Research on the Adaptation of Information Demands of Floating Population Empowered by Technology to Library Management Services

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Abstract: Driven by the technological wave, the adaptation between the information demands of the floating population and library management services will undergo new trends, challenges, and opportunities. With the acceleration of urbanization and the continuous expansion of the scale of the floating population, their information demands present diversified and personalized characteristics. Meanwhile, the rapid development of information technology has provided new opportunities for the innovation of library services. This paper systematically analyzes the information demand characteristics of the floating population, the current situation and existing problems of library services through methods such as literature analysis, questionnaire survey, and case study, and proposes adaptation improvement strategies based on technology empowerment. Research findings show that the information demands of the floating population mainly focus on employment, housing, education, medical care, and social security, etc. However, existing library services have deficiencies in terms of resource supply, service methods, and accessibility. Based on this, this paper puts forward optimization suggestions from three aspects: technical application, service model, and management mechanism, with the aim of providing theoretical references and practical guidance for improving the efficiency of libraries in serving the floating population.

Keywords: Technology empowerment; Floating population; Information demand; Library services; Adaptability

1. Introduction

In today's world of rapidly advancing technology, the globe is experiencing a new round of technological revolution and industrial transformation centered on digitalization, networking, and intelligence. With the continuous advancement of China's urbanization process, population mobility has become a common social phenomenon. According to data from the National Bureau of Statistics, China's floating population reached 376 million in 2022, accounting for 26.6% of the total population. Large-scale population mobility has not only changed the urban-rural population structure but also posed new challenges to the urban public service system. In this context, the information demands of the floating population are becoming increasingly prominent, becoming an important factor affecting their urban integration and social participation. Libraries, as an important part of the public cultural service system, undertake the functions of information dissemination, knowledge services, and lifelong education. However, traditional library service models often exhibit a certain degree of lag and inadequacy when facing the floating population as a special group. On one hand, the information demands of the floating population have distinct characteristics of vocational orientation, practicality, and timeliness; on the other hand, library service resources, methods, and concepts have not fully adapted to this change. Simultaneously, the rapid development of information technology provides new possibilities for library service innovation. The application of emerging technologies such as big data, artificial intelligence, and mobile internet is profoundly changing the ways information is produced, disseminated, and accessed. How to leverage technology empowerment to enhance the adaptation between library services and the information demands of the floating population has become an urgent problem to be solved in the current library academia and industry. From the perspective of technology empowerment, this study explores the characteristics and evolution trends of the information

demands of the floating population, analyzes the current situation and shortcomings of library services, and proposes adaptation improvement strategies based on technological innovation. The research results not only help enrich library service theory but also provide practical references for improving the information access environment for the floating population and promoting socially inclusive development.

2. Analysis of the Characteristics of the Floating Population's Information Demands

As a special social group, the floating population's information demands exhibit distinct characteristics (Table 1). Through field research and data analysis, we found these characteristics are mainly manifested in the following aspects:

Table 1 Survey Results on Types and Priorities of Information Demands of the Floating Population (N=1,200)

Information Demand Type	Percentage(%)	Main Access Channels	Demand Urgency (1-5)
Employment Information	76.5	Online Platforms / Fellow Villagers	4.7
Housing Rental	68.2	Intermediaries / Community Notices	4.3
Children's Education	59.3	School Notices / Government Websites	4.1
Medical Care	54.7	Hospitals / Community Service Centers	3.9
Legal Rights Protection	32.1	Judicial Offices / Trade Unions	3.5
Skills Training	28.6	Human Resources Dept. / Company Notices	3.2

Note: Demand urgency uses a 5-point scale (1=Not urgent, 5=Very urgent)

2.1 Information Demands Have a Strong Practical Orientation

The survey shows that over 80% of respondents are most concerned about information closely related to daily life, including employment opportunities (76.5%), housing rental (68.2%), children's education (59.3%), and medical care (54.7%). Employment information ranks first with 76.5% attention, especially among manual laborers like construction workers and domestic helpers who have particularly prominent real-time requirements for casual labor information (87.3% of respondents want job information updated within 24 hours). Housing rental demand (68.2%) shows clear spatial differentiation: the floating population in urban-rural fringes is more concerned about rent levels (attention rate up to 92.4%), while workers in central urban areas value commuting convenience more (73.6%). Children's education demand (59.3%) varies by school stage, with consultations on compulsory education admission policies accounting for 81.5%, far exceeding preschool education (43.2%) and high school education (28.7%). Within medical care demand (54.7%), cross-regional medical insurance settlement (72.3%) and emergency medical procedures (68.9%) are the most urgent information gaps. Research indicates that the content of the floating population's demands is highly correlated with basic survival elements. This pragmatic tendency reflects the real pressures they face in urban survival and development.

2.2 Information Demands Exhibit Clear Phased Changes

The information focus of the floating population varies significantly across different stages of urban residence, showing distinct phased evolution characteristics that map onto their trajectory of

urban survival and development:Upon Initial Arrival: Information demands are highly focused on solving "shelter" and "livelihood" problems. Demand for accommodation information is as high as 92.3%, and demand for employment information reaches 88.6%. "Essential guides" for survival in the new environment form the absolute core of their information world.After 3-6 Months of Initial Adaptation and Stable Residence: The focus of life begins to transition from "seeking survival" to "planning development". As basic subsistence needs are met, the desire for future planning and urban integration increases. The information focus shifts significantly towards enhancing their own competitiveness and seeking institutional security. Attention to skills training information, for seeking better career development, rises to 43.2%. Attention to social security policy information, a source of security related to their rights and interests, rises to 38.9%, becoming new hotspots, indicating they are beginning to "lay the foundation" for long-term stable life in the city.For Long-term Residents: Information demands deeply reflect their aspirations for "citizenization" and "settling down". Life stability leads them to focus on the family's long-term well-being and asset accumulation. Children's education information becomes the top concern, reaching 67.8%. Housing purchase information demand significantly accounts for 52.4%, rising to a dominant force in the information demand map. This reflects their profound shift in identity and life goals from "urban transients" to "urban masters".

2.3 Information Access Channels Show a Diversification Trend

The information access channels for the floating population present a diversified pattern. This change is reflected not only in the increase in the number of channels but also in the significant shift in the relative status and function of different channels. On one hand, traditional interpersonal communication networks based on geographic, kinship, and occupational ties (accounting for 61.2%) - such as word-of-mouth among fellow villagers, co-workers, and relatives - still play an indispensable role. This channel is particularly valuable for obtaining informal, localized information that requires interpersonal verification (such as certain casual job opportunities, word-of-mouth rental information), becoming an important information link for the floating population to establish a sense of security in an unfamiliar environment. On the other hand, the popularity of smartphones has acted as a catalyst, completely reshaping the primary channel for information access. Mobile internet, with its convenience, immediacy, and vastness (accounting for 78.5%), has become the dominant source of information. Through various apps like life services, job recruitment, social media, search engines, and instant messaging tools, the floating population can actively search for information covering almost all aspects such as accommodation, work, policies, and life tips anytime and anywhere. This "fingertip information freedom" greatly breaks through geographical and social circle restrictions, improving the efficiency and autonomy of information access, and profoundly changing their way of integrating into urban life. However, amidst this channel prosperity, a key shortcoming cannot be ignored: public cultural service institutions, especially libraries, are significantly absent in meeting the information demands of the floating population. The proportion accessing information through libraries is only 12.3%. This low percentage starkly reflects the profound disconnect between library services and the actual needs of this large group. Possible reasons include: library locations, opening hours, and service models failing to effectively match the work and life rhythms of the floating population; lack of targeted collection resources (especially practical, skills-enhancing, easy-to-understand ones); insufficient promotion and guidance for accessing digital resources; and low awareness of library services or a perceived psychological distance among some members of the floating population. This disconnect means an important, potential channel for accessing authoritative, systematic, and free information is not fully realizing its social service potential.

2.4 Information Demands Exhibit Internal Group Differentiation

The floating population is not a homogeneous whole; their information demands show distinct internal group differentiation characteristics. Significant differences in information demands are observed among floating populations of different ages, occupations, and education

levels:Youth: Show an urgent demand for vocational skills enhancement, industry trends, and career development information, accounting for 82.4%. Simultaneously, demand for enriching social networks, integrating into urban social circles, and accessing leisure and entertainment information (social entertainment needs) accounts for 63.7%.Middle-aged and Older Floating Population: Are most concerned about medical and health information, reaching 71.2%. Meanwhile, demand for pension policy information is significant at 58.9%. Future pension planning, related welfare policies, and the feasibility of retiring elsewhere are also becoming hot topics, relating to their ultimate expectation of achieving "old-age support" in the city.Education Level: As an important indicator of social stratification, influences the level and preference of information demands. The floating population with higher education levels generally possesses stronger information acquisition capabilities and longer-term life planning horizons. Their attention to continuing education information such as on-the-job further study, degree advancement, and professional skill certification reaches 46.8%, representing an important strategy for investing in the future and maintaining competitiveness. Concurrently, those with higher education show significantly greater interest in information about cultural exhibitions, art events, and public lectures held in the city, reaching 39.5%, reflecting their pursuit of integrating into the urban cultural fabric, improving quality of life, and achieving a sense of spiritual belonging.

These characteristics provide an important basis for libraries to carry out targeted services and highlight the urgency of adaptive reform of the current service model. Understanding and analyzing these demand characteristics is the prerequisite and foundation for enhancing service adaptation.

3. Diagnosis of the Current Situation and Problems in Library Services

Currently, public libraries in China have undertaken some explorations and practices in serving the floating population, but overall, numerous deficiencies remain. Through an investigation of 30 public libraries in 15 cities across China (Table 2), we identified the following prominent issues:

Table 2 Comparison of the Current Situation of Library Management Services for the Floating Population by Library Type

Service Indicator	Provincial Libraries (N=8)	City Libraries (N=12)	Community Libraries (N=10)	Overall Average
Special Service Coverage Rate	75%	42%	15%	38%
Proportion of Multilingual Resources	6.2%	3.8%	1.2%	3.5%
Proportion of Mobile Terminal Visits	58%	47%	32%	44%
Monthly Average Service User Visits (Floating Population)	320	180	65	165
Number of Partner Institutions	9.4	5.2	2.1	5.1

Data Source: 2024 Survey of 30 Libraries

3.1 Limited Service Coverage is the Primary Problem
Judging from the geographical breadth and targeting of service provision, coverage is severely

uneven and targeted programs are scarce. Nationwide, only about 23% of libraries have clearly launched service programs specifically designed and named for the needs of the floating population. This means that in over three-quarters of libraries, conventional services have not consciously included this special group as a core service target or made differentiated designs. More worryingly, these limited special services are highly concentrated geographically - the vast majority are located in large, economically developed, resource-rich cities or provincial capitals. Vast areas of small and medium-sized cities, counties, as well as urban-rural fringes and industrial park peripheries where the floating population actually congregate, have become "blind spots" or "weak areas" for specialized library services. This severe imbalance on the supply side means that a large number of floating populations located outside core cities struggle to access library resource support even at the institutional level.

    Secondly, at the cognitive level of the target group, the awareness rate is extremely low. Even if individual libraries provide services, they are effectively non-existent if the floating population is unaware of them. The survey shows that among the floating population, the proportion who clearly know that their local library provides relevant services is only 34.5%. In other words, nearly two-thirds of the floating population are almost completely unaware of what help the libraries near them can offer. This widespread state of "information fog" stems from the severe weakness and channel misalignment of library promotion. The lack of targeted, proactive promotion deep into communities and workplaces, utilizing their commonly used media (such as short video platforms, WeChat groups, fellow townspeople associations), means that valuable service resources remain largely "unknown."
Ultimately, low awareness inevitably leads to an "ice-cold" actual usage rate. The proportion of the floating population that has actually used library services (including borrowing, reading, participating in activities, using electronic resources, etc.) is as low as 18.7%. This is far below the average level for urban permanent residents and more deeply exposes the "mismatch" between the service design itself and the real needs and living conditions of the floating population.

3.2 Poor Resource Adaptability is Another Salient Problem

Another key obstacle for libraries serving the floating population lies in the severe "adaptability gap" of their collections and digital content. This gap is not simply a shortage of quantity, but rather a profound, systematic mismatch between the resource structure, content themes, presentation methods, and the real, urgent, and unique information demands of the floating population. The core issue is that the resource development logic of most libraries still unconsciously anchors on an "idealized urban permanent resident" profile, failing to proactively respond to and accommodate the particularities of this large group. The most prominent contradiction is reflected in the imbalance in the thematic structure of print and digital resources. Regular collections and databases often emphasize academic research, classic literature, local history, or popular leisure reading, while"essential"information resources crucial for the survival and development of the floating population are extremely scarce and marginalized. For example:Severe Lack of Rights Protection Information: crucial for livelihood and dignity: Surveys show that specialized books clearly explaining core survival issues for migrant workers, such as labor rights protection, contract dispute resolution, legal aid channels, and wage arrears recovery, account for a surprisingly low 2.3% of the total social science collections in libraries. This makes it difficult for the floating population to conveniently find the knowledge tools for rights protection in libraries, which should provide authoritative support.Skills Enhancement Resources: that support career development and transition are not only scarce in variety and systematic but also account for less than 1.5% of the collection. This creates a huge gap with the strong career development aspirations of the floating population, especially the youth, hindering their ability to achieve urban integration and income growth through skills improvement.Near-absence of Dialect Resources: The Mandarin proficiency of newcomers and the middle-aged/elderly among the floating population is limited; they are more accustomed to using their native dialects to access and understand information. Libraries are almost blank in terms of dialect resources: audio materials,

etc., written in major outflow dialects such as Southwestern Mandarin, Henan dialect, Anhui dialect, are almost nowhere to be found. This means that groups with weaker language abilities, even if they enter the library, face the dilemma of "seeing resources but not understanding the content."Severe Insufficiency of Multilingual Services: Multilingual resources (e.g., in Uyghur, Tibetan) for ethnic minority floating populations or foreign migrant workers are even rarer, further excluding some groups from the service scope.

The root cause of this poor resource adaptability lies in the inflexibility of library resource acquisition and development mechanisms and the failure to perceive demand. Acquisition standards often rely on traditional bibliographies and supplier recommendations, lacking specific demand surveys and resource planning for the floating population; cataloging and recommendation systems also fail to establish effective "floating population demand" tags and guidance paths. This not only results in a hidden waste of public resources but, on a deeper level, reflects the inability of public cultural service institutions to respond to the needs of specific groups while fulfilling their duty of "universal access and benefiting all people." Improving the precise adaptability of resources is another difficult hurdle that library services must overcome to move beyond "physical coverage" and achieve "effective service."

3.3 Inflexible Service Delivery is a Key Bottleneck Constraining Library Service Efficacy

The significant inflexibility in current library management service delivery has become a key bottleneck deeply restricting the full release of their service efficacy, especially failing to match the increasingly mobile needs of the modern population. The traditional in-library service model, as the mainstream form, creates a sharp conflict between its fixed opening hours and physical space limitations and the high-intensity, long-commute, fragmented work-life rhythm of the floating population: when these mobile individuals desire knowledge in their limited leisure time, the library doors may already be closed. Although 87% of libraries have launched online services, their functional development is far from mature, with the vast majority (92.5%) only offering basic functions like catalog search, and 76.3% providing e-book reading. Deep interactive services such as online reference consultation, personalized resource, virtual community communication, segmented content customization, and career information navigation are severely lacking. Furthermore, mobile service applications, intended to be tools for breaking spatiotemporal constraints, often backfire due to generally poor user experience: complex registration processes, confusing functional layouts, and slow system responses 无形中 erect barriers, keeping out many potential users unfamiliar with digital operations or lacking patience. This structural mismatch between the service supply side and user demand side clearly indicates that if service concepts and models are not innovated based on real user needs, libraries, even with abundant resources, will struggle to truly deliver their service efficacy to those who need it most. Service transformation is an urgent proposition crucial to the survival of the library's core value in the digital age.

3.4 Shortage of Professional Talent is a Deep-Seated Problem

The current service provision for the floating population by libraries is encountering a deep-seated bottleneck of structural shortage of professional talent. The most direct manifestation is the lack of direct service personnel: nationwide, less than 15% of librarians are truly familiar with the specific cultural backgrounds, life difficulties, and information needs of the floating population group; librarians proficient in using major labor outflow area dialects (e.g., Sichuan, Henan, Anhui dialects) to provide barrier-free communication services are as rare as phoenix feathers. This dual lack of language and cultural understanding acts like an invisible wall, causing the groups most in need of information assistance to encounter at the service front desk.

3.5 Lack of Collaborative Mechanism Becomes a Shortcoming in the Library Service Network

The deep-seated constraints on library service efficacy also stem from the significant absence of collaborative mechanisms with the external ecosystem. Currently, cooperation between libraries

and key institutions such as communities, enterprises, and social organizations is generally loose and fragmented, failing to establish a normalized, institutionalized network for resource integration and action coordination. This state of fragmentation directly leads to narrow service coverage and resource supply, making it particularly difficult to accurately reach mobile groups with diverse needs like migrant workers. Only 11% of libraries have established fixed cooperation channels with migrant worker service agencies, meaning the vast majority of migrant workers cannot easily access library services through the community organizations or aid agencies they are familiar with. Furthermore, deep cross-sector collaboration projects in areas requiring policy linkage and resource complementarity – such as libraries embedding vocational skills information in community service centers, jointly developing vocational training resources with enterprises, and collaborating with government departments to push public policy interpretations – are even fewer. This "siloed" pattern not only causes duplicate service investment and resource waste but also fragments the social support network, trapping libraries, which should serve as information hubs and social integration platforms, in the predicament of "information islands." Breaking down institutional barriers and building a user demand-centered collaborative service ecosystem has become the necessary path to enhance the social penetration and comprehensive service effectiveness of libraries.

The existence of the above problems makes it difficult for libraries to effectively meet the information demands of the floating population, urgently requiring resolution through conceptual innovation and technology empowerment. Especially in the context of digital transformation, how to use emerging technologies to break through service bottlenecks has become the key to enhancing adaptability.

4. Adaptation Improvement Strategies under Technology Empowerment

4.1 Optimize the system from three aspects: technology application, service model and management mechanism

In response to the issues analyzed in the previous text, we propose the following adaptation improvement strategies based on technology empowerment, systematically optimizing from three aspects: technology application, service model, and management mechanism. At the technology application level, it is suggested to build an intelligent information service platform for the floating population. By leveraging big data technology to analyze user behavior data, precise demand profiles can be drawn, and personalized information push can be achieved. For instance, based on users' search records and stay time, it can intelligently recommend employment information or training resources. Meanwhile, natural language processing technology is applied to develop multilingual service systems to solve the problem of language barriers. The artificial intelligence customer service can provide 24-hour online consultation and promptly answer common questions such as social security policies and children's school enrollment. In terms of service model innovation, the focus is on developing mobile-first smart services. Optimize the library's APP and mini-program, simplify the registration process, and add one-click service functions. Launch the "Information Express" module to integrate authoritative information from government departments and ensure the timeliness and accuracy of the content. Establish an integrated online and offline service network, and set up smart borrowing cabinets and digital service stations in areas with a high concentration of floating population such as industrial parks and construction sites. Carry out "information assistance" activities, train information volunteers, and help digitally disadvantaged groups master basic information skills; In terms of the reform of the management mechanism, it is suggested to establish a multi-party collaborative service system. Libraries should establish a data sharing mechanism with institutions such as the human resources and social security department and the Migrant population service center, and jointly build a comprehensive information service platform. Introduce social forces to participate in service supply, such as cooperating with enterprises to carry out digital vocational skills training and collaborating with

universities to develop cultural integration courses. Improve the performance evaluation system, incorporate services for the floating population into the assessment indicators of libraries, and establish a user satisfaction evaluation system.

In addition, special attention should be paid to digital inclusive design. Given the digital divide among the floating population, service design should take into account both technological advancement and ease of use. Provide multiple access channels (such as SMS service, voice interaction, etc.) to ensure that users of different technical literacy can all obtain necessary information support. At the same time, we should enhance information literacy education and regularly hold training activities on the use of smart phones and information discrimination.

4.2 Phased Implementation of Strategies

The implementation of these strategies needs to be phased:Short-term (1 year): Focus on improving basic digital services.Medium-term (2-3 years): Build an intelligent service platform.Long-term (3-5 years): Form a mature technology-empowered service system.Through continuous optimization and innovation, the ultimate goal is to achieve a high degree of adaptation between library services and the information demands of the floating population (Table 3).

Table 3 Technology Empowerment Strategy Implementation Path and Expected Effects

Implementation Phase	Key Technologies	Specific Measures	Expected Effect Indicators
Short-term (1 year)	Mobile Internet + Big Data	1. Optimize Library App 2. Establish Demand Database	1. User Growth Rate ≥ 30% 2. Service Awareness Rate Increased to 60%
Medium-term (2-3 years)	Artificial Intelligence + Cloud Computing	1. Deploy Intelligent Consultation System 2. Build Resource Sharing Platform	1. Problem Resolution Rate ≥ 85% 2. Resource Utilization Rate Increased by 40%
Long-term (3-5 years)	Internet of Things + Digital Twin	1. Build Smart Service Station Network 2. Develop Virtual Training System	1. Service Coverage Rate ≥ 90% 2. User Satisfaction Reaches 4.5/5

Note: Effect indicators are based on Delphi method expert evaluation results.

5. Conclusion and Outlook

This study, by the multi-level, dynamic information demand map of the floating population and the adaptation challenges of the library service system, reveals the key pathways to enhance service precision and inclusivity under the background of technology empowerment. The core conclusions indicate:The information demands of the floating population exhibit distinct practical orientation and complex structure – their demand content closely revolves around survival and development essentials like employment, housing, medical care, and children's education, and shows significant phased evolution characteristics along with the urbanization process. In terms of access methods, they rely on mobile terminals like smartphones for efficient access, yet internal group stratification occurs due to differences in digital literacy. Information preferences show obvious heterogeneity among groups with different career trajectories and generations. Libraries face systematic bottlenecks: limited physical coverage radius leads to insufficient service accessibility (especially in suburban); misalignment between resource development and high-

demand areas like vocational skills enhancement and urban integration guidance; coexistence of traditional in-library models and the superficial nature of digital services creating a "dual rigidity"; severe shortage of professionals skilled in serving the floating population; and fragmentation of collaborative networks with communities, enterprises, and government agencies.In response to the above challenges, the study proposes a three-dimensional breakthrough strategy of "technological innovation - model restructuring - institutional optimization":On one hand, utilize big data profiling and AI recommendation engines to achieve precise demand perception and intelligent resource matching; use VR/AR technologies to create immersive skills training scenarios.On the other hand, build a hybrid service network of "online communities + offline micro-stations"; develop proactive "information butler" style services.In terms of management mechanisms, it is necessary to establish cross-departmental resource scheduling platforms and librarian skill training systems.Future research urgently needs to deepen exploration in three aspects:First, explore the disruptive applications of technologies like 5G low latency and Metaverse virtual spaces in remote vocational skills training and cross-regional cultural integration.Second, reveal the differentiated configuration logic and resource mechanisms for floating population services under different city tiers (e.g., megacities vs. counties) and regional development gradients.Third, design efficacy evaluation models integrating multidimensional indicators such as "resource usage rate," "user satisfaction," and "social integration degree," to reverse the evaluation inertia that emphasizes input over outcomes.

At the practical level, a gradual path of "pilot first - experience diffusion" is recommended: prioritize the selection of representative city libraries in highly concentrated floating population areas like the Yangtze River Delta and Pearl River Delta to carry out "Smart Service Station" demonstration projects, exploring innovative forms such as "enterprise-community-library" tripartite vocational skills enhancement stations and multilingual policy consultation platforms, forming replicable and scalable standard modules and collaboration paradigms. With the deepening advancement of the Digital China strategy, the proliferation of new infrastructure and the iteration of AI technologies will provide unprecedented technological leverage for libraries to break spatiotemporal barriers in services and deepen precise content supply. By building a smart service system centered on the development needs of the floating population, libraries can not only significantly enhance their value level as social knowledge hubs but also play an irreplaceable role in promoting orderly population mobility, bridging information divides, and the equalization of basic public services. This transformation is not only related to the survival and development of libraries themselves but will also provide strong cultural support and information guarantee for the urban-rural dual structure and achieving people-oriented new urbanization. With the further of Digital China construction, technology empowerment will provide broader space for library service innovation. Through continuous optimization of service supply, libraries are expected to play a greater role in promoting the social integration of the floating population and the equalization of basic public services. This will not only help enhance the social value of libraries but also provide beneficial support for integrated urban-rural development.

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