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ENHANCING MOBILE INTERFACE INTERACTION DESIGN FOR THE ELDERLY IN BEIJING: ADDRESSING ACCESSIBILITY, USABILITY, AND CULTURAL NEEDS

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Abstract:

The rapid proliferation of mobile technology has dramatically reshaped daily life across all age groups; however, the elderly population often struggles with accessibility and usability challenges in mobile applications. This study investigates the critical role of interface interaction design in enhancing the digital experiences of elderly users in Beijing, China. Through a combination of quantitative surveys involving 200 senior participants and qualitative interviews with 7 experienced interface designers, the research identifies the physical, cognitive, and emotional barriers that older adults face when using mobile touchscreen devices. Results highlight that while some elderly users adapt enthusiastically to digital technologies, many experience difficulties due to poor motor skills, impaired vision, and limited digital literacy. The findings reveal that features such as simplified navigation, customizable font sizes, voice-activated assistance, and culturally sensitive design elements significantly improve user satisfaction and engagement among seniors. Correlation analysis underscores the importance of voice control integration and intuitive design to reduce cognitive load and foster greater technology acceptance. Based on these insights, the study offers actionable recommendations for developing elderly-friendly mobile applications that prioritize inclusivity, ease of use, and user empowerment. This research not only addresses existing gaps in elderly-centered interface design but also advocates for a user-centered, iterative design approach to bridge the digital divide and promote digital inclusion among Beijing's aging population. Future research directions suggest deeper exploration into emotional connectivity, personalized learning supports, and cross-cultural adaptation of mobile interfaces for senior citizens globally.

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Keywords:

Accessibility, Digital Inclusion, Elderly Mobile Interface, Interaction Design, Usability

Introduction

The rapid growth of mobile technologies has transformed the way people interact with digital systems. However, elderly populations, particularly in Beijing, face considerable challenges when engaging with mobile interfaces. While younger users often adapt seamlessly to evolving designs, older adults encounter barriers stemming from age-related declines in vision, motor coordination, and cognitive processing (Chen & Chan, 2022). These challenges are compounded by a lack of user-centered mobile product specifications tailored to different elderly age groups, including 60–65, 65–70, and above 70 years old. Inadequate interface interaction design contributes to digital exclusion, limiting access to essential services such as healthcare, finance, and social communication (Zhou, Guo, & Yu, 2023).

Recent surveys highlight the urgency of this issue. According to the China Internet Network Information Center (CNNIC, 2023), over 150 million Chinese internet users are aged 60 and above, yet only 40% report confidence in using smartphones independently. Furthermore, nearly 60% of elderly respondents expressed frustration with complex navigation, small fonts, and culturally irrelevant design features (Liu & Ma, 2022). These statistics underline the gap between rapid technological progress and the inclusivity of mobile interaction design for older users in Beijing. Table 1 presents a statistical overview of elderly mobile adoption in China:

Table 1
Mobile Adoption Among Elderly Users in China (Adapted from CNNIC, 2023)

Age Group	Smartphone Adoption Rate	Reported Usability Challenges (%)	Independent App Use (%)
60–65 years	78%	45%	55%
65–70 years	64%	57%	42%
Above 70 years	48%	71%	29%

These figures demonstrate that while adoption rates remain high among the "younger elderly," usability challenges significantly increase with age, especially for those over 70 years. From a design perspective, interface interaction design serves as a multidisciplinary approach that combines audiovisual, interactive, and feedback-oriented elements to optimize user experiences (Cardello, 2023). Well-designed interfaces can reduce cognitive load, improve accessibility, and align cultural symbols and metaphors with users' backgrounds (Fitzgerald, 2021). However, existing mobile applications in Beijing have been developed with limited consideration of elderly users' needs, creating significant usability and accessibility gaps.

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The scope of this study is centered on elderly users in Beijing, China, with a focus on how accessibility, usability, and cultural needs can be integrated into mobile interface interaction design. The research emphasizes both empirical and cultural factors, as Beijing represents an urban environment where digital technologies are widespread, yet elderly digital inclusion remains limited (Wang & Sun, 2022).

The specific objectives of this study are as follows:

1. To assess the preferences for mobile interfaces among Beijing's elderly, interconnected to accessibility requirements and cultural nuances inclusively.

2. To investigate existing interface paradigms developed for interaction design in the context of elderly people, identifying weaknesses and constraints in current design practices.

3. To provide effective recommendations for improving interface design, such as increasing font size, simplifying navigation, and embedding culturally relevant design features for elderly mobile users.

By addressing these objectives, this study contributes to closing the knowledge gap in the field of elderly-centered mobile interaction design. It further aims to inform designers, developers, and policymakers in creating inclusive technologies that enhance the autonomy and well-being of elderly populations in Beijing.

Literature Review

As a result of their remarkable proliferation around the world, mobile devices have evolved into an irreplaceable component of modern life. They enable users to rapidly access a wide range of services and information, making them an indispensable component of modern life. While it is true that the mobile revolution has had a huge impact on people of all ages, it is of the utmost importance to take into consideration the unique requirements and perspectives of the senior population, particularly when it comes to the design of user interfaces for mobile applications. This discussion highlights the need of taking into account the specific requirements of the elderly population when developing mobile applications and conducts an in-depth analysis of how the elderly population perceives touchscreen experiences present in mobile devices.

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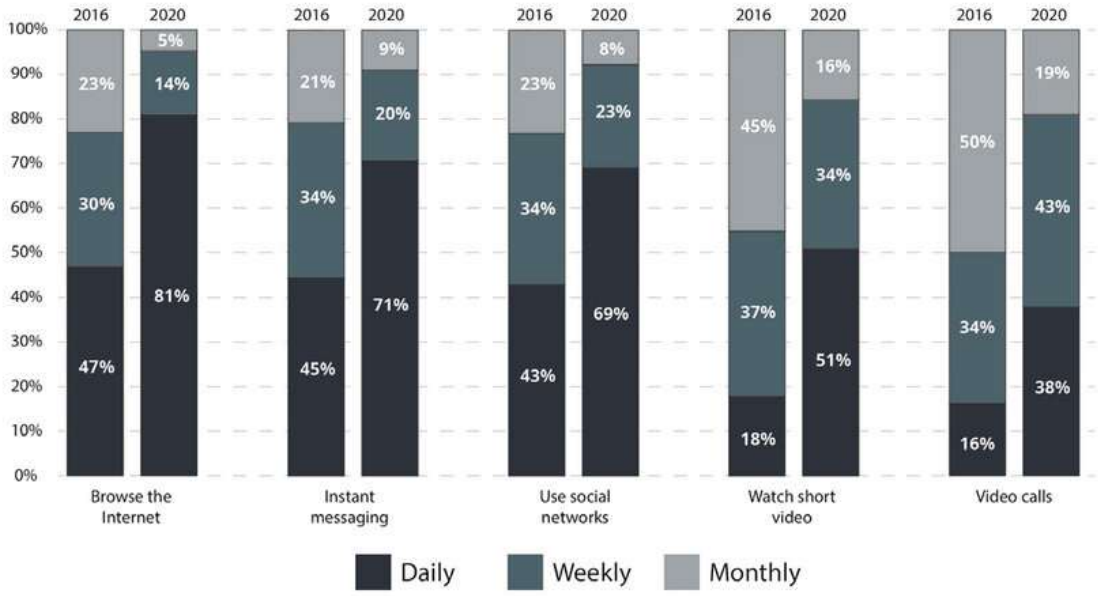

Figure 1: Elderly using Smart Phone

When it comes to using mobile devices with touch screens, elderly folks frequently face a number of challenges. Alterations in physical, cognitive, and sensory functioning that are associated with aging are mostly to blame for these challenges. One of the most significant challenges that older users encounter is the difficulty in performing the precise touch motions that are required to operate current touchscreen interfaces. This is because motor skills tend to decline with age. In addition, a significant number of elderly people may experience difficulties with their vision, which can make it challenging to see small type or differentiate between various computer icons. Last but not least, cognitive decline may make it more difficult for a person to learn and retain complex navigational patterns, which are typically seen in a variety of mobile applications (Mohd Hassan et al., 2021).

The dispositions of elderly persons toward mobile technology may range from excitement to dread, depending on the circumstances. According to Ferreira et al. (2021), there are individuals who are ready to accept new technologies because they recognize the potential benefits that may be gained from utilizing these technologies to contact with loved ones, gain access to information, and participate in a variety of activities. The use of touchscreen technology, on the other hand, might be disturbing for a substantial portion of the elderly population due to their lack of experience with technology, concerns regarding security and privacy, and the likelihood of experiencing frustration when navigating intricate interfaces.

On the other hand, the experiences that elderly people have had in the past can have a significant impact on how they feel about digital technology that uses touch screens. It's possible that those who have previously had a positive experience with user-friendly interfaces will be more open to using mobile items. Some individuals, on the other hand, may be less ready to accept new applications if they have previously experienced applications that were difficult to use or poorly designed.

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To what extent older individuals are able to make use of touchscreen technology will be determined by their level of expertise and their willingness to learn. The adoption of new technology is something that some elderly folks are willing to accomplish, and they exhibit genuine curiosity and enthusiasm in order to study the prospects that mobile devices present. They are ready to devote the appropriate amount of time and effort to themselves in order to acquire knowledge about and implement these technologies. According to Al Shehri et al. (2022), a sizeable portion of the elderly population may be hesitant to use them because they are concerned about the possibility of making mistakes and they do not have faith in their ability to utilize these devices in the appropriate manner. It's possible that these individuals are concerned about accidentally pressing the wrong buttons, getting lost in intricate interfaces, or having their privacy and security compromised. It is necessary to have an awareness of these particular traits in order to design mobile applications that are able to respond to the diverse requirements and attitudes of senior users. This in turn helps to create a digital environment that is more welcoming to this demographic.

According to the findings of the study that was conducted by Li et al. (2021), the design of mobile applications that are fashioned for older citizens have to prioritize simplicity. It is possible to significantly enhance the user experience by reducing the amount of clutter, utilizing typefaces that are legible, and providing navigation that is clear. In order to accommodate any vision issues that may arise, the size of the components of the user interface, such as icons, buttons, and text, should be enlarged. It is possible that older people will have less confusion if the design is consistent. This could include design elements such as navigation patterns and the positioning of common capabilities. It is possible that elderly users would find it simpler to comprehend and make use of the application if it is provided with help options and instructions that are easy to understand. (Avioz-Sarig et al., 2021) Research has shown that providing users with both visual and audio feedback for their activities within the application might potentially boost their confidence and reduce the number of errors they make. By providing elderly users with the ability to alter the font size, contrast, and other components of the application's interface, it is possible to empower them to personalize the application to meet their specific requirements.

Some elderly people are enthusiastic about touch screen technology, while others are cynical about it. These feelings range from delight to cynicism. It is essential to develop mobile applications that are not only user-friendly but also cater to the specific requirements of this group in order to fulfil the objective of ensuring their participation in the digital world. By putting an emphasis on simplicity, clarity, and user assistance, designers have the ability to create interfaces that make it possible for elder consumers to successfully interact with mobile goods (Zuhana et al., 2022). To effectively make recommendations for boosting the user experience and quality of life for older users in the digital age, interface interaction design and research for mobile applications in the context of the elderly population in Beijing, China, must take these issues into account.

Despite the fact that the older population's attitudes regarding touchscreen technology continue to be complex and diverse, the adoption of touchscreen technology among the elderly population has consistently increased over the past decade. Numerous older people believe that mobile touchscreen devices are associated with increased levels of independence as well as enhanced communication with their family and friends. The lack of familiarity with the technology, on the other hand, frequently results in uneasiness and resistance. These negative

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attitudes can be further exacerbated by the design of user interfaces that fail to take into account age-related cognitive and physical limits. These limitations include deteriorating vision, diminished motor abilities, and memory lapses. In a study conducted by He et al. (2021), it was discovered that older persons have a better acceptance rate for touchscreen goods that feature simpler navigation and provide immediate, unambiguous feedback. This finding highlights the value of inclusive design.

Cognitive load and usability are two important characteristics that play a significant role in determining how those who use touchscreen devices feel about them. Users who are older have a tendency to have feelings of being overwhelmed and discouraged from continuing to utilize interfaces that are cluttered or overly complex. Interfaces that are built with minimalism, large icons, and easy movements, on the other hand, result in more positive attitudes and improved utilization rates. The findings of Zhang and Li (2023) indicate that senior participants were more willing to explore new mobile applications when they perceived the design to be friendly, approachable, and adapted to their specific requirements. Their findings highlight the fact that great user experiences have a direct influence on the propensity of elderly folks to accept digital technologies in their day-to-day life.

The elderly's earlier exposure to technology is another important component that plays a role in shaping their perspectives. People who have even a little amount of prior experience using computers or cellphones tend to have a higher level of self-assurance and are more willing to adapt to newer digital devices. On the other hand, people who have never used touchscreen gadgets before are likely to find them strange and daunting. This demonstrates the significance of educational support and training in the process of cultivating trust in technological capabilities. Not only can guided learning sessions and peer assistance greatly enhance older individuals' competence, but they also significantly boost their motivation to engage with touchscreen technology, according to Wu et al. (2022). Therefore, efforts to create adequate digital literacy programs should go hand in hand with the design of products that are user-friendly.

In addition, the elderly are influenced by social influence and emotional value when it comes to their sentiments about touchscreen mobile gadgets. The ability to communicate with loved ones through messaging applications, social media, and video calling platforms has been reported by a significant number of elderly people as a source of greater sentiments of inclusion and connectivity. The initial opposition to technology is frequently overcome by these societal benefits, which ultimately results in a more positive attitude toward technology. Especially among elderly users, a recent study conducted by Chen and Sun (2020) demonstrates that perceived social usefulness had a higher impact on technology acceptability than ease of use alone. This was especially true for the technology. Based on this, it appears that putting more of an emphasis on the relational benefits of mobile touchscreen devices may be a more successful way to motivate people than concentrating solely on the functionality of these gadgets.

Lastly, the emotional connection that exists between older users and the equipment they use is a significant factor in the formation of attitudes that are maintained over time. An increased sense of self-efficacy and a heightened sense of autonomy can be the result of a sense of accomplishment that comes from acquiring new digital abilities. Enhancing user happiness and fostering a stronger emotional connection can be accomplished through the use of devices that promote personalization. These devices may include font sizes that can be adjusted, voice

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commands, and customization possibilities. A study conducted by Liu et al. (2024) discovered that elder users who experienced a strong emotional connection to their electronic gadgets exhibited higher levels of engagement and lower rates of abandonment. Because of this emotional link, the initial learning curve can be transformed into a gratifying experience, thereby transforming mobile goods into meaningful tools that can be used in day-to-day life.

Table 2: Matrix of Reviewed Studies on Elderly Mobile Interface Design

Author(s) & Year	Focus of Study	Key Findings	Relevance to Elderly Mobile Interface Design
Mohd Hassan et al. (2021)	Challenges faced by elderly in touchscreen interaction	Aging impacts motor skills, vision, and cognition, making precise touchscreen use difficult	Highlights need for larger icons, clearer fonts, and simplified navigation
Ferreira et al. (2021)	Elderly attitudes toward mobile technology	Attitudes range from enthusiasm to fear; barriers include lack of experience, privacy concerns, and frustration	Shows importance of trust-building, security assurance, and reducing complexity
Al Shehri et al. (2022)	Elderly willingness to adopt mobile devices	Many hesitate due to fear of mistakes and lack of confidence; some show curiosity and enthusiasm	Underlines role of guided training and support to encourage adoption
Li et al. (2021)	Design priorities for elderly mobile applications	Simplicity, legible fonts, larger UI components, and consistent navigation improve usability	Offers direct design recommendations for elderly-friendly apps
Avioz-Sarig et al. (2021)	Feedback in mobile applications	Visual and audio feedback increases confidence and reduces errors	Supports multimodal feedback for enhancing elderly user experience
Zuhana et al. (2022)	User-friendliness and elder participation	Simplicity, clarity, and assistance features enable elderly to interact successfully	Reinforces inclusive design principles for digital participation
He et al. (2021)	Inclusive touchscreen design acceptance	Simpler navigation and clear feedback improve elderly acceptance rates	Proves inclusivity leads to higher adoption and satisfaction
Zhang & Li (2023)	Usability and attitudes in elderly app adoption	Minimalism, large icons, and easy gestures improve attitudes; positive design encourages adoption	Directly links design quality to willingness to use mobile technology

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Wu et al. (2022)	Role of digital literacy training	Guided learning and peer support boost competence and motivation	Suggests training programs must accompany interface design efforts
Chen & Sun (2020)	Social influence in elderly technology acceptance	Social usefulness (e.g., communication with family) outweighs ease of use in motivating adoption	Emphasizes relational design benefits beyond functionality
Liu et al. (2024)	Emotional connection with mobile devices	Personalization (adjustable fonts, voice commands) fosters autonomy and engagement	Shows emotional design elements reduce abandonment rates

Related Theory

The Technology Acceptance Model (TAM), first proposed by Davis (1989), provides a widely used framework for understanding how individuals adopt and use new technologies. According to TAM, two primary factors perceived usefulness (PU) and perceived ease of use (PEOU) determine a person's behavioral intention to adopt technology. Perceived usefulness refers to the extent to which individuals believe that using a particular system will improve their daily functioning or quality of life, while perceived ease of use describes how effortless they perceive the system to be. For elderly populations, both factors are highly relevant since age-related challenges such as declining vision, reduced motor skills, and lower digital literacy influence how they evaluate the usefulness and ease of new mobile applications (Venkatesh & Bala, 2008). When interfaces are designed with larger icons, clear feedback, and simplified navigation, elderly users are more likely to perceive the system as both easy and beneficial, which increases their intention to adopt mobile technology.

In the context of elderly users in Beijing, TAM offers valuable insights into how accessibility, usability, and cultural needs shape technology adoption. Research shows that older adults' willingness to use mobile applications depends not only on the technical aspects of design but also on their confidence in overcoming usability challenges (Chen & Chan, 2022). Furthermore, cultural elements such as familiarity with Chinese language fonts, traditional symbols, or family-centered communication features enhance perceived usefulness by aligning the design with users' social values (Zhou, Guo, & Yu, 2023). By applying TAM to this study, it becomes possible to systematically analyze how design improvements in mobile interfaces can influence elderly individuals' acceptance of digital technologies. This theoretical lens thus provides a structured way to connect interface design choices with behavioral outcomes in elderly technology adoption.

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Conceptual Framework

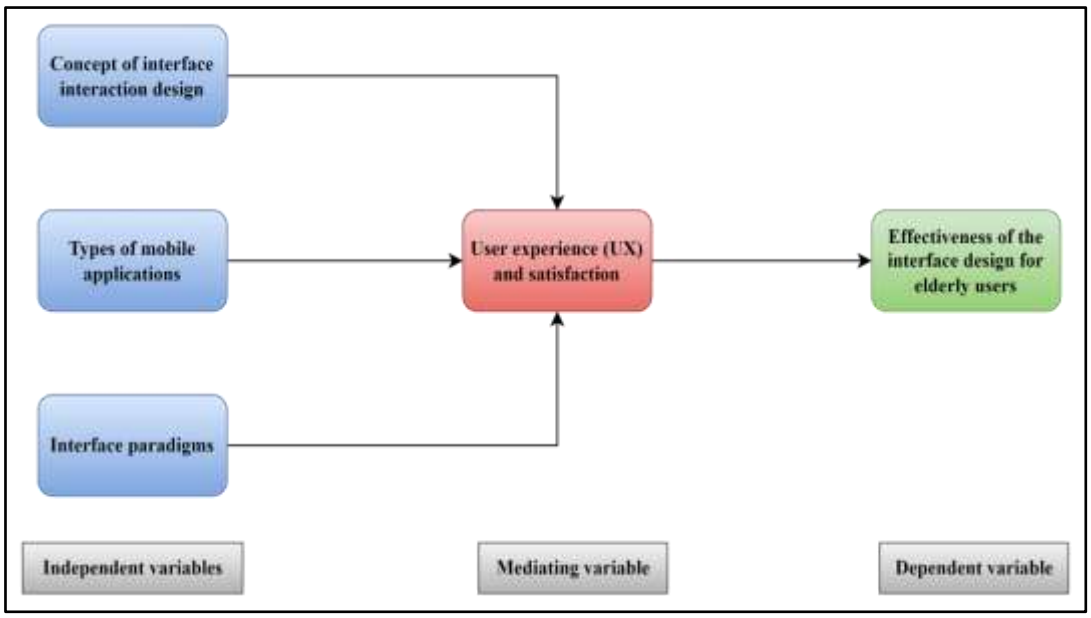

Figure 2: Conceptual Framework

(Source: Self-created)

Research Methodology

The best option for the study of mobile product interface interaction design for Beijing, China's senior population is to choose an exploratory research design. The research objectives are aligned with its adaptability, user-centeredness, and ability to uncover unknowns, which facilitate the generation of context-specific insights and user-centred recommendations that are essential for improving the usability and efficacy of mobile applications for the elderly.

The best options for the study on mobile product interface interaction design for the senior population in Beijing, China are to use the survey and interview technique for primary data collection to get quantitative and qualitative data. This approach provides objectivity, generalizability, efficiency, cost-effectiveness, organized insights, consistency, and dependability, all of which are in line with the goals of the research (Wang et al., 2023). This particular and dynamic environment enables the research to offer evidence-based suggestions for improving interface design, which in turn improves the usability and efficacy of mobile apps for senior users.

The number of the 200 participants to be involved in the quantitative survey was set based on both statistical consideration and practical constraints. An appreciable sample group is the 200 used for qualitative research and qualitative analysis to study the likes of the Beijing seniors in mobile phone interface design. This sample size is the middle ground between the requirement of a large dataset to have a sufficient representation and the practical limitation of resources and time. In addition to this, the choice of 7 interface designers with experience working on qualitative research through interviews draws upon their expertise in the field.

It is important to clarify that while Google Assistant is generally restricted in mainland China, some participants may have reported usage through devices configured with VPNs by family members, or may have used alternative voice assistants available on Chinese platforms. There

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is also a possibility that the term 'Google Assistant' was used loosely or interchangeably to refer to any voice-controlled interface present on their device. This was noted during informal discussions and follow-up clarification interviews.

In the context of the study on mobile product interface interaction design for Beijing, China's older population, selecting appropriate software for statistical analysis is essential. SPSS is appropriate for performing statistical analysis of the collected quantitative data, whereas thematic analysis is appropriate for analyzing qualitative data (Murana & Rahimin, 2021).

Table 3: Summary of Research Methodology

Step	Detail
Research Design	Exploratory research design
Data Collection	Surveys (quantitative) + Interviews (qualitative)
Sample Size	200 elderly participants (survey), 7 interface designers (interviews)
Participants	Elderly in Beijing (aged 60–65, 65–70, 70+), experienced interface designers
Data Analysis	SPSS (quantitative), Thematic Analysis (qualitative)
Outcome	Evidence-based recommendations for elderly-friendly mobile interface design

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Results and Discussion

Quantitative Data Analysis

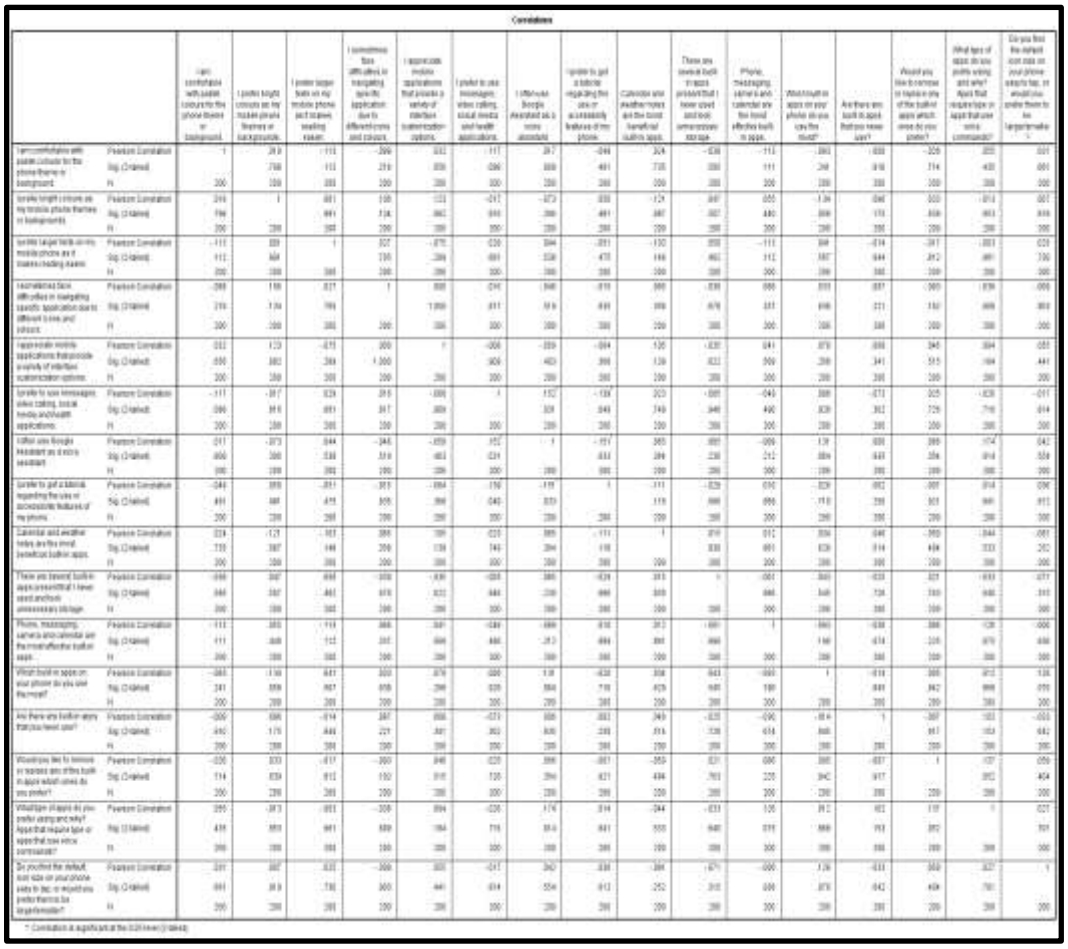

Figure 3: Correlation Analysis between App Usage and Reported Voice Assistant Use (including Google Assistant and local equivalents)

(Source: SPSS)

The cross-tabulation results of the correlation analysis conducted with the help of SPSS reveal the detailed patterns of the various interpersonal user preferences and several behaviours related to the usage of mobile phones among the elderly people of Beijing. The analysis of the results has revealed most of them as having low coefficients thus implying that most of the user preference variables do not exhibit strong interdependence.

"The most interesting result is a positive relationship between the use of messages, video calls, social networks, and health applications and the regular use of voice assistants such as Google Assistant or its local equivalents (r =.152, p =.031). It is important to note that due to restrictions on Google services in mainland China, some participants may have referred to other locally available voice assistants—such as Xiao Ai or DuerOS—as 'Google Assistant'. Therefore, the findings should be interpreted broadly as indicating a positive association between the use of voice-based input technologies and app engagement in communication and health-related tasks.

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Similarly, there is also a negative relationship between the relative frequency of using messages, video calling, and social networking sites and the need for tutorials about the use or availability of features of the phone (Correlation Coefficient = -.139, Significance Level = 0.049). Based on this, there is the reason that elderly users who use social and communication apps may not often require tutorials related to the phone as they become confident in handling it. The negative correlation shows that those people who are at ease with the initial twelve apps do not need as much help since they are already familiar with the main aspects of a mobile experience.

Surprisingly, the results reveal a low association of the decision made about choosing bright colours as mobile phone themes and other factors. For example, a preference for bright colours has little correlation with the difficulties in using icons and colours to navigate between various applications (r =.106, p =.134) This shows that elderly users' colour preferences will not prevent them from facing hurdles in the navigation of applications. This is a very surprising outcome since personal preferences cannot dictate the other aspects of the usability of a given mobile interface.

Another significant and large effect size is identified between the users who use Google Assistant often and the choice of the applications that are voice-controlled instead of typing (Cohen's d = 0.174; p = 0.014). This implies that the older users who do not like the idea of typing instead of using voice for creating applications are likely to use these voice assistants, this supports the use of voice interface for enhancing the mobile experience of the older users.

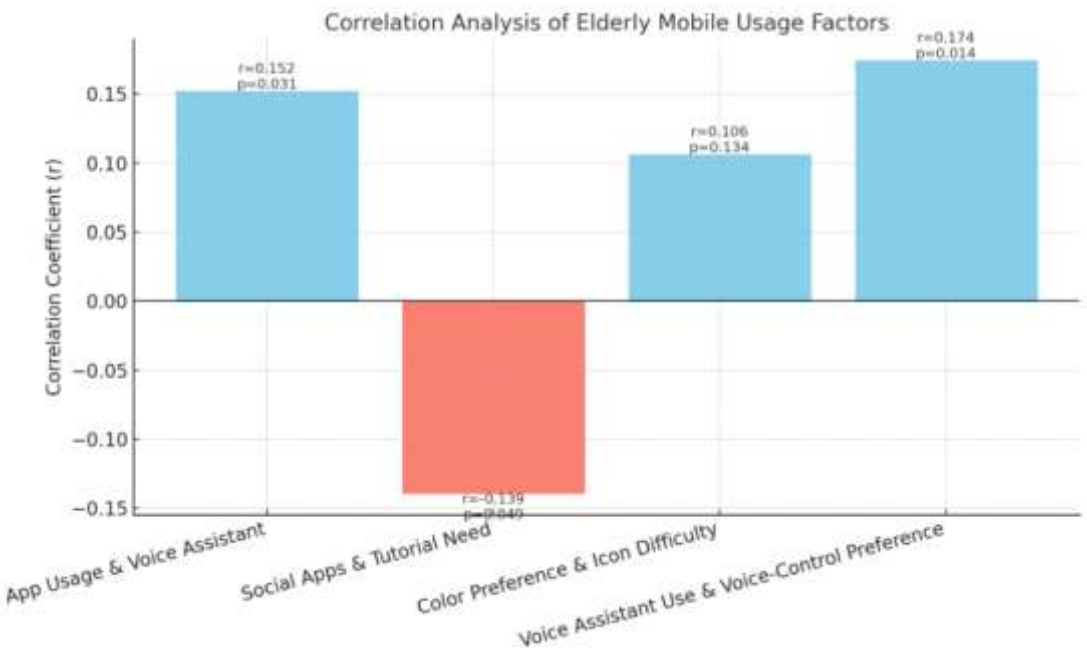

Figure 4: Correlation Analysis between App Usage and Reported Voice Assistant Use (including Google Assistant and local equivalents)

(Source: SPSS)

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In this regard, based on the correlation data, one can highlight several important connections, and these are the connections with the usage of communicational applications, tutorials and voice assistants. As the findings indicate, most relationships are quite weak, but voice-activated features are identified as the most important factor which can improve usability for elderly users. Thus, the results suggest that when designing interfaces for mobile applications for this population, voice-based input and output should be prioritized because this may meet the needs and preferences of this educationally disadvantaged population to a greater extent by providing tutorials to ensure that they are capable of inputting into the mobile interfaces via voice commands.

Qualitative Data Analysis

Theme 1: Elderly Attitude With Touch Screen Experience In Mobile Products

The use of touchscreen mobile devices among the elderly population has become a significant topic of discussion, primarily due to the interplay of physical, cognitive, and emotional factors that shape their interaction with such technologies. Many elderly individuals face challenges such as reduced manual dexterity, impaired vision, and cognitive disorders, making it difficult to execute gestures, navigate through interfaces, or interpret icons on touchscreen devices. These obstacles often lead to frustration and anxiety, further impacting their willingness to engage with mobile technology.

Theme 2: Touchscreen Accessibility And Engagement With The Elderly

The theme "Accessibility and interaction with elderly through touch screen" presents an ever-growing problem for elderly users of mobile touchscreen devices. Many seniors face physical and cognitive constraints, such as poor motor control, impaired eyesight, and declining cognitive abilities, which can make interaction with such technology challenging. The lack of elderly-friendly interface designs exacerbates these difficulties, discouraging engagement and causing frustration.

Theme 3: Concept of Interaction Design

Interaction design is a critical strategy in developing human-computer interaction (HCI) systems that provide meaningful, intuitive, and user-centered experiences. At its core, interaction design focuses on bridging the gap between users and technology, ensuring a smooth and engaging connection. It aims to mimic real-life interactions in technology as closely as possible, facilitating intuitive use and emotional engagement.

Theme 4: Interface Interaction Design Suitable For Elderly Mobile Products

Designing interface interaction for elderly mobile products presents numerous challenges across cognitive, physical, sensory, and psychological domains. Elderly users often face limitations such as memory loss, attention deficits, and impaired dexterity, which can lead to errors or delays in interaction. An effective design must address these constraints by simplifying interactions and making the user journey more intuitive.

Theme 5: Notion Of Different Paradigms Related To Interfaces That Have Been Developed In The Interaction Design

Interaction design for elderly users is a crucial component of user experience (UX) and human-computer interaction (HCI). Over the years, various paradigms have emerged to create interfaces that are both accessible and intuitive for elderly users, who often face cognitive and physical impairments. Among these is the user-friendliness paradigm, which emphasizes the

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importance of simplicity, cost-effectiveness, and error-free interfaces. This paradigm minimizes the cognitive load on elderly users by presenting information in manageable quantities and using real-life analogies to make systems easier to understand.

Conclusion

The objectives of this study were to examine the preferences for mobile interfaces among elderly users in Beijing, investigate weaknesses and constraints of existing interaction design paradigms, and provide effective recommendations for enhancing accessibility and usability. These objectives were largely achieved, as the findings confirmed that elderly users experience persistent challenges due to physical, cognitive, and cultural barriers, while also demonstrating clear preferences for simpler navigation, larger fonts, consistent layouts, and voice-based input. Moreover, the correlation analysis highlighted how voice assistants and communication-related applications play an essential role in improving elderly engagement with mobile technologies.

This study contributes both theoretically and practically. From a theoretical perspective, it extends the Technology Acceptance Model (TAM) by applying it to elderly populations in Beijing, showing how perceived usefulness and perceived ease of use are mediated by cultural and accessibility needs. From a practical standpoint, the research offers actionable design recommendations, such as enlarging interface components, embedding tutorials, and integrating voice-controlled features that align with elderly capabilities. These findings provide insights for designers and policymakers aiming to promote digital inclusion, while also informing guidelines that may shape accessibility standards in mobile application design.

For future research, it is recommended to expand the sample size beyond Beijing to other regions of China to capture rural–urban differences, and to adopt longitudinal methods to evaluate how elderly preferences evolve with continued exposure to new technologies. Additionally, incorporating experimental prototypes and usability testing would provide stronger evidence for validating design recommendations. Research should also refine the distinction between different voice assistants (e.g., Xiao Ai, DuerOS, Celia) to avoid misinterpretation, ensuring greater accuracy in reported usage.

Several challenges were encountered in the study, particularly regarding participants' ambiguous references to Google Assistant, which is restricted in mainland China. This limitation points to the need for more precise definitions, better screening questions, and participant training in future studies. Another challenge was balancing the diversity of elderly age groups (60–65, 65–70, and 70+) while maintaining statistical reliability. Improvements can be made by developing adaptive research instruments tailored to each age segment and by integrating participatory design sessions that actively involve elderly users in prototype development.

This study recommends that mobile interface designs for elderly users in Beijing should emphasize simplicity and clarity through larger fonts, consistent navigation, and uncluttered layouts. Voice-based interaction should be integrated as a core feature to reduce reliance on typing and enhance accessibility for those with motor or vision difficulties. Built-in tutorials, audio guidance, and visual cues are essential to support learning and confidence, while culturally relevant design elements and personalization options (e.g., adjustable contrast or themes) can strengthen usability and emotional connection. Together, these strategies can make mobile technologies more inclusive and meaningful for the elderly.

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