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Functional Requirements Analysis of Intangible Cultural Heritage Helping People with Disabilities App under Service Design Perspective

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Abstract. This study used service design theory as guiding methodology and focused on the intersection of intangible cultural heritage and disability services. It explored how to realize the two-way value creation between the development of intangible cultural heritage and the employment of people with disabilities through digital platforms. This passage first examined and analyzed the current situation and dilemmas in the development of intangible cultural heritage and disability services. After learning about the gaps and disconnections in relevant industries, the author's team understood the needs of each user through user interviews, and designed a service system map with a logical chain of 'Co-creative Design—Processing and Production—Public Welfare Dissemination—Consumption and Donation'. The Kano questionnaire was designed and distributed to understand users' concerns about the platform's functionality. User requirements were classified and ranked using the Kano model to propose the functional modules and priority settings included in the app for intangible cultural heritage helping people with disabilities. This has led to the conception of a prototype platform for cultural services helping the disabled that can be co-created by multiple parties. The design met the needs of creators, consumers and social expectations. It provided ideas for the research and development of intangible cultural heritage helping people with disabilities APP, and promoted the dynamic inheritance of intangible cultural heritage and social integration and self-worth of the disabled.

Keywords: service design, intangible cultural heritage, the disabled, digital platforms, Kano model.

1. Introduction

The concept of intangible cultural heritage was formally defined in the Convention for the Safeguarding of the Intangible Cultural Heritage, adopted by UNESCO in 2003 [1]. Specific safeguarding measures such as 'identification', 'documentation' and 'preservation' were then proposed. As an important carrier for the continuation of the genes of national culture and civilization, the degree of revitalization and utilization of intangible cultural heritage has been elevated to a strategic height in the whole world. However, intangible cultural heritage faces many problems, such as geographical limitations, difficulty of skills inheritance, family inheritance and

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difficulty in meeting the modern market trends due to old-fashioned modelling. It is often hard for the general public to participate in the transmission and preservation of intangible cultural heritage. At the same time, there is a clear contrast between the high level of enthusiasm for handmade products and national culture and the shortage in the number of intangible cultural heritage artisans and other craftspeople. This has brought new opportunities and development windfalls for the conservation, passing on and dissemination of intangible cultural heritage.

Furthermore, concerned about the large size of the global disability community and the fact that the vast majority of working disabled people are still engaged in simple manual labour jobs, with low quality employment and low stability of employment in the community [2], their social participation needs and employment dilemmas need to be urgently addressed through new avenues. Based on the above background, the author's team proposes to use intangible cultural heritage culture as a platform for the disabled to participate in the production process of all kinds of cultural creations and handicrafts. Employment is empowered through training in cultural skills, making 'intangible cultural heritage + helping people with disabilities' a new way of exploring cross-border integration and development. However, intangible cultural heritage is easily restricted by specific regions and materials, and the scope of activities of groups of individuals with disabilities is limited, but by combining digital technology, building a branded APP service platform in the context of service design, carrying out multi-party co-creation, and promoting the transformation of intangible cultural heritage to help disabled people's commercialization can be a good way to solve the above problems.

2. Current research status and context

2.1. Current status of intangible cultural heritage APP development

The current work on digital transformation of intangible cultural heritage is still dominated by research on technology and morphology. And Research on basic theories and practical methodological systems is insufficient, and the mature body of knowledge has not been formed yet. These has led to a lack of general theory to guide the digitization of intangible cultural heritage, and has directly affected the efficiency of practice [3]. However, the present era of highly developed mobile Internet technology has brought new opportunities for the 'revitalization' of intangible cultural heritage and traditional culture. The application platform will undoubtedly become a new platform for dissemination and application of cultural resources by virtue of its high popularity and user stickiness [4].

At the moment, the intangible cultural heritage APPs on the market are mainly divided into three categories: information integration and popularization, experience and interactive sharing, and e-commerce trading and shopping. However, a large number of existing APPs have problems such as unintuitive expression of cultural content, poor interactive experience, incomplete user experience, etc [5]., and it is difficult to get out of the circle without a bursting point. The user needs analysis of such apps is clearly inadequate, failing to capture the importance of their audience groups and related needs. As for the front and back ends of the platforms, there are multiple problems, for example, non-genetic inheritance bearers lack online exhibition and communication, and their grasp of the fashion market is insufficient. While designers are prone to lack of clarity about the requirements for the production of their products on the ground and the target users of their products. These leave the value chain incomplete for multiple parties and make it difficult for these types of platforms to grow in a significant way.

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2.2. Needs and employment challenges of people with disabilities

There are many disabled people in China. The second national sample survey of persons with disabilities showed that by 1 April 2006, there were 82.96 million people with various types of disabilities in China, accounting for 6.34% of the total population [6]. Disabled families have low incomes and are particularly affected by poverty. The '2024 National Survey Report on the Income Status of Disabled Families' pointed out that in 2023, the growth rate of per capita annual consumption expenditure of disabled families nationwide was lower than that of the general population. Although there has been an overall trend of sustained growth, the disabled remain a particularly vulnerable group [7]. The main reasons for low income include weaker physical condition and intellectual impairment caused by sensory disabilities. However, apart from such objective reasons, people have long adhered to a 'problem perspective'. People always view them as 'vulnerable groups' or 'problem groups' in need of assistance [8], while ignoring their potential and agency in design and production. This has made government and social assistance the main source of income for disabled people in China. For the disabled themselves, they have a strong need for social interaction but a narrow social circle, and there is a considerable gap between their level of personal fulfillment and current living and employment conditions. Therefore, it is necessary to focus on the specific needs based on actual circumstances, provide personalized and diversified services for different categories and levels of disability [9].

2.3. Concept of a platform for intangible cultural heritage helping people with disabilities

In response to the above challenges, this passage proposes a service system model based on the logical chain of 'co-creation design—processing and production—public welfare communication—consumption and donation' and plans the functions of an intangible cultural heritage assisted disability APP based on user preferences. The core essence lies in leveraging cultural value to empower disability inclusive initiatives. At the same time, leverage the unique characteristics of the disabled community and the charitable nature of disability assistance to promote social and commercial benefits of intangible cultural heritage creative industries. Through the collaborative efforts of intangible cultural heritage practitioners, disabled producers, designers, and the general public, a comprehensive new approach to cultural disability assistance will be established. It can cover the entire process from concept to implementation and from individual cases to widespread application. Expand the theoretical application of service design theory in the public welfare sector. Meanwhile, establish a sustainable closed-loop ecosystem that links intangible cultural heritage transmission with employment opportunities for persons with disabilities in practice.

3. Construction of a service system for intangible cultural heritage helping people with disabilities

3.1. User needs insight and service design strategies under diverse collaboration

In the service design process of an e-commerce platform for intangible cultural heritage and disability assistance, understanding the needs of various users is the foundation and prerequisite for building a service system. The inheritance and development of intangible cultural heritage rely not only on the efforts of the inheritors themselves, but also on the collaborative cooperation of various parties, including the government, designers, enterprises, and communities. People with disabilities should not depend solely on social assistance, but should rather realize their self-worth and social

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identity through actual work. Therefore, the concept of 'collaborative design' has been introduced. Collaborative design, as an innovative design method, has been widely applied in product design, service design, social innovation research, and other fields. All stakeholders can sit around a table to create a common language, vision, and strategy to promote the sustainable development of intangible cultural heritage projects for persons with disabilities [10].

This multi-party collaborative service model is primarily aimed at four groups of people: intangible cultural heritage inheritors, people with disabilities, designers and consumers. To better leverage the benefits of social cooperation and tell the stories of disability assistance, author's team conducted user research through participatory observation (volunteering at institutions such as the Nanjing Cultural Centre, the Nanjing Xuanwu Jiuzhou Cultural and Art Centre for Persons with Disabilities, and the Maqun Home for Persons with Disabilities) and structured and unstructured interviews. The team collected and analyzed their relevant demands, constructed typical user role models, and presented them in Table 1. Among these, the APP serves as an important tool connecting various parties and also as a platform that enables their needs to be better 'seen.' The platform not only includes product display and sales functions, but also realizes values such as user co-creation, story dissemination, and cultural education.

Table 1. User classification and requirements summary

User Type	Key Feature	User Interface	Major Demand	Design Strategy
Intangible Cultural Heritage Inheritors	• Highly skilled • Good at offline operations but inexperienced in online communication and cross-border co-operation	• The skills will be continued • The influence of dissemination will be expanded • Realizing economic gains and social value	• A sustainable model for the dissemination and passing on of skills • Channels for effective communication with young people • Exhibition platforms and co-operation opportunities	• Set up a 'co-creation platform' to match designers • Supports the promotion of their individual products
Disabled people	• Limitations in physical or cognitive functioning • Ability to be creative and consistently participate in production • More time available	• Self-worth through labour • Access to skills and income support • Positive social connections	• Production processes and learning styles adapted to their abilities • Fair and respectful co-operation mechanisms • Employment opportunities	• Provide a module for making tasks with simplified operation and clear feedback • Create an 'intangible cultural heritage brand for persons with disabilities' to increase external recognition
Designers	• Possesses design fundamentals and cross-boundary interests • Pursues creative expression and social values • Enthusiastic to participate in projects but with limited practical experience	• Enhancement of competence through practical opportunities • Participation in social welfare services • Ability to see their designs on the ground in production	• Access to authentic collaboration opportunities and design feedback • Effective communication bridges with intangible cultural heritage inheritors • Practical opportunities • Platforms and project support for showcasing the results	• Build a 'co-creation + task system' project mechanism to promote practical cooperation • Provide intangible cultural heritage exchange and learning opportunities and a practical platform • Provide a channel for excellent design works to be displayed and incubated
Consumers	• Concerned about the culture, uniqueness and social value of products • Tend to buy products with story and public welfare elements	• Realization of values while gaining a unique aesthetic experience (support for disabled groups, preservation of intangible cultural heritage)	• A clear path to purchase and a good experience • Understanding the story and value behind the product • Quality assurance and emotional connection	• Strengthening the presentation of stories of 'intangible cultural heritage + helping people with disabilities' • Introducing interactive content

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3.2. Construction of platform service system

Service design is essentially a systematic design method centred on the user. Based on consideration of multiple stakeholders, systematic design innovation should be carried out on elements such as people, places, products, and information to promote comprehensive improvement in service experience, service quality, and overall value [11]. In preliminary research, the author's team conducted in-depth research on the needs of the platform's main user groups and combined this with corresponding design strategies. This allowed for the initial outline of the overall framework for intangible cultural heritage disability assistance services and the construction of a service system diagram, as shown in Figure1.

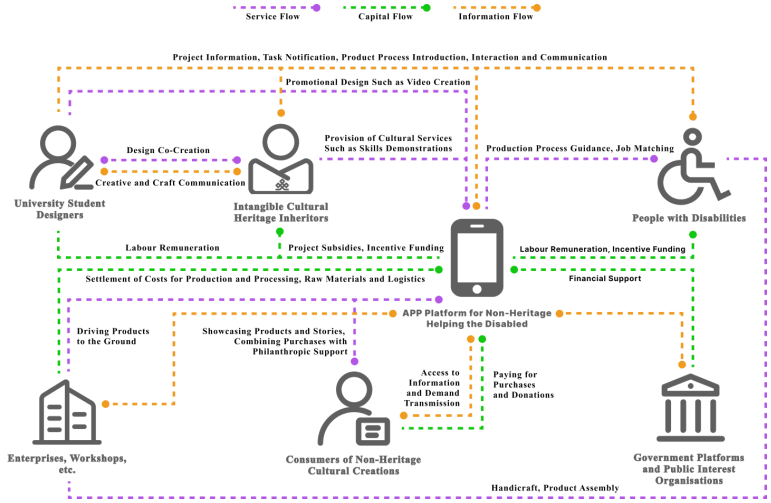

Figure 1. Service system diagram for the intangible cultural heritage disability assistance APP

The service system diagram is centred around the 'Intangible Cultural Heritage and Disability Assistance Platform' and revolves around six key roles: intangible cultural heritage inheritors, persons with disabilities, designers, consumers, government organizations and enterprise workshops. The system shows the flow and relationships between information, services, and funds, revealing the interaction paths and coordination mechanisms between multiple entities.

The platform is responsible for overall coordination and coordination. It not only connects multiple users, but also collaborates with enterprise workshops, government agencies, and social welfare organizations to secure funding and cooperative projects, therefore promoting the development of intangible cultural heritage and disability assistance initiatives. The platform promotes design and teaching interaction among designers, intangible cultural heritage inheritors, and people with disabilities by publishing design requirements and task details to them. It enhances their participation and employ-ability through relevant skills training, promoting product implementation and subsequent platform sales. The platform also arranges for partner companies to directly connect with the disabled and provide them with suitable jobs. When selling products, the platform will release product information and cultural disability-friendly design concepts to consumers, helping to convert achievements into marketable products and improve market dissemination. Finally, consumers give back to the platform by purchasing co-created products and making charitable donations. The APP will pay the funds received to initial partners and service providers. The entire system integrates various resources based on a logical chain of 'co-creation design—processing and production—public welfare communication—consumer donation.' It combines cultural heritage with social welfare, aiming to achieve a multi-dimensional win-win

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situation in terms of intangible cultural heritage dissemination, employment empowerment for people with disabilities, and youth practical experience.

4. APP function planning based on user preferences

4.1. Overview of the Kano model

This study primarily utilizes the Kano model to collect, analyse, and categorize user demand data. The Kano model was developed in 1984 by Professor Noriaki Kano of Tokyo Institute of Technology and is used in scenarios such as customer demand classification and prioritization. This model combines the degree of product quality characteristics with user satisfaction to construct a two-dimensional cognitive framework of 'quality characteristic realization degree-user perceived satisfaction' [12]. The model divides user satisfaction results into five types: Attractive Attributes, One-dimensional Attributes, Must-be Attributes, Indifferent Attributes, and Reverse Attributes. A representation of the Kano model was suggested by Hogstrom et al [13]., as shown in Figure2.

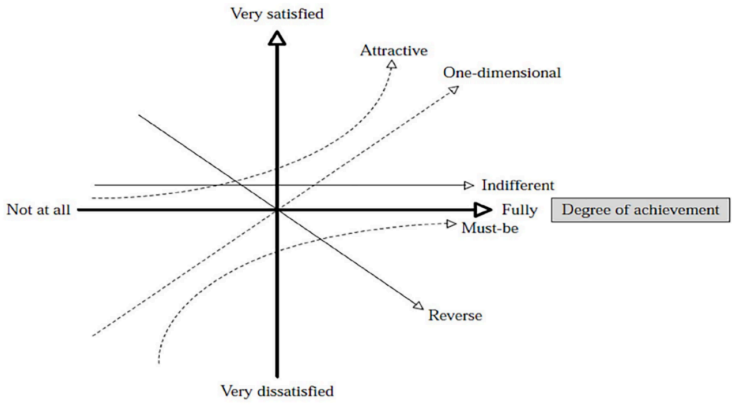

Figure 2. Kano model curve

This study collected users' needs for certain functions of an online platform for intangible cultural heritage disability assistance APP. By distributing Kano questionnaires and analyzing the results using this model, the author's team ranked the users' demand and preference for each function and categorized the attributes. It provides important prerequisites and theoretical references for the subsequent design of digital platforms.

4.2. Questionnaire creation and distribution

Based on the in-depth interviews conducted earlier and the aforementioned service system design, the three major functional categories of the app can be summarized as follows: intangible cultural heritage education and multi-party collaboration, product purchase and donation, and new approaches to public welfare assistance for the disabled, as shown in Table 2.

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Table 2. List of user demands for intangible cultural heritage disability assistance Apps

Classification	Number	Demand Content
Intangible cultural heritage popularization and multi-party co-creation	A1	Intangible cultural heritage inheritors and designers co-create products and collaborate on design
	A2	Encyclopedia of Intangible Cultural Heritage Craftsmanship
	A3	Video co-created by artisans (artisans, people with disabilities, designers) explains the creative process
	A4	Message interaction and Q&A area
Product purchase and donation	B1	Browsing and ordering of handicraft products (search, classification, recommendation)
	B2	Direct purchase of public welfare products: Buy handcrafted products made by people with disabilities directly
	B3	Public Welfare Donation Channel (Love Donations to support the Disabled)
New approaches to public welfare assistance for the disabled	C1	Employment matching for people with disabilities, pushing work based on the type of disability
	C2	Designers create exclusive IP images for people with disabilities

In order to ensure the validity of the survey results, the questionnaire was distributed to the general public, persons with disabilities and their families, intangible cultural heritage inheritors, and designers. Each question includes both positive and negative aspects. The question format is 'If this feature were available, what would you think? If this feature were not available, what would you think?' The options are 'Like' 'Must-be' 'Neutral' 'Live with' and 'Dislike', corresponding to 5, 4, 3, 2, and 1 points, respectively. Based on the option scores for each positive and negative question, analyze and organize the user group's satisfaction and demand for the feature then. This Kano questionnaire was distributed online, with 100 questionnaires distributed and 99 returned. One suspicious data set was removed, leaving 99 valid data sets.

4.3. Data analysis and statistics and user requirements analysis

According to the Kano model's demand type evaluation table, as shown in Table 3, where 'A' represents Attractive Attributes, 'O' represents One-dimensional Attributes, 'M' represents Must-be Attributes, 'I' represents Indifferent Attributes, 'R' represents Reverse Attributes, and 'Q' represents Questionable Attributes. Classify the attributes of the collected questionnaire results and calculate the frequency statistics. For each requirement item, calculate the proportion of each attribute separately, and use the attribute with the largest proportion as the quality attribute for this service requirement [14]. For example, if the answer to a positive question is 'Must-be' and the answer to a reverse question is 'Neutral,' then the requirement can be expressed as an 'I' Indifferent Attributes. By analyzing the statistics of the 9 requirements from A1 to C2 and calculating the Better-Worse coefficients, the statistical analysis and classification of users' functional requirements for the intangible cultural heritage disability assistance app can be obtained, as shown in Table 4.

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Table 3. Demand type evaluation table of the Kano model

		Dysfunctional form of the question				
		Dislike	Live with	Neutral	Must-be	Like
Functional form of the question	Dislike	Q	R	R	R	R
	Live with	M	I	I	I	R
	Neutral	M	I	I	I	R
	Must-be	M	I	I	I	R
	Like	O	A	A	A	Q

A, Attractive; O, One-dimensional; M, Must-be; I, Indifferent; R, Reverse; Q, Questionable

Table 4. Summary of Kano model analysis results

Function	A	O	M	I	R	Q	Result	Better	Worse
A1	0.40	0.15	0.16	0.28	0.00	0.01	A	0.5556	-0.3131
A2	0.22	0.22	0.13	0.41	0.00	0.02	I	0.4490	-0.3571
A3	0.32	0.23	0.13	0.30	0.00	0.02	A	0.5612	-0.3673
A4	0.31	0.06	0.06	0.55	0.00	0.02	I	0.3776	-0.1224
B1	0.21	0.16	0.35	0.26	0.00	0.02	M	0.3776	-0.5204
B2	0.27	0.17	0.12	0.43	0.00	0.01	I	0.4444	-0.2929
B3	0.27	0.07	0.07	0.56	0.00	0.03	I	0.3505	-0.1443
C1	0.35	0.17	0.13	0.33	0.00	0.01	A	0.5306	-0.3061
C2	0.37	0.06	0.11	0.43	0.00	0.03	I	0.4433	-0.1753

A, Attractive; O, One-dimensional; M, Must-be; I, Indifferent; R, Reverse; Q, Questionable

As shown in Tables 2 and 3, B1 'Browsing and placing orders (searching, categorizing, and recommending) for handicraft products' are Must-be Attributes. A1 'Intangible Cultural Heritage inheritors collaborate with designers to create products', A3 'Artisans (craftspeople, people with disabilities, designers) collaborate to create video explanations of the creative process', and C1 'Employment matching tool for people with disabilities (recommends intangible cultural heritage jobs based on disability type)' are Attractive Attributes. The rest are all Indifferent Attributes.

However, traditional Kano model analysis directly divides demand attributes using the attribute with the largest proportion, which is too rigid and has certain limitations. In order to understand the ranking and importance of each requirement more accurately, the Better-Worse coefficient calculation method proposed by Berger et al. is introduced to analyse each requirement [15]. The specific calculation formula is as follows, as shown in (1)-(2).

$$B = (A + O)/(A + O + M + I) \tag{1}$$

This indicator ranges from 0 to 1, with values proportional to sensitivity. The higher the value, the higher the priority.

$$W = (O + M)/(A + O + M + I) \times (-1) \tag{2}$$

This indicator ranges from -1 to 0, with values inversely proportional to sensitivity. The higher the value, the greater the sensitivity, and the higher the priority.

Referring to the Better-Worse coefficient values in Table 3, plot a four-quadrant scatter plot with the Better values and |Worse| values as the x- and y-coordinates, respectively, and use the mean

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values of the two as the critical lines, as shown in Figure 3. The four quadrants represent different usage requirement attributes. The first quadrant represents One-dimensional Attributes, the second quadrant represents Attractive Attributes, the third quadrant represents Indifferent Attributes, and the fourth quadrant represents Must-be Attributes. As can be seen from Figure 3, the demand types summarized in Table 4 have undergone some adjustments, forming new demand category attributes.

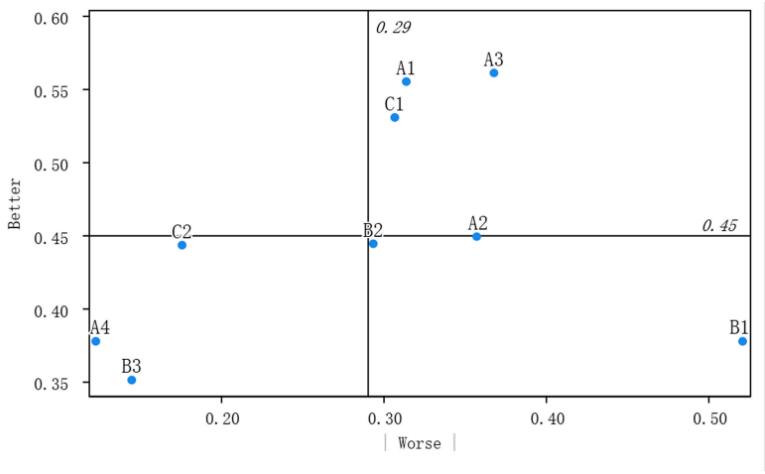

Figure 3. Better-worse four quadrant scatter diagram

Taking into account Table 4 and Figure3, Must-be Attributes are B1 'Browsing and placing orders for handicraft products (search, categorization, recommendation)' and B2 'Direct purchase of charity products (direct purchase of handicraft products made by people with disabilities)'. They should be given priority consideration during the design phase. When these features are well developed, user satisfaction does not increase significantly, but if they are not available, user satisfaction decreases significantly. One-dimensional Attributes include A1 'Co-creation of products by intangible cultural heritage inheritors and designers', A2 'Encyclopedia of Intangible Cultural Crafts', A3 'Co-creation of video explanations detailing the creative process by artisans (craftspeople, people with disabilities, and designers)', C1 'Employment matching tool for people with disabilities (recommending Intangible Cultural Heritage-related jobs based on disability type)'. When such features are well developed, user satisfaction increases significantly. Conversely, if these features are not available, user satisfaction decreases significantly. Therefore, careful consideration and design are also required. Indifferent Attributes include A4 'Message interaction and Q&A area', B3 'Public welfare donation channel (charitable donations to support people with disabilities and intangible cultural heritage inheritance)', and C2 'Designers creating exclusive IP images for people with disabilities'. There is no significant relationship between these attributes and satisfaction. Therefore, they can be temporarily disregarded or given lower priority when designing the interface and service system for the APP. The specific functional requirements for each major category are listed, as shown in Table 5.

Table 5. Ranking of the importance of functional requirements for the intangible cultural heritage disability assistance APP

Classification	Rank the importance of requirements
Intangible cultural heritage popularization and multi-party co-creation	A1,A2,A3 > A4
Product purchase and donation	B1,B2 > B3
New approaches to public welfare assistance for the disabled	C1 > C2

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4.4. Information architecture design

With the results of the Kano model analysis and multi-party collaboration in service system design, the main functions and information architecture of the intangible cultural heritage disability assistance APP were designed, as shown in Figure 4. The 5 main sections are set up on the APP's home page, including 'Identity Verification,' 'Intangible Cultural Heritage Education and Multi-Party Collaboration,' 'Product Purchase and Donations,' 'New Approaches to Public Welfare and Disability Assistance,' and 'Mine'. By analyzing the results of the Kano model and the Better-Worse coefficient, the requirements in the four quadrants are converted into functional modules in the APP. The specific modules are described below.

4.4.1. Identity verification

Users who log in to the app can select their identity and verify it, including intangible cultural heritage artisans, persons with disabilities, and designers. These identities have different secondary functions, such as showcasing their work, obtaining targeted support and suitable work content, and gaining design practice opportunities.

4.4.2. Intangible cultural heritage popularization and multi-party collaboration

The main features include showcasing collaborative design products created by intangible cultural heritage inheritors and designers, providing educational information about Intangible Cultural Heritage craftsmanship, and offering multi-party collaborative video explanations of the creative process. This module builds a bridge between intangible cultural heritage inheritors and designers. It also provides users with a quick search function to find specific intangible cultural heritage projects or craft information, and uses video as a medium to tell stories about how intangible cultural heritage can be co-created to assist people with disabilities.

4.4.3. Product purchase and donation

The main features include browsing and ordering handmade crafts, purchasing handicrafts made by people with disabilities, and making charitable donations. Users can search for handicraft products that interest them through search, browse by category, or use system recommendations. At the same time, users can directly purchase handicrafts made by people with disabilities and make donations to them.

4.4.4. New approaches to public welfare and disability assistance

Employment matching service for people with disabilities and create unique IP images for people with disabilities. Based on the type of disability, people with disabilities will be accurately recommended suitable intangible-cultural-heritage-related job positions, thereby enhancing their social participation and employment rates. Designers also design IP characters to enhance brand communication and appeal.

4.4.5. Mine

This module includes functions such as 'My Reviews,' 'Order History,' 'My Donations,' 'My Works,' 'My Sales,' etc., depending on different identities. Users can manage their orders here, such as

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checking product logistics progress, fund transfers, charitable contributions, etc.

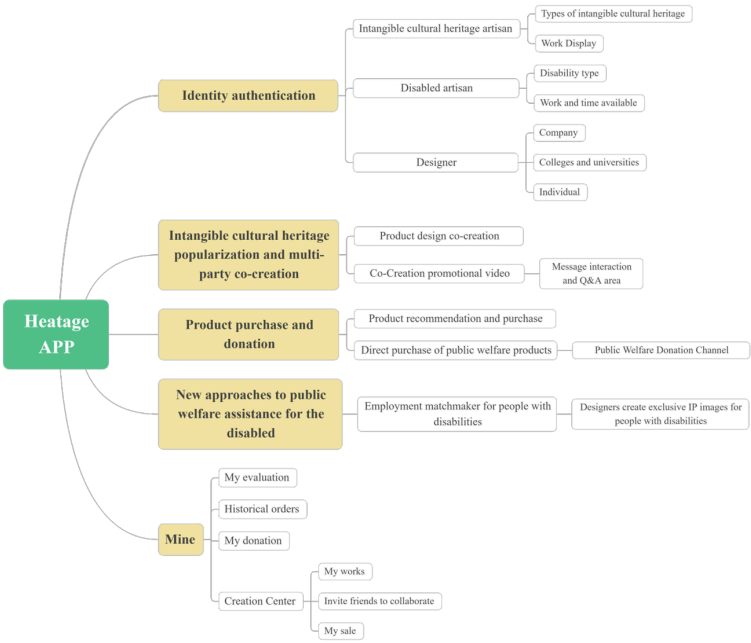

Figure 4. Information architecture of intangible cultural heritage assistance APP for the disabled

5. Conclusion

This passage starts from service design and obtains the needs of users of the intangible cultural heritage disability assistance app through in-depth interviews and questionnaires. Using the Kano model and Better-Worse coefficient analysis, users' sensitivity and preference for the various services provided by the platform are assessed, and then described and ranked accordingly. Using these results as a reference, design the information architecture for the intangible cultural heritage platform for persons with disabilities. Through theoretical modelling and data calculation, including service system design and interaction platform functional requirement analysis and prioritization, a prototype cultural disability assistance service platform that enables multi-party collaboration and co-creation is designed. It provides theoretical guidance for the development of a sustainable business model that promotes the inheritance and development of intangible cultural heritage while enhancing employment opportunities for people with disabilities.

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