public Digital Culture Service Platform Construction [J]. Library Research, 2018, 48(1): 37-45.
[13] Cao Shujin, Wang Zhihong, Gu Tinghua. Investigation and Analysis of Public Digital Culture Websites in Guangdong Province [J]. Library Forum, 2015, 35(11): 10-18.
[14] Chen Zeqian. The Service Status and Prospects of China's Culture Cloud [J]. Library and Information Service, 2018(5): 62-71.
[15] Dai Yanqing, Li Yuyu. Research on Public Digital Culture Website Optimization Based on User Needs [J]. Journal of Sichuan Library, 2020(2): 74-79.
[16] Liao Yunlu. Research on Service Quality Evaluation and Countermeasures of Public Digital Culture Projects [D]. Nanchang: Nanchang University, 2019.
[17] Chen Zeqian, She Xiaotong, Zheng Naijing, et al. Construction and Application of Evaluation Indicators for Public Cultural Cloud Services [J]. Library and Information Service, 2020(6): 54-66.
[18] Zhou Jinyi. Research on Public Digital Culture Website Evaluation Based on Analytic Hierarchy Process—Taking "National Digital Culture Network" as an Example [J]. Library Research and Work, 2017(12): 63-67.
[19] Wei Dawei. Analysis on the Integrated Innovation and Development of Public Digital Culture Projects [J]. Library Theory and Practice, 2019(8): 26-31.
[20] Ji Ting, Geng Jian. Integration Development and Innovation-Driven Transformation: Exploration of Public Digital Culture Service Platform Upgrading Construction [J]. New Century Library, 2020(3): 70-75.
[21] Dai Yanqing, Wang Lu. Research on Service Marketing Strategy of "National Digital Culture Network"—From the Perspective of 7Ps Marketing Theory [J]. Journal of the National Library of China, 2018, 27(3): 23-29.
[22] Dai Yanqing, Sun Yingbo. Exploration of Service Marketing of Large-Scale Public Digital Culture Projects in the United States [J]. Library Forum, 2018, 38(2): 135-141.

[23] Dai Yanqing, Dai Boqing. User Experience Evaluation of China's Public Digital Culture Service Platforms: Taking National Digital Culture Network as an Example [J]. Library and Information Knowledge, 2019(5): 80-89.
[24] Dai Yanqing, Tao Zeyu. Marketing of Public Digital Culture Services in the UK and Its Enlightenment—Taking the "Culture Online" Project as an Example [J]. Library and Information, 2016(5): 76-80, 75.
[25] Liao Jiaqi. Investigation and Analysis of Information Organization and Construction Models of Public Digital Culture Service Platforms [J]. Library Theory and Practice, 2020(1): 130-136.
[26] Tang Yi, Xiao Ximing, Zhou Lihong. Research on the Construction of Public Digital Culture Resource Integration Models in China [J]. Library Journal, 2016, 35(7): 12-25.
[27] Tian Rong, Xiao Ximing. Investigation and Analysis of Information Organization Methods in Public Digital Culture Resource Integration in China and Optimization Strategies [J]. Library and Information, 2016(2): 1-7.
[28] Shen Yan, Xiao Ximing. Current Status and Implementation Conditions of Public Digital Culture Resource Integration in China—Analysis of Several Typical Projects [J]. Library, 2015(9): 6-10, 15.
[29] Wan Yan Dengdeng, Wang Wenfei. Practical Exploration and Promotion Strategies of Public Participation in Public Digital Culture Construction [J]. Journal of the National Library of China, 2020, 29(3): 94-103.
[30] Xiao Ximing, Wan Yan Dengdeng. Social Participation Models in Foreign Public Digital Culture Services and Their Enlightenment [J]. Library, 2016(7): 26-30, 48.
[31] Wang Meng, Chen Ya, Zheng Jianming. Research on User Acceptance Model of Public Digital Culture Services [J]. Library Science Research, 2018(2): 69-76.
[32] Qian Dan, Chen Ya. Exploration of Integrated Service Effectiveness of Public Digital Culture [J]. Library, 2017(6): 60-64.
[33] Wang Meng, Chen Ya, Zheng Jianming. Research on the Mechanism of Government-Society Linkage on Public Digital Culture Service Effectiveness [J]. Library and Information Knowledge, 2020(6): 44-53.
[34] Qian Dan, Chen Ya. Identification and Optimization of Accessibility Elements of Public Cultural Service Platforms [J]. Library Theory and Practice, 2017(10): 63-67.
[35] National Public Culture Cloud. Basic Introduction [EB/OL]. [2020-07-20]. https://www.culturedc.cn/guide.html.
[36] Ge Liezhong, Xu Wei. User Experience Theory and Practice [M]. Beijing: China Renmin University Press, 2020: 59.
[37] WU M A. Basic Steps of User Testing [OL]. [2020-12-26]. https://zhuanlan.zhihu.com/p/31907781.

Author Contributions

Chen Zeqian: Responsible for proposing research ideas and framework, writing and revising the paper;
Zheng Naijing: Responsible for data collection and processing, final draft formatting;
Li Yacan: Responsible for data collection;
Zhang Xiao: Responsible for data collection.

The Service Status, Main Problems, and Optimization Suggestions of One-Stop Public Digital Culture Service Platforms Supporting User Participation

Abstract: [Purpose/significance] Fully supporting user participation is an inherent requirement for public digital culture service platforms to fulfill their service functions and enhance service effectiveness. Service research from the perspective of user participation can bring new discoveries and provide new ideas for the construction of one-stop public digital culture service platforms. [Method/process] Through network investigation of one-stop public digital culture service platforms, an analysis framework of multi-role user participation was formed. Based on the analysis framework, the status of the service platform supporting user participation was revealed. Some service platforms were selected and user participation tasks were formulated. User test and semi-participatory observation methods were used to record and analyze the process of participating tasks. Various problems were summarized, and optimization suggestions were put forward finally. [Result/conclusion] The service function of one-stop public digital culture service platforms supporting user participation is not perfect, and there are many usability and usability problems, which can be optimized from three aspects of top-level design, service function, and user experience.

Keywords: one-stop public digital culture service platform; user participation; user role; optimization suggestions

Note: Figure translations are in progress. See original paper for figures.