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Touch·Hear·Remember:A Multimodal Design and Cultural Empowerment Study on Cultural and Creative Books for Individuals with Visual Impairments

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Abstract:
Individuals with visual impairments constitute a key population within the public cultural service system,facing dual barriers of"physical accessibility"and"psychological accessibility."Their needs regarding cultural rights protection and social inclusion have become increasingly prominent.Against the backdrop of the implementation of the Barrier-Free Environment Construction Law,this study draws upon core findings from relevant literature and centers on the development of cultural and creative books for visually impaired individuals as an innovative medium.It elaborates on the theoretical foundations,design principles,and practical pathways of such development based on the perceptual characteristics,cultural needs,and current status of social support for visually impaired groups.The paper proposes a development framework of"multisensory integration+cultural immersion+technological empowerment+social collaboration,"and further illustrates these concepts through a design case on calligraphy culture.The study aims to provide references for the industrial development and public-welfare promotion of cultural and creative books for visually impaired individuals,thereby contributing to the high-quality and equitable development of public cultural services.

Keywords:
People with visual impairments;cultural and creative books;multimodal design;barrier-free culture;cultural empowerment;sensory adaptation

1.Research Background and Context

1.1Research Background

According to data from the China Disabled Persons'Federation,the number of individuals with visual impairments in China has exceeded 17 million,and this figure continues to rise alongside the accelerating aging of the population.In recent years,the implementation of the Law on the Construction of Accessible Environments and the advancement of the"14th Five-Year Plan for the Protection and Development of Persons with Disabilities"have provided solid legal and policy foundations for safeguarding the rights and interests of visually impaired individuals[2].Nevertheless,in practice,this group still faces multiple challenges.At the level of

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the physical environment,issues such as occupied tactile paving and inadequate mobility facilities pose safety hazards[3].In terms of information access,traditional printed books and visually oriented cultural products often fail to meet their perceptual needs;meanwhile,intelligent services in public libraries are hindered by poor device compatibility and limited resources[13].From the perspective of social inclusion,cognitive misconceptions—such as attributing disability-related challenges solely to the individual—and a lack of emotional support restrict the ability of visually impaired individuals to fully realize their potential[14].

Culture,as a spiritual bond that binds society together,plays a significant role in promoting social integration and enhancing the quality of life for people with visual impairments.Currently,the development of accessible cultural products demonstrates a trend toward diversification:from audio description in accessible films[6,9] and reading services for the visually impaired in public libraries[13,14],to assistive tools such as smart guiding canes[11,15],and public-welfare initiatives like“Running in the Dark”[7].These efforts collectively create bridges that enable the visually impaired to connect with the wider world.However,existing products still exhibit certain limitations:accessible reading services tend to focus primarily on basic information delivery and often lack cultural creativity or emotional resonance;intelligent assistive tools emphasize practicality while underrepresenting cultural expression;and public-welfare services,due to their limited reach,struggle to establish sustainable mechanisms for cultural empowerment.

As a hybrid form integrating cultural creativity with book-based media,cultural-creative books serve the dual purpose of disseminating information and carrying cultural meaning while evoking emotional engagement.When designed for visually impaired users,such books must transcend the inherent visual constraints of traditional reading materials and instead employ multisensory design and cultural innovation.In doing so,they can become essential media through which visually impaired individuals perceive beauty,experience culture,and participate in society.This endeavor not only responds directly to the mandate of the*Law on the Construction of Accessible Environments*to“ensure the equal participation of visually impaired persons in cultural life”[2],but also aligns with contemporary trends emphasizing“technology for good”and“cultural inclusiveness.”As such,it holds significant practical relevance and profound social value.

1.2Research Significance

1.2.1Theoretical Significance

By integrating multimodal discourse analysis,strengths-based theory,and principles of accessible design,this study constructs a systematic theoretical framework for the development of cultural-creative books for the visually impaired,thereby enriching the research dimensions of accessible cultural product design.Existing scholarship primarily focuses on optimizing mobility environments for the visually impaired[3],applying intelligent assistive technologies[11],or improving public services[14].Research specifically targeting cultural-creative books as a distinct medium,however,remains largely unexplored.By examining the tactile,auditory,and other perceptual characteristics of visually impaired users alongside their cultural needs,this study investigates pathways for multisensory integration in book design,providing theoretical support for innovation in accessible cultural products.

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1.2.2Practical Significance

Meeting the cultural needs of individuals with visual impairments is one of the core goals of such initiatives.Through multimodal design,cultural and creative books enable visually impaired readers to experience cultural elements—such as calligraphy and traditional arts—through tactile,auditory,and other perceptual channels,effectively addressing existing gaps in their cultural consumption.Enhancing the social inclusion of visually impaired groups is equally essential.As a meaningful medium for social interaction,these cultural and creative books facilitate communication between visually impaired individuals and sighted persons through public-interest initiatives and community-based activities,thereby helping to dismantle barriers to"psychological accessibility"[14].Furthermore,developing cultural and creative books for the visually impaired can promote an inclusive cultural industry.This process not only fosters new cultural formats but also facilitates deeper integration between public welfare and commercial endeavors,contributing humanistic value to the broader cultural sector.In addition,such books support the inheritance and dissemination of China's outstanding traditional culture.Designs that incorporate calligraphy,regional culture,and other traditional elements transform these books into innovative vehicles for cultural transmission,enabling visually impaired individuals to become active participants and direct beneficiaries of cultural heritage.

1.3Literature Review

Drawing on 20 referenced studies,this paper reviews the literature from four dimensions:the core challenges faced by visually impaired individuals,the current state and limitations of accessible services,trends in technological applications,and pathways for cultural empowerment.

1.3.1Core Challenges Faced by the Visually Impaired

Wang Chunyu et al.[3],through empirical investigation,identify that visually impaired individuals encounter facility hazards,obstacles,and difficulties adapting to environmental changes during mobility.Wang Sizhe[14] argues that visually impaired groups face dual barriers of"physical accessibility"and"psychological accessibility"when accessing public services,with their emotional needs and inner potential often neglected.Meng Zhidan[13]emphasizes that visually impaired users experience low device compatibility and insufficient resources when acquiring information.Collectively,these challenges reflect structural inequalities across three domains—spatial mobility,information access,and social participation—and the absence of cultural products further exacerbates their marginalization and disconnect from society.

1.3.2Current State and Limitations of Accessible Services

Existing accessible services span mobility environments,public libraries,and cultural entertainment.In mobility-related services,assistive tools such as smart guiding canes[11,15]and service dogs[1,4]have significantly enhanced the safety of travel for visually impaired individuals.In the cultural sector,accessible films[6,9] and library-based reading services for the visually impaired[13,14]provide essential cultural nourishment.In terms of social support,initiatives such as"Running in the Dark"[7]and volunteer running companions offer platforms for social interaction.

However,existing services remain constrained in several ways:

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a.Service formats are relatively singular,focusing primarily on“basic protection”while lacking“cultural creativity”and“emotional empowerment”;

b.Resource allocation is uneven,with rural and marginalized groups underserved[5,10];

c.Integration of technology and culture is insufficient,as intelligent devices tend to prioritize functional utility over cultural expression[11].

1.3.3Trends and Potentials in Technological Applications

Emerging intelligent technologies provide new possibilities for enhancing accessible services.The COSY smart guiding cane employs infrared sensors to detect obstacles[11],while Moses Sung et al.[15]developed an ultrasonic sensor–based cane that connects with smartphones to offer personalized alerts.Public libraries have also introduced smart devices to improve the efficiency of reading services for visually impaired patrons[13].

The core advantages of these technologies lie in enhanced perception and adaptive interaction,which support the development of cultural-creative books for visually impaired users.Technologies such as tactile sensors,audio modules,and Bluetooth connectivity can enable multisensory interaction and extend functional capabilities within the design of these books.

1.3.4Pathways for Cultural Empowerment

Existing studies increasingly highlight the importance of cultural empowerment for visually impaired individuals.Liu Yuanjun et al.[9]demonstrate how audio description in accessible films enables“auditory translation and memory construction.”Wang Sizhe[14],drawing on strengths-based theory,advocates for public libraries to shift from“universal provision”to“deep empowerment.”An Shenglan[12]documents cases in which visually impaired individuals broaden their“vision”through cultural journeys.

These studies collectively reveal that cultural empowerment hinges on respecting subjectivity,activating intrinsic potential,and creating participatory platforms.Cultural-creative books—integrating informational content with interactive experiences—are thus an ideal medium for realizing this empowerment pathway.

Although existing research offers theoretical foundations and practical references for developing cultural-creative books for the visually impaired,a systematic design framework and development model remain absent.Based on the literature review and grounded in the perceptual characteristics and cultural needs of visually impaired users,this study proposes a development model of“multi-sensory integration+cultural immersion+technological empowerment+social synergy,”addressing the current research gap.

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2.Theoretical Foundations and Core Principles for Developing Cultural-Creative Books for the Visually Impaired

2.1Theoretical Foundations

2.1.1Multimodal Discourse Analysis Theory

Multimodal discourse analysis posits that human meaning-making is achieved through multiple modes—including language,vision,hearing,and touch—which complement and interact with one another.For individuals with visual impairments,the absence of visual modality necessarily heightens their reliance on tactile and auditory modalities.Liu Yuanjun et al.[9],in their study on accessible films,propose the“sound creation—sound perception—sound recollection”process,illustrating the crucial role of auditory modality in meaning construction for visually impaired audiences.Similarly,the smart guiding cane designed by Xi Ruilu et al.[11] demonstrates multimodal coordination through tactile feedback(grip texture),auditory alerts,and vibrational cues.

The development of cultural-creative books for the visually impaired should therefore be grounded in this theoretical framework,constructing a multimodal semiotic system that integrates“touch+hearing+text(Braille/audio-based content)”to ensure comprehensive and accessible information transmission.

2.1.2Strengths-Based Theory

Strengths-based theory emphasizes recognizing individuals’intrinsic capacities and available resources rather than focusing solely on their“limitations”or“problems”[14].While traditional accessible products often prioritize compensating for impairments,the development of cultural-creative books for visually impaired users should shift toward empowerment and growth.Through culturally rich content and interactive design,such books can stimulate creativity,cultivate aesthetic appreciation,and strengthen the willingness of visually impaired individuals to engage socially.For example,a cultural-creative book integrating calligraphy elements may allow users to perceive the rhythm of brushstrokes through touch and learn calligraphic narratives through audio,thereby fostering aesthetic development and cultural confidence.

2.1.3Accessible Design Principles

At the heart of accessible design lie the principles of equity,inclusiveness,and universality,which call for products that accommodate the needs of diverse user groups while removing both physical and psychological barriers[2].The accessible design of cultural-creative books for the visually impaired must address both“physical accessibility”and“information accessibility.”Physically,materials and structural elements should be safe,comfortable,and easy to operate.In terms of information,Braille,audio descriptions,and tactile textures should be incorporated to ensure that users can access content with ease.

At the same time,the principle of universal design should be upheld so that these cultural-creative books remain usable and meaningful to sighted readers as well,fostering interaction and mutual understanding between different user groups.(i.e., Figure 1)

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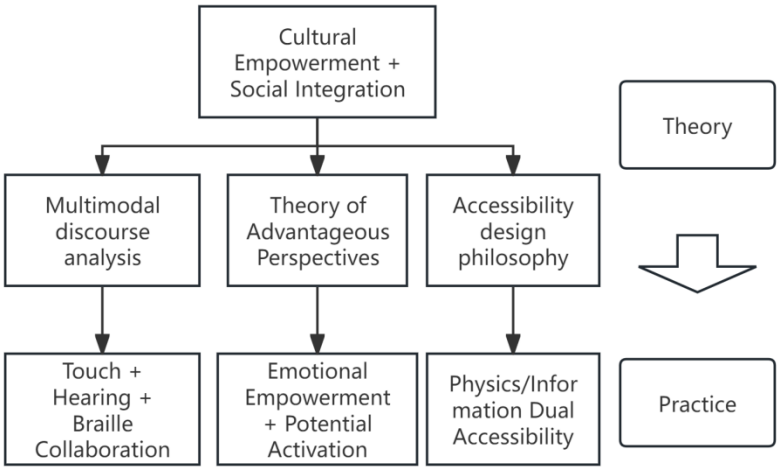


Figure 1.Theoretical Framework for Developing Creative Books for Visually Impaired Individuals

2.2Core Design Principles

2.2.1Sensory Adaptation:Centering Tactile and Auditory Modalities While Ensuring Multimodal Synergy

The perceptual systems of visually impaired individuals demonstrate distinctive characteristics:individuals with total blindness rely primarily on tactile and auditory modalities,whereas those with low vision may utilize residual light perception and shadow contrast to assist cognition[3].Accordingly,the development of cultural-creative books must place tactile and auditory design at the center while providing appropriate visual adaptations for users with partial vision.

To accommodate the perceptual profiles of both fully blind and low-vision users,a multisensory integrated design system should be established,leveraging the synergy of touch,hearing,and visual assistive elements to overcome barriers to information acquisition.

Tactile design incorporates raised textures,mixed materials,and touchable models to convert written,visual,and spatial information into tactile form—for instance,transforming the characteristic strokes of regular or semi-cursive script into raised-line textures to support tactile recognition.

Auditory design,serving as a complementary modality,integrates audio narration,classical music,and ambient soundscapes to introduce the cultural background of calligraphy works while creating an immersive atmosphere.

Visual adaptation for low-vision users employs high-contrast colors,enlarged and clearly legible typefaces,-structured layouts,and non-reflective materials to reduce visual fatigue and ensure accurate perception.

2.2.2Cultural Immersion:Embedding High-Quality Cultural Elements to Convey Spiritual Value

The core value of cultural and creative books lies in their“cultural creativity,”and they should be prevented from devolving into mere“assistive tools.”Their design should integrate elements of China’s outstanding

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traditional culture,regional cultural characteristics,and contemporary public-welfare culture,enabling visually impaired users to perceive cultural richness in an intuitive and meaningful way.In terms of incorporating traditional culture,traditional art forms such as calligraphy,ink painting,paper cutting,and shadow puppetry can be transformed into multisensory content.For example,leveraging the research strengths of the Calligraphy School of Jilin Architectural University,a“Calligraphy Culture Creative Book for the Visually Impaired”could be developed.Such a book may combine tactile renditions of classic calligraphic rubbings with audio interpretations of calligraphy-related stories,and include material samples of brush,ink,paper,and inkstone.In embedding regional culture,cultural and creative books can be developed based on local cultural resources to enhance regional recognizability.For instance,in the case of Tibet,a book may incorporate tactile patterns of Tibetan architecture,audio recordings of Tibetan songs,and narratives of Tibetan culture[10].From the perspective of public-welfare culture,elements such as the“Dark Running Group”[7]and guide dogs[4]may be integrated to convey values of equality,mutual support,and resilience,thereby further motivating visually impaired individuals to participate more actively in society.

2.2.3Emotional Empowerment:Addressing Psychological Needs and Enhancing Social Inclusion

The“psychological accessibility”barriers faced by individuals with visual impairments fundamentally stem from insufficient emotional support and limited social recognition[14].Accordingly,the development of cultural and creative books should prioritize the emotional needs of this population,conveying warmth and empowerment through the coordinated design of content and form.In constructing emotionally resonant content,materials such as inspirational narratives,public-welfare cases,and biographies of cultural figures may be incorporated.Examples include the developmental stories of the“Dark Running Group”[7]and the creative journeys of visually impaired artists[8],both of which can effectively foster emotional resonance,enhance self-identity,and strengthen confidence.From the perspective of designing for social interaction,formats that encourage sharing and participation can be adopted.For instance,a“reader message section”(in Braille and audio)may be embedded within the book,complemented by offline cultural activities to provide social bridges that help visually impaired readers connect with like-minded peers.In terms of aesthetic expression and conveying warmth,material selection,color schemes,and packaging design should reflect humanistic care while avoiding overly“medicalized”or“instrumentalized”design tendencies.This may include using soft,eco-friendly fabrics and wood as production materials,paired with warm tones such as beige and brown to evoke a sense of comfort and security[11].

3.Case Design:Ink Resonance—A Calligraphy-Themed Cultural and Creative Book for the Visually Impaired

Building on the proposed development framework,this study presents the case design of Ink Resonance—A Calligraphy-Themed Cultural and Creative Book for the Visually Impaired.Drawing on the research strengths of the Calligraphy School at Jilin Jianzhu University,the product integrates cultural value,functional accessibility,and affective engagement.

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3.1Content Development

To enable visually impaired users to experience the cultural depth of Chinese calligraphy,the book is structured around four core modules.

The Calligraphy Fundamentals Module introduces basic strokes in kai,xing,and cao scripts.Raised tactile lines are used to represent stroke structures,accompanied by audio narration to support cognitive recognition. The Classic Stele Appreciation Module presents selected fragments from canonical calligraphic steles,reconstructing texture through layered tactile patterns,with synchronized audio commentary to enhance cultural interpretation.The Stories and Cultural Context Module features classical anecdotes,delivered through spoken narration and supported by tactile models that provide dual-sensory engagement.The Interactive Experience Module includes a“touch-and-trace”activity,where users imitate strokes while sensors record and provide feedback.Braille text and voice reading assist users in guided practice and memorization.

To ensure practical multisensory integration,the book follows rigorous technical specifications for tactile,auditory,Braille,and visual elements.Tactile strokes are produced using medical-grade silicone,with a raised height of 0.5–1 mm to balance sensitivity and comfort.Stele textures are recreated using a layered inlay technique,while accompanying models are crafted from wood and ceramic to retain authentic material qualities.Audio narration,recorded by calligraphy instructors at approximately 150 words per minute,is blended with traditional instrumental music and supports voice-based interaction for real-time inquiry.Braille follows national standards,with clear layout,a maximum of 200 characters per page,and alignment with tactile elements for synchronized perception.For low-vision users,high-contrast layouts and enlarged Chinese characters complement tactile information,ensuring multisensory coordination.

3.2Format and Structural Design

The book’s material selection,structural layout,and physical dimensions are optimized for tactile accessibility and practical use.The cover uses dark blue fabric with embossed Braille and gold-stamped calligraphic characters spelling“Ink Touches the Heart,”combining cultural symbolism with recognizability.Inner pages employ soft,durable eco-friendly xuan paper and silicone layers,balancing comfort with longevity.A modular foldable design includes 20 detachable pages,each labeled with distinct tactile navigation markers—circles for fundamentals and squares for stele appreciation—to facilitate quick orientation.

The product adheres to portability standards:fully opened,it matches the A4 format(21×29.7 cm)for optimal usability;folded,it reduces to 10.5×14.8 cm,making it pocket-sized.Weighing approximately 400 g,the book supports convenient everyday use by visually impaired readers.

3.3Dissemination and Feedback Mechanism

3.3.1Dissemination Strategy

To maximize the cultural and social impact of the calligraphy-themed cultural and creative book for visually impaired users,a multi-dimensional dissemination framework was developed.

Through partnerships with public libraries and disability service centers nationwide,1,000 copies were dis-

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tributed for free public lending,providing visually impaired readers with equitable access to cultural resources.An on-site experience center was established at the Calligraphy School of Jilin Jianzhu University,where visually impaired participants are invited to engage in hands-on calligraphy activities,integrating cultural content with immersive experience and reinforcing cultural connection.

Online dissemination leverages social media platforms such as Douyin and WeChat Video Channels to share instructional materials and user testimonials.These narrative-driven media outputs make multisensory features visible to the public and help raise societal awareness of the cultural needs of people with visual impairments.

Commercial dissemination is achieved through simultaneous release on e-commerce platforms and offline cultural-creative stores at a retail price of 99 CNY.A portion of the sales revenue is allocated to public welfare programs supporting the visually impaired,enabling a sustainable cycle of“cultural dissemination,social empowerment,and charitable reinvestment.”

3.3.2Feedback and Iterative Improvement

To ensure sustained usability and relevance,the project implements a full-cycle iterative mechanism encompassing testing,optimization,and evaluation.During the initial implementation phase,30 visually impaired participants—representing diverse visual conditions and age groups—were invited for field testing.Feedback was primarily collected on tactile comfort,clarity of audio narration,and perceived utility of the content.These insights informed targeted refinements,including adjusting the raised height of stroke textures for improved tactile recognition,optimizing audio narration speed,and expanding the interactive module to enrich usage scenarios.

To respond to evolving user needs,a semiannual evaluation mechanism was established.Longitudinal data are collected on users’calligraphy cognition,aesthetic development,and levels of cultural and social participation.These dynamic assessments guide ongoing updates to content and core functions,ensuring that the product continues to enhance both its cultural value and social impact over time.

4.Challenges and Prospects

4.1Challenges

Several obstacles remain in the development of cultural-creative books for visually impaired users.First,-balancing technological sophistication with cost is difficult,as intelligent modules are expensive while the purchasing power of the target population is limited.Second,addressing diverse user needs is challenging,given the wide variability in visual impairment levels and personal preferences.Third,societal awareness and dissemination remain constrained,with limited recognition of visually impaired cultural needs and difficulties in reaching remote regions.Fourth,content development faces tensions between intellectual property protection and innovation.

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4.2Future Prospects

Future development directions include:(1)technological innovation,incorporating AI,AR,and brain–computer interface technologies to enhance interactivity and accessibility;(2)content diversification,expanding to multi-cultural and academically oriented themes;(3)ecosystem building,fostering a coordinated framework involving government guidance,academic support,enterprise participation,and public-welfare collaboration;(4) extension of social value,creating platforms for cultural exchange and advancing standardization and internationalization of accessible cultural-creative products.

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