

Research on the Demand and Optimization Strategy of Aging-Friendly Services in Public Libraries Based on the Kano Model

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Abstract: Aging-friendly services in public libraries are critical to addressing population aging challenges and safeguarding older adults cultural rights. As global aging has intensified, scholars and practitioners worldwide have conducted multidimensional research in this field. Focusing on aging-friendly services, this paper designs the demand indicators for aging-friendly services in public libraries from four dimensions: spatial environment, resource services, service methods, and assistive technologies. Using the Kano Model, and through questionnaire surveys and data analysis, it systematically identifies the types of needs of elderly readers for public library services (such as basic needs, expected needs, and exciting needs). The study finds that the aging-friendly service needs of elderly readers exhibit the characteristics of hierarchy, diversity, and dynamics. Public libraries should adopt optimizing basic services, innovating service scenarios, creating distinctive brands, and building a multi-dimensional collaborative service system as strategic means. They should focus on expected demands and offer more comprehensive and sustainable age-friendly services to elderly readers.

1. Introduction

The Kano model was first developed by Noriaki Kano, a Japanese expert in quality management, inspired by the "two-factor theory" proposed by American psychologist Herzberg [1]. It introduces the concepts of satisfaction and dissatisfaction into quality management and establishes a two-dimensional cognitive model that connects product performance fulfillment with user satisfaction [2]. The core idea of the Kano model is to classify product functions scientifically by analyzing users' satisfaction levels with these functions in depth. Based on the two-dimensional matrix of "user satisfaction-degree of requirement fulfillment", Kano put forward a theory for categorizing user needs, which divides requirements into five types: basic, expected, exciting, indifferent, and reverse [3]. The Kano model works well in situations where user needs are complicated and require a clear distinction between "must-have" and "value-added" satisfaction. It aligns closely with the "inclusiveness plus personalization" features of age-friendly services in public libraries. The Kano model, a typical qualitative analysis tool, can accurately identify the

demand levels for elderly-friendly services in public libraries and prevent resource misallocation. This provides public libraries with practical support to improve their service methods. This paper draws on foreign "elderly - centered" theoretical frameworks and applies the Kano model to systematically analyze the demands and optimization strategies for age-friendly services in public libraries.

2. The Connotation and Characteristics of Age-Friendly Services in Public Libraries

2.1 The Connotation of Age-Friendly Services in Public Libraries

An inclusive service system, age-friendly services in public libraries are developed to address the characteristics of elderly individuals, including the decline in physiological functions (such as reduced vision and hearing), changes in cognitive abilities (like slower information processing speed), and social participation needs (for example, issues related to social isolation). This system is built through environmental modification, resource adaptation, technological innovation, and other approaches [4]. Its main core objectives are as follows: safeguarding basic interests, facilitating digital access and integration, and enhancing social connections.

2.2 The Characteristics of Age-Friendly Services in Public Libraries

Table 1 Types of Age-Friendly Services in Public Libraries

Service Dimension	Coding	Service Type	Description (Examples)
Spatial Environment (SE)	SE1	Barrier-Free Facilities	Wheelchair ramps, handrails, low service counters, tactile paths, etc.
	SE2	Age-Friendly Reading Space	Quiet areas with magnifying glasses, etc.
Resource Services (RS)	RS1	Large-Print Books/Newspapers	Books on health maintenance and healthcare
	RS2	Age-Friendly Website Design	Large font size and easy operation
	RS3	Intergenerational Reading Activities	Joint reading and communication activities for the elderly and children
	RS4	Elderly Interest Groups	Calligraphy/photography/painting groups for the elderly
	RS5	Traditional Culture Experience	Traditional Chinese opera, tea art, nostalgia exhibitions, etc.
Service Methods (SM)	SM1	Digital Skills Training	Mobile phone usage, internet access, etc.
	SM2	Smart Device Lending Service	Rental of voice guides, large-screen mobile phones, tablet computers, etc.
	SM3	Home Book - Delivery Service	Services for elderly people with mobility issues
	SM4	Reading Guidance	Book recommendations, companion reading, etc.
Assistive Technology (AT)	AT1	Voice Navigation System	In-library voice guidance

The elderly reader group in public libraries presents needs with the following characteristics: (1) Physiological and psychological needs overlap. For instance, reduced vision creates a demand for large-print resources, while there is also a psychological need to "be respected"; (2) Intergenerational differences are highly pronounced [5]. Elderly people aged 60-70 show greater concern for digital skills training, whereas those over 80 have a stronger need for life care services; (3) Social participation motivation is strong. There is a high demand for rebuilding social connections through cultural activities. The needs of elderly readers demonstrate both basic and differentiated characteristics. After systematically reviewing domestic and international research on age-friendly

services and summarizing high-frequency service items, the demand for age-friendly services in public libraries is preliminarily divided by the author into 4 dimensions and 12 basic types (see Table 1).

3. Analysis of the Hierarchical Needs for Age-Friendly Services in Public Libraries

Following the basic steps for identifying user demand attributes, the demand attributes of elderly readers for age-friendly services in public libraries were categorized using methods including traditional Kano model classification and classification based on the Better-Worse index.

3.1 Questionnaire Design and Data Collection

The questionnaire designed for this study includes three parts. First, it surveys the demographic characteristics of elderly readers in public libraries, covering basic information such as age, gender, education level, and digital literacy. Second, based on the 12 selected age-friendly service indicators of public libraries listed in Table 1, both positive and negative questions were formulated. Respondents then chose the attitude option that best matched their own perception according to their personal subjective understanding and service experience. Service requirement types were determined using the Kano model classification rules based on responses to positive and negative bidirectional questions. The third section contains open-ended questions aimed at gathering elderly readers' suggestions for service improvements.

The Kano model questionnaire was distributed offline between February and March 2025, a total of 345 questionnaires were received. After removing 29 invalid responses—due to excessively short completion times or highly similar answers—a total of 316 valid questionnaires remained, representing an effective response rate of 91.6%. Overall, the sample selection was stratified by gender, age, education level, and digital literacy. This sampling approach was reasonably designed and ensures the sample has certain representativeness.

3.2 Classification Results of Age-Friendly Service Needs

To account for variations in how respondents perceived public libraries' age-friendly services, the quality element classification approach developed by Matzler and Hinterhuber was adopted [6]. This method enabled a more detailed and systematic analysis of the demand attributes associated with age-friendly service models in public libraries. The demand attributes of 12 specific age-friendly services were categorized individually through in-depth examination of responses from 316 questionnaires, combined with the Kano model's two-dimensional attribute classification matrix (see Table 2).

Table 2 Kano Model Two-Dimensional Attribute Classification Matrix Table

User Requirements		If the **service is not provided, how do you feel about it?				
		Very Satisfied	As Expected	Indifferent	Barely Acceptable	Very Dissatisfied
If the **service is provided, how do you feel about it?	Very Satisfied	Q	A	A	A	O
	As Expected	R	I	I	I	M
	Indifferent	R	I	I	I	M
	Barely Acceptable	R	I	I	I	M
	Very Dissatisfied	R	R	R	R	Q

Specifically, a public library's age-friendly service is classified as an "excitement demand" when respondents answer "like very much" to the positive question and "should be the case" to the reverse question. This is because such demands create unexpected and satisfaction that exceed

users' expectations. If respondents select "indifferent" for the positive question while choosing "should be the case" for the reverse one, the service falls into the "indifferent demand" category, meaning it has little noticeable impact on users. When respondents misunderstand question items or make errors in their answers, questionable results (Q) may occur and require further verification.

3.2.1 Classification Results of the Kano Model

The needs of elderly readers are characterized by being fundamental and having differences. The Kano model effectively distinguishes between essential basic services and value-added services that enhance experience, serving as a tool for precise optimization. Based on this, the frequency of user demand attributes for various elderly-friendly service methods in public libraries was summarized. According to the proportion of different service demand attributes, 12 demand items of elderly-friendly service types were classified in detail. The final classification results are presented in Table 3.

Analysis through the Kano model reveals that the demand categories for elderly-friendly services in public libraries can be hierarchically divided into four types. Among these, there are 5 attractive service demands (A), including elderly interest groups (40.2%), intergenerational shared reading (45.6%), door -to-door book delivery (48.1%), voice navigation (27.5%), and traditional culture experience (54.4%). When attractive demands are not met, the "indifferent" response rate is high (dominated by the I value), while meeting these demands leads to a high "delighted" response rate, making them a key breakthrough for service innovation. Five items were identified as expected service demands (O), including elderly-friendly reading spaces (51.6%), digital skills training (52.2%), and intelligent device borrowing (45.6%). When these expected demands are met, the proportion of "satisfied" responses is high (>50%), while the proportion of "dissatisfied" responses is relatively high when they are not met. Therefore, targeted optimization is needed to enhance satisfaction levels. Two items were categorized as basic service demands: barrier-free facilities (79.5%) and large-print books (71.2%). When these basic demands are unmet, the proportion of "very dissatisfied" responses is significantly high, showing that the elderly group views these two items as essential basic services that "must be satisfied".

Table 3 Summary of Kano Evaluation Classification and Better-Worse Coefficients for Elderly-Friendly Service Needs

Service Type	Service Demand Attribute Statistics (Frequency / Percentage)					Classification Result	Better Coefficient	Worse Coefficient
	A	O	M	I	R			
SE1	2.50%	18.00%	79.50%	0.00%	0.00%	M	0.72	-0.83
SE2	10.10%	38.30%	51.60%	0.00%	0.00%	O	0.59	-0.62
RS1	3.80%	25.00%	71.20%	0.00%	0.00%	M	0.7	-0.8
RS2	21.20%	43.70%	35.10%	0.00%	0.00%	O	0.53	-0.47
RS3	45.60%	36.70%	17.70%	0.00%	0.00%	A	0.6	-0.4
RS4	40.20%	42.10%	17.70%	0.00%	0.00%	A	0.62	-0.38
RS5	54.40%	29.40%	16.20%	0.00%	0.00%	A	0.51	-0.49
SM1	19.60%	45.60%	34.80%	0.00%	0.00%	O	0.68	-0.58
SM2	14.20%	52.20%	33.60%	0.00%	0.00%	O	0.65	-0.55
SM3	48.10%	33.90%	18.00%	0.00%	0.00%	A	0.58	-0.42
SM4	12.00%	48.10%	39.90%	0.00%	0.00%	O	0.63	-0.57
AT1	27.50%	40.20%	32.30%	0.00%	0.00%	A	0.54	-0.46

3.2.2 Classification Results Based on the Better-Worse Index

To make the classification more detailed and scientific, the author has added the "customer

satisfaction coefficient (CS)" – also known as the Better-Worse index analysis method developed by Berger and other scholars – to the Kano model analysis [7]. This enhanced Kano model not only takes users' basic satisfaction into account but also helps explore how satisfied or dissatisfied users feel under different service needs. Calculations show that barrier-free facilities, large-print books/newspapers, and digital skills training are high-priority items that need immediate attention. Medium-priority areas include elderly-friendly reading spaces, age-appropriate website design, smart device lending, reading guidance, and voice navigation systems, which should be improved step by step. Low-priority activities like senior interest groups, intergenerational reading programs, and traditional culture experiences require long-term planning or trial projects.

3.2.3 Results of cross-analysis

Stratified analysis by users' age groups shows that elderly individuals aged 60-70 have the highest demand intensity for digital skills training, which reflects the urgency of younger elderly people to integrate into digitalization. Elderly individuals over 80 years old have a significantly higher demand intensity for door-to-door book delivery services than those in other age groups, highlighting the mobility issues faced by older elderly people.

Based on the tiered analysis of digital literacy, the low digital literacy group showed the highest demand for digital skills training. This was significantly different from the high digital literacy group. Meanwhile, the high digital literacy group had a stronger demand for voice navigation systems, reflecting their preference for intelligent services.

3.3 Analysis of the Characteristics of Demand for Age-Friendly Services in Public Libraries

Combining the sample characteristics and Kano classification results, the demand for age-friendly services in public libraries presents the following core characteristics:

3.3.1 Hierarchical and Diversified Service Demands

Kano model analysis shows that the needs of elderly readers can be clearly divided into three categories: basic needs, expected needs, and exciting needs, with significant differences in service attributes between these categories. Expected needs (such as digital skills training and intelligent device borrowing) account for 42% (5/12 items), reflecting elderly readers' urgent desire to enhance their information literacy and digital participation abilities. There is a significant positive correlation between the satisfaction of such needs and user satisfaction, which serves as a key breakthrough for improving service quality. Basic needs, including barrier-free facilities and large-print books, make up 16% (2/12 items). This figure highlights the strong reliance elderly readers have on libraries' physical environments and basic resources. If these needs are not addressed, it will directly lead to dissatisfaction with library services among elderly users. Excitement-driven needs, such as senior interest groups and intergenerational reading activities, account for 42% (5/12 items). When provided, these services can significantly boost elderly readers' sense of belonging and happiness, acting as a key innovative way to build an ecosystem for "cultural elderly care".

3.3.2 Dynamic Nature of Service Demand: New Trends under the Intersection of Digitalization and Aging

Elderly readers' demand for digital services was found to be significantly higher than traditionally expected. This finding aligns with the trend of "rapidly growing digital needs among older adults" identified in international studies (Kimetal., 2021) but highlights a local characteristic:

the "two-way squeeze" of the digital divide [8]. Those with low digital literacy require urgent basic skills training, while those with high digital literacy show greater interest in intelligent services like voice navigation, indicating the stratified and dynamically evolving nature of demand.

3.3.3 Differences among Elderly Groups: Multidimensional Impacts of Age and Digital Literacy

Two distinct patterns emerged from cross-analysis. When examining age groups, adults over 80 showed twice the demand for door-to-door book delivery services compared to those aged 60-70, confirming the validity of conclusions regarding mobility limitations in advanced age. Looking at digital literacy levels, the demand for digital skills training among people with low digital literacy is 3.1 times stronger than those with high digital literacy. This shows how urgent it is to provide "digital inclusion" services.

4. Optimization Strategies for Age-Friendly Services in Public Libraries

To address the current issues in age-friendly services at public libraries, optimization strategies should be developed based on the principles of precision, stratification, and emotional care, following the implementation path of "basic guarantee - intelligent empowerment - multiple collaboration". These strategies should include setting up regional access points for reading glasses categorized by diopter and shared hearing aid facilities for elderly people with hearing difficulties.

4.1 Basic needs: Optimizing basic services to ensure essential requirements

For physical space improvements, every public library should provide barrier-free restrooms, install additional handrails, use non-slip flooring, and place diopter-classified reading glass stations along with shared devices like hearing aids in public areas [9]. Dynamic adjustments should be made to the environmental design, with reading lights that have adjustable brightness installed. Feedback from elderly users on the library's environmental design should be collected regularly to guide optimization and adjustments. At the resource adaptation level, public libraries should plan to update large-print books every year and build an elderly-themed resource library covering topics like health care, science popularization, and history and culture. They should also promote one-click borrowing services and set up special sections with Braille books and audio resources for elderly people with visual or hearing impairments.

4.2 Expected needs: accurately meet needs and innovate service scenarios

In terms of digital support, public libraries should develop age-friendly digital service platforms, making the operation interfaces simpler and adding voice navigation and video tutorials. Differentiated supply strategies should be implemented. For the 60-69 age group, dialect-based and slow-paced digital training courses should be developed, along with one-on-one digital skills coaching. Elderly users with lower educational backgrounds should receive guidance on digital resource usage through conversational and example-driven methods; for those with higher education levels, in-depth services like academic database searches and e-journal subscriptions should be added.

In terms of activity innovation, public libraries should design an "age-tiered" activity framework. This includes engaging 60-69 year olds in volunteer work such as book organizing and event planning, arranging cultural experiences like nostalgia exhibitions and intangible cultural heritage crafts for those over 70, partnering with top-tier hospitals to conduct health education sessions, and collaborating with communities to host intergenerational reading programs. In terms of resource

integration, expert databases have been set up through collaborations between public libraries, universities and medical institutions. Health lectures on topics like Alzheimer's prevention and hypertension management are organized on a regular basis, which helps improve the professionalism and relevance of these sessions.

4.3 Excitement-type needs: Tap potential value and build characteristic brands

At the pilot level of smart services, intelligent tour guide robots that support dialect recognition and voice question answering are introduced, AR digital reading devices that can scan books to generate 3D scenes are purchased, and courses such as short video production and mobile phone photography are offered. Social library spaces should be developed to foster interest-focused service brands. Public libraries are advised to establish communities like "Silver Age Reading Clubs" and "Intergenerational Cultural Salons", set up elderly interest groups for activities such as calligraphy, painting and chorus, and invite professional instructors to provide guidance [10]. Elderly readers should be encouraged to organize regular events including tea parties and sharing sessions, which helps strengthen their cultural identity and social belonging, boost their sense of participation and achievement, and form a positive "activity-participation-stickiness" cycle. In terms of cultural inheritance and innovation, public libraries should launch "elderly oral history collection" programs to record family memories and local culture [11]. They should also organize hands-on experiences with intangible cultural heritage crafts like paper-cutting and tie-dyeing, which helps strengthen their role in preserving cultural memories.

4.4 Long-term guarantee mechanism: Building a multi-stakeholder collaborative service system

At the policy coordination level, local governments should be urged to include elderly-friendly services in the evaluation criteria for public libraries, such as setting mandatory indicators for elderly service satisfaction. At the technical support level, partnerships with tech companies should be formed to develop elderly-friendly products, including easy-to-use smart devices and age-appropriate apps, making technology more accessible. At the multi-collaboration level, volunteer groups from communities, hospitals, and universities should be encouraged to take part in service delivery. Examples include establishing "silver-haired mutual aid teams" and college student volunteer positions. By integrating resources from various sectors, a service network characterized by "library leadership with social participation" can be created, ensuring more comprehensive and sustainable elderly-friendly services for older readers.

5. Conclusions

In summary, public libraries need to meet the essential needs of elderly users by optimizing basic services and expanding service methods on an ongoing basis. They should also accurately address the expected needs of elderly users through innovating service scenarios to continuously improve service quality. Additionally, public libraries should actively develop exciting services, tap into potential value, and build distinctive brands to ensure maximum service quality with limited resources. To achieve this, public libraries should balance basic service provision with innovation promotion and establish a "demand-oriented, multi-collaborative" service system. This study primarily focused on elderly users of public libraries in Hubei Province, which limits the sample coverage. Future research should use artificial intelligence technology to track the behavior patterns of elderly readers, conduct cross-regional comparative studies on the differing needs of users across age groups, dynamically adjust service strategies, and drive the transformation of age-friendly

services in public libraries toward "data-driven" and "demand-driven" models.

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