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Exploring Mobile Interface Design for the Elderly Population in Beijing, China

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Abstract

This research aims to establish the interface interaction design of Chinese elder mobile products specific to Beijing. They supplement the three main theories with Human-Computer Interaction (HCI), Gerontechnology, and Ecological Systems Theory where other studies left off. Being related to usability, learnability and user experience, the research establishes design solutions specific to the targeted elderly users with physical impairment and cognitive alteration. Some of the main suggestions are dynamic text resizing, well-marked or unobtrusive assistive navigation tools, and the incorporation of persons with disabilities in the design of the tools. Therefore, it affirms the need to adopt principles of inclusive design in aiming at improving the usability and accessibility of mobile technologies for elderly users. In this regard, this work integrates theoretical and empirical knowledge to provide practical recommendations for enhancing elderly users' quality of life by proposing better interface designs with mobile technology.

Keywords: Interface Interaction Design, Elderly Users, Usability, Accessibility, Human-Computer Interaction

Introduction

Graphic interface design, on the other hand, deals with the visualization aspect, the look and feel of the buttons and the general user interaction process. This encompasses both the interface and interaction designs to come up with friendly and fun-based products. Another consideration regarding elderly people is that mobile products should be very simple, easy on the eyes and easy to navigate. Interface design implies developing interfaces' aesthetics and collaborations for this audience, thereby improving their experiences. Special designs of touch screens and user-friendly interwar interfaces enable essential communication through

the use of multi-media in people-machine interaction (Paulauskas et al., 2023). Some of the app examples include data-centric apps and home screen designs for elderly people. This chapter provides the literature review and theoretical framework about the background of interface interaction design for elderly mobile products, along with the research statements, objectives, questions, and hypotheses for the study, as well as the scope limitations, and significance of the research. Concepts and variables are explained, and there is also the development of a conceptual framework that offers a clear understanding of the research angle, strategy and scope.

The provision explores the relevance and use of Mobile Interface Interaction Design for the elderly in Beijing, People's Republic of China. Proper designs help in the increased usability of products aimed at elderly users by incorporating items such as compressible fluids or sharp interfaces for increased robustness and efficient control of tasks (Ahmad et al., 2021). These are user interface designs, other designs are Graphical, voice-controlled, Gesture-based interfaces and others that enhance usability. Interaction design is the process that establishes communication between people and computers, humanizing technology. Some of the user preferences in design include pigmented control buttons, the use of icon badges and back-to-top buttons. The approaches to these designs are examined although there has been a significantly increased interest and call for designing suitable, engaging mobile applications for elderly users (Fischer et al., 2020). As such, it seeks to capture an all-round overview of interface interaction designs for this demographic's strengths, weaknesses, and potential for development.

This subject leads to the research problem that there is little known about the interaction design of the interface to elderly mobile products as a way of improving their experience. This design approach enhances stability and eliminates the interface problem, and in the case of mobile specifications, it considers the aspect of age. In Beijing, China, elderly users have problems with app functionality because the casinos developed applications for mobiles that do not have specifications for age brackets 60-65, 65-70, and above 70. Lack of adequate knowledge of interface and interaction design poses a major challenge in creating effective, inviting, and coherent mobile products (Oulasvirta et al., 2020). Interaction design promotes feedback–centric user interactions, which is essential when In designing applications. However, the current study reveals that there is scant literature on the subject, and knowledge gaps hamper progress in enhancing the elderly's digital environment. Further study is required to fill these gaps to understand the challenges that exist and possible design solutions.

The purpose of this research is not only to unveil related interactive interface strategies for the improvement of the current mobile devices for elderly users but also to fill the gaps existing in the prior studies. It is equally important to note that there are various interface strategies to consider when aiming to address the specific needs of the elderly audience (Rienzo & Cubillos, 2020). The study points to actionable designs for friendly user interfaces and explains that prior research on the topic is insufficient. It will define works interface interaction designs, suggest measures towards enhancing it and state the difficulties expected. Intended for elderly users, this multidimensional approach will help deliver on the objectives of closing knowledge gaps and will serve to illustrate the role and application of the interactivity layer in mobile products.

Essentially, this research seeks to improve the design of mobile products for elderly users and determine the interactive interface strategies, which remain unexplored by previous research. It is important to understand all the strategies regarding the interface as in the case

with the elderly people, they have different needs to be addressed. The researchers emphasize the importance of ease and accessibility incorporated in designs and also point to the lack of previous studies on the subject. It will establish and discover the successful designs of the interactions between the interfaces, recommend ways to enhance them, and consider the obstacles related to them. This multidimensional approach aims to close knowledge gaps and will benefit elderly users by clarifying the importance and use of interactive interfaces in mobile products. Interfaces are easy-to-understand designed graphical layouts with visual, tangible and audible aspects for ease of use. Interactive design, in turn, centres on interactions that are based on feedback and initiated by users. Interface and interactive design are intertwined, making for effective, pleasing designs that feel active. Mobile product specification documents state key application features and functionality. EMIID is a concept that addresses the designing of appealing and engaging mobile interfaces for the elderly with special attentiveness to the accessibility component and usability features.

Research objectives are

1. To assess the preferences for mobile interfaces among Beijing's elderly interconnected to accessibility requirements and cultural nuances inclusively.
2. To investigate several existing interface paradigms developed for interaction design in the context of elderly people, to understand weaknesses and constraints of existing design.
3. To provide effective recommendations for improving interface design such as changing font size for elderly users in mobile applications.

Literature Review

Portability is now one of the fundamental tools of modern society, granting customers immediate access to different services and knowledge (Kuebler-Wachendorff et al., 2021). But it is still important to bear in mind, that elder people would more likely require and possess different needs and perceptions of mobile interaction. The following discussion delves into the elderly's perception of the touchscreen in mobile device products. Specifically, elderly users have problems with touch screen mobile devices as, due to age-related changes, they have decreased physical, cognitive, and sensory abilities. Physical problems such as shaking affecting the touch gestures, visual impairments that can hinder the identification of texts or icons, and memory issues that may lead to poor understanding of directional patterns (Yoshua et al., 2022). Elderly attitude towards mobile technology; varies from positive to negative. Some look forward to connecting with people and getting information to them, others, on the other hand, are worried by unfamiliarity with the medium, issues of security, and difficulty in using the tools. There is a direct correlation between their acceptance or rejection of new technologies in the form of devices and their experiences in the past; if they have embraced certain technologies in the past they will embrace new devices and if they have a bad experience with a certain technology they will reject new devices. Readiness also ranges from those who are keen on trying out new technologies to those who are reluctant because for one reason or another; they might be afraid that they will make mistakes and do not have much confidence in their abilities (Sartas et al., 2020).

Therefore, when designing for the elderly, it is recommended that interface designers de-clutter the interface, utilize fonts that are easy to read, incorporate easy-to-understand navigation aids, increase the size of things like buttons and icons, as well as implement similar designs for similar functions. Some of the ways through which usability can be improved include giving clear instructions on how to use the program, giving verbal and visual cues that

assist users, and program flexibility (Kaya & Yıldız, 2019). Ensuring that the mobile applications developed are easy to use by elder people is important to enhance their quality standard of living. The engagement of elderly people with touchscreen devices is becoming significant in the present world hence the need to understand their difficulties and enhance the ways of their access to these devices. Elderly users have some issues like physical impairments like weak grip/mobility of fingers, The elderly often get confused and make wrong choices due to weak mobility and eyesight they sometimes click on the wrong button which they did not intend to do (Li & Luximon, 2020). Presbyopia and cataracts also create additional challenges for understanding small fonts and low contrast, often used on modern interfaces. Decision-making is also impaired, especially in technology use where individuals have to deal with multiple systems and remember the passwords, making them resistant to change.

It means opportunities to improve accessibility and engagement are included in the sphere of user-oriented design. Navigation of both public and business applications should be clear, and labels with large buttons and easily readable fonts should be used. Easy-to-use accessibility features include magnification, voice, and haptic feedback, which can greatly assist people with visual and motor disabilities. Client involvement of elderly users helps in determining and making interfaces pertinent to their requirements (Fischer et al., 2020). Moreover, intuitive CT, as well as training and support sessions, can make older people use it with less hesitation. Features to address the needs and interests of seniors include enrolling them in mobile applications created for them with the appropriate content and unique functions like health tracking and social interaction apps. Subsequent changes and the incorporation of feedback from elderly users when updating applications can also improve the level of engagement. Furthermore, the authenticity of applications as well as user support in the local language in the case of Beijing, may significantly increase usability. More extensive involvement with users and the use of insights from community organizations may help in designing influential technologies and creating an environment that will make the older population embrace technology (Marston & Van Hoof, 2019).

This is because interaction design is the process of designing interfaces between people and computers in a natural and easy-to-use manner thus vital in the design of touchscreen interfaces for the elderly populace. Interaction design aims at achieving user goals in context while designing an interface that makes the appearances, objects and behaviours natural for use. Some common types of interactions are CLI and GUI, Menu-Driven Interface, Form-Based Interface and Programmed Interface, while others are Natural Language Interface that have different characters suitable for several users (Kuhail et al., 2021). As for elderly users, mobile interfaces comprise many factors regarding cognitive, physical, and emotional. Two of them are as follows when working with children: Accessibility adaptations include increasing the size of buttons and icons and contrast of colours for normally aging people. It is just as important to address the emotion-related challenges that people face through new technologies, including fear and frustration over device usage, for which informative and supportive interfaces should be facilitated.

It will be appropriate for future studies to address the issues related to more specific interfaces and the technology that will provide older users with better accessibility and interactivity. User feedback, and more specifically user tests with older adults, must be conducted subtly and in the long term to be able to design for them without developing interfaces that shame them and discourage them from using advanced technologies (Lin & Lindtner, 2021). Accessibility usability designs and standards directly affect the behaviour,

attitude, and even health of elderly users. According to the empirical analysis, older people benefit from the clear and comprehensible interface and labels and the unified organization of all the key functions on mobile devices. For instance, employing a limited number of options, as well as flexible font size options can address some of the concerns associated with age-affected vision barriers to using mobile applications.

Elderly users have more dependent outcomes concerning technology if there are questionable interfaces (Lindberg & De Troyer, 2020). Every user sees the value that the technology holds for them which in turn promotes the utilization of technology with good interfaces that meet their needs. For instance, the use of WeChat by elderly citizens in China is due to its large font text, simple layout and easy-to-identify icons that make it easy to communicate and thus improve their attitude towards technology. It is also important to note that the usability of an interface has a bearing on the health of elderly users through the use of healthcare applications and remote monitoring gadgets. Intuitive health applications with prospects such as health monitoring, doctor consultations, and medical prescription alerts encourage its users in the health enhancement process. Such interfaces enable the elderly persons to input the activities, check vital signs, and see simple and clear health status hence enhancing persons' health or illnesses management and health well-being (Adami et al., 2021). Smart devices, through the use of mobile applications, provide real-time readings and health analysis which enable tracking of health trends and early intervention in case of abnormality.

However, in the area of interface design, numerous paradigms have been cultivated to enhance the usability of products for the elderly. Some of the paradigms that have been discussed are usability, accessibility, user-oriented design, and affective design. To improve usability and make sure interfaces do not ignore the capabilities of elderly users and their requirements in terms of cognitive, sensory, and physical faculties, each paradigm focuses on different aspects: simple intuitive navigation, the possibility to adjust the settings to personal preferences, and appealing aesthetics and design. Ageing interfaces are also associated with social, physical and cognitive computing environments concerning interface design (Zhou et al., 2023). Related to social computing facilities elderly users can continue to interact within society through features of interactivity. To avoid dangers associated with physical computing environments, they are designed to be safe for users with applications such as Life360 or WalkSafe being utilities. Cognitive computing deals with AI-related problems such as disabilities and issues that cause loads of stress to the brain, with the applications to be developed to help the elderly in complex situations.

Lastly, there are theoretical ideas such as isolation effect theory and Hick's Law which provides an understanding of efficient interaction designs of interfaces (Bakaev et al., 2019). These theories stress the use of highly visible items and reduce the decision-making steps for elderly users to improve usability. Applying these principles would help designers ensure that interfaces are not only usable and easily accessible by the elders, but they are also engaging and suited for their usage thus helping them provide better experience when using mobile devices thus improving their quality of life. Gestures and feedback are also very essential for improving usability for the elderly since they can be quickly guided on the functions of any icon as well as the possible action to undertake when they click on a specific icon (Lindberg & De Troyer, O2021). These could be icons, labels, or tooltips to assist the end-users in comprehending the layout of the tool/program. For example, animations can provide feedback by affecting the state of an animated button, such as changing colour or size on click, drawing attention to other elements, or showing a load bar for a task. Another two

manners that help users are to underline only some items and to use progress indicators as the information about the user's activities and the results of the performed activities.
Hypertextual voice interaction and vocal commands improve the availability of the application for older users. It has been used to effectively translate voice to interfaces which makes it easier to make commands without having to hold any physical device. This will be very advantageous to people who have problems with hand movements as it provides a way of communicating with them. Designing the app with interfaces that can accept many voice commands including opening an app, and composing messages among other benefits makes the convenience of the elderly convenient (Song et al., 2022). In interface design, it is necessary to make the gestures as simple as possible because elderly people may have problems with distinct gestures because of their weaker grip. Another approach is to add options to swipe with a single finger or provide less complex gestures for those with limited use of multiple fingers. It lessens the amount of working memory and motor resource demands so that older adults may interact with applications effortlessly. One of the main discussion points arising from this case is how to meet the needs of these diverse and highly differentiated consumers. Offering choices to set font size, change colours, and redefine the interface facilitates clients to customize the interface to suit them. From this aspect, flexibility facilitates a comfortable and convenient interaction with the content, thus improving readability and functionality (Parlakkiliç, 2022).
When it comes to operations on a mobile interface, assistance and support options are crucial especially when more senior persons are being targeted. Impressions, videos, tooltips, and context-sensitive support provide a self-service solution, as the users do not have to struggle with figuring out how to use the application. In addition to that, help desks, helplines or online forums can be easily accessed as additional help when required to also enhance the user experience. Usability testing and other assessment techniques like cognitive walkthroughs and expert reviews must be performed to determine the usability of interface designs for seniors. Usability testing is normally done by watching the other older adults using the interface of the resource to identify problems and to understand what the user appreciates. Cognitive walkthroughs illustrate the level of difficulty users are likely to experience during learning or accomplishing a task while expert review offers the view of an expert who judges the interface against standard guidelines (Simkute et al., 2021). The above techniques provide solutions for enhancing the interface designs to achieve optimum usability and satisfy the elders.
It is therefore incredibly important for designers to recognize and comprehend the various requirements and difficulties encountered by older adults when using interfaces. Shortened attention spans, impaired motor skills, vision and hearing loss, and psychological factors play a role in the early and progressive stages of cognitive impairment making it essential to consider accessibility issues to ensure that the product is genuinely enjoyable for all (Oset et al., 2020). To ensure that they are ready to deal with these challenges, designers should ensure that they work to enhance simplicity, usability, accessibility, and personalization. Reducing the general complexity of the interface, avoiding clutter, and improving the organization and the general usability can have an improvement on the overall usability for users in the older age group. People-oriented information design patterns such as typography, navigational aids, and feedback provide users with cues throughout the interface enhancing their experience (Sahoo, 2023). Including voice interaction and improving the haptic experiences, using enlarged click areas and sufficient distances between them to adapt to the physical impairments and increase the hitting precision. Additional preferences support

and help options also enable older adults to enhance the interface according to their own choices and needs.

Qualitative data gathered from usability testing, users, and other experts help to make periodic modifications to the interface designs as per the convenience of the older population. With a regular following of new trends and available standards, designers can bring in the best of both worlds while considering user needs and Accessibility Standards. Therefore, to create interface interactions for elderly mobile products, one must first familiarize themselves with the demands made by the elderly. Thus, by applying diversified principles of design, considering an individualized approach, and offering sufficient assistance, designers can offer effective and engaging interfaces to seniors. To further evolve the interface interaction and to make the technology-provided changes accessible, usable, effective, and beneficial for older adults, it is important to constantly conduct research, incorporate user testing and engage in collaboration.

Theoretical Framework

Human-Computer Interaction (HCI) Theory

It is essential the design interfaces for older adults using the approach of Human-Computer Interaction (HCI) theory that highlights concepts such as usability, learnability and User Experience (UX) (Croon, 2022). Usability makes sure that the interfaces are not just efficient, but also enjoyable to use even for those with limited skill in using technology due to their age. People have learnability as an aspect since it deals with making a user feel comfortable with the techniques used and their ability to follow instructions and interact easily. Ensuring UX comes first is useful for keeping users interested and happy due to interfaces can be aesthetic and entertaining. Gerontechnology which is the cooperation of the elderly's needs with the use of technology emphasizes the need to design for both physical limitations such as poor sight and mobility and changes in cognition while creating interfaces that are easy to navigate. Social connection features also promote quality of life for the elderly. Web accessibility, and the concepts of making classic design for all, such as appropriate sizing, high opposition, and availability for people with special needs (Croon, 2022). Because older people may differ from younger ones in some ways, it is possible to involve these users in the design process. In sum, applying these principles results in clear and intuitive designs to enable older adults to independently interface with mobile technologies for comprehensible and satisfactory use.

Ecological Systems Theory

According to the Ecological Systems Theory, more attention should be paid to the interactions of older adults with the physical world while designing interfaces (Fischer et al., 2021). In addition, it encompasses the personal contexts of the microsystem, the relationship between two or more environments of the mesosystem, an external context that influences interactions of the exosystem, the cultural and social context of the macrosystem, and context that changes across the developmental period of the chronosystem. Awareness of these dynamics is useful for helping designers build interfaces for older adults that take into account their requirements and environments. Decisions made about designs are not final since User-Centered Design involves users at every stage in the design process (Dopp et al., 2019). This entails continued user research to understand the abilities and preferences of the target group, which in this case is older adults. Usability test and feedback such as in-lab feedback enhances designs and make them more friendly and easily understandable. Employing them in design choices in collaborations that employ participatory practices

improves the applicability and relevance of interfaces to older adults. In aggregate, these frameworks encompass principles that help in designing interface solutions that are adaptive, accessible, and effective for improving older adulthood's use of mobile technology.

Conclusion

There is a need to develop a concept of designing interface interactions for the elderly with Mobile products, which incorporates HCI theory, Gerontechnology, and the Ecological Systems Theory. In a way, this orientation to usability, learnability and user experience points to the kind of interfaces that can be produced for older people with their cognitive, physical and sensory limitations. Usability features comprising of font space and navigation options as well as a consideration of Inclusive design principles will improve the usage experience. Incorporation of older adults in the design process is central to defining interfaces that foster independence for these individuals and also the cordial relationship between them and the technology. Studying ongoing and incorporating research findings to respond to the needs of elderly users mobile interface usability shall continue to be developed.

Contribution

The study fills an obvious academic and research niche gap by exploring interface interaction design for elderly mobile products, especially within the Beijing, China context. As it exemplifies and discusses the abovementioned interface paradigms along with evaluating different aspects of elderly users' characteristics like physical and cognitive limitations, as well as cultural differences, it offers practical recommendations for improving mobile devices' usability and accessibility. The study combines the existing theoretical framework of Human-Computer Interaction (HCI), Gerontechnology knowledge, and the ecological Systems Theory to establish guidelines for designing to factor usability, learnability, and user experience. Features like customizable texts, easy-to-follow tools and 'playing along' techniques clearly state its feasibility.

References

Adami, I., Foukarakis, M., Ntoa, S., Partarakis, N., Stefanakis, N., Koutras, G., & Stephanidis, C. (2021). Monitoring health parameters of elders to support independent living and improve their quality of life. *Sensors*, *21*(2), 517.https://www.mdpi.com/1424-8220/21/2/517/pdf

Ahmad, B., Richardson, I., & Beecham, S. (2021). Usability recommendations for designers of smartphone applications for older adults: An empirical study. In *Software Usability*. InchtechOpen. https://www.intechopen.com/chapters/76198

Bakaev, M., Goltsova, E., Khvorostov, V., & Razumnikova, O. (2019). Data compression algorithms in analysis of UI layouts visual complexity. In *International Andrei Ershov Memorial Conference on Perspectives of System Informatics* (pp. 167-184). Cham: Springer International Publishing.https://etd.auburn.edu/bitstream/handle/10415/8040/Recommendations_for_Interaction_Design_in_Spatial_Computing_Yunfan_Zhang.pdf?sequence=6

Croon, A. (2022). Thinking with care in human–computer interaction. *Feminist Theory*, *23*(2), 232-246.https://journals.sagepub.com/doi/pdf/10.1177/14647001221082294

Dopp, A. R., Parisi, K. E., Munson, S. A., & Lyon, A. R. (2019). A glossary of user-centered design strategies for implementation experts. *Translational behavioral medicine*, *9*(6), 1057-1064.https://www.researchgate.net/profile/Kathryn-

Parisi/publication/329488030_A_glossary_of_user-centered_design_strategies_for_implemen-tation_experts/links/5c0ad1324585157ac1b047dd/A-glossary-of-user-centered-design-strategies-for-implemen-tation-experts.pdf

Fischer, B., Peine, A., & Östlund, B. (2020). The importance of user involvement: a systematic review of involving older users in technology design. *The Gerontologist*, *60*(7), e513-e523. https://academic.oup.com/gerontologist/article-pdf/60/7/e513/33749237/gnz163.pdf

Fischer, B., Peine, A., & Östlund, B. (2020). The importance of user involvement: a systematic review of involving older users in technology design. *The Gerontologist*, *60*(7), e513-e523. https://academic.oup.com/gerontologist/article-pdf/60/7/e513/33749237/gnz163.pdf

Fischer, J., Riechers, M., Loos, J., Martin-Lopez, B., & Temperton, V. M. (2021). Making the UN decade on ecosystem restoration a social-ecological endeavour. *Trends in ecology & evolution*, *36*(1), 20-28. https://www.cell.com/trends/ecology-evolution/pdf/S0169-5347(20)30248-2.pdf

Hartato, Yoshua, R. J. A., Husein, Garetta, A., & Warnars, H. L. H. S. (2022). Technology for Disabled with Smartphone Apps for Blind People. In *Expert Clouds and Applications: Proceedings of ICOECA 2022* (pp. 271-282). Singapore: Springer Nature Singapore. https://www.researchgate.net/profile/Jebakumar-Immanuel-D/publication/362735698_Design_of_Smart_Super_Market_Assistance_for_the_Visually_Impaired_People_Using_YOLO_Algorithm/links/648edb5d95bbbe0c6ecfbd8a/Design-of-Smart-Super-Market-Assistance-for-the-Visually-Impaired-People-Using-YOLO-Algorithm.pdf#page=285

Kaya, K. Y., & Yıldız, İ. (2019). Comparing three free to use visual programming environments for novice programmers. *Kastamonu Education Journal*, *27*(6), 2701-2712.https://dergipark.org.tr/en/download/article-file/848795

Kuebler-Wachendorff, S., Luzsa, R., Kranz, J., Mager, S., Syrmoudis, E., Mayr, S., & Grossklags, J. (2021). The right to data portability: Conception, status quo, and future directions. *Informatik Spektrum*, *44*, 264-272. https://link.springer.com/content/pdf/10.1007/s00287-021-01372-w.pdf

Kuhail, M. A., Farooq, S., Hammad, R., & Bahja, M. (2021). Characterizing visual programming approaches for end-user developers: A systematic review. *IEEE Access*, *9*, 14181-14202. https://ieeexplore.ieee.org/iel7/6287639/6514899/09320477.pdf

Li, Q., & Luximon, Y. (2020). Older adults' use of mobile device: usability challenges while navigating various interfaces. *Behaviour & Information Technology*, *39*(8), 837-861.https://www.researchgate.net/profile/Qingchuan-Li/publication/333588206_Older_adults'_use_of_mobile_device_usability_challenges_while_navigating_various_interfaces/links/5e53706292851c7f7f55194f/Older-adults-use-of-mobile-device-usability-challenges-while-navigating-various-interfaces.pdf

Lin, C., & Margot Lindtner, S. (2021). Techniques of use: Confronting value systems of productivity, progress, and usefulness in computing and design. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems* (pp. 1-16).https://dl.acm.org/doi/pdf/10.1145/3411764.3445237

Lindberg, R. S., & De Troyer, O. (2020). Towards a reference model of guidelines for the elderly based on technology adoption factors. In *Proceedings of the 6th EAI International*

Conference on Smart Objects and Technologies for Social Good (pp. 30-35). https://researchportal.vub.be/files/76243868/Goodtech_2020_paper_.pdf

Lindberg, R. S., & De Troyer, O. (2021). Towards an up to date list of design guidelines for elderly users. In *CHI Greece 2021: 1st International Conference of the ACM Greek SIGCHI Chapter* (pp. 1-7). https://biblio.vub.ac.be/vubirfiles/77211454/Expert_Evaluation_ICHI_conference_3_.pdf

Marston, H. R., & Van Hoof, J. (2019). "Who doesn't think about technology when designing urban environments for older people?" A case study approach to a proposed extension of the WHO's age-friendly cities model. *International journal of environmental research and public health*, *16*(19), 3525.https://www.mdpi.com/1660-4601/16/19/3525/pdf

Oset, M., Stasiolek, M., & Matysiak, M. (2020). Cognitive dysfunction in the early stages of multiple sclerosis—how much and how important?. *Current neurology and neuroscience reports*, *20*, 1-9. https://link.springer.com/article/10.1007/s11910-020-01045-3

Oulasvirta, A., Dayama, N. R., Shiripour, M., John, M., & Karrenbauer, A. (2020). Combinatorial optimization of graphical user interface designs. *Proceedings of the IEEE*, *108*(3), 434-464. https://ieeexplore.ieee.org/iel7/5/9024148/09000519.pdf

Parlakkiliç, A. (2022). Evaluating the effects of responsive design on the usability of academic websites in the pandemic. *Education and Information Technologies*, *27*(1), 1307-1322. https://link.springer.com/content/pdf/10.1007/s10639-021-10650-9.pdf

Paulauskas, L., Paulauskas, A., Blažauskas, T., Damaševičius, R., & Maskeliūnas, R. (2023). Reconstruction of industrial and historical heritage for cultural enrichment using virtual and augmented reality. *Technologies*, *11*(2), 36. https://www.mdpi.com/2227-7080/11/2/36/pdf

Rienzo, A., & Cubillos, C. (2020). Playability and player experience in digital games for elderly: A systematic literature review. *Sensors*, *20*(14), 3958. https://www.mdpi.com/1424-8220/20/14/3958/pdf

Sahoo, B. (2023). *User experience design for automated damage detection through camera bridge in the freight rail sector* (Doctoral dissertation, Technische Hochschule Ingolstadt). https://opus4.kobv.de/opus4-haw/files/3915/I001611708Thesis.pdf

Sartas, M., Schut, M., Proietti, C., Thiele, G., & Leeuwis, C. (2020). Scaling Readiness: Science and practice of an approach to enhance impact of research for development. *Agricultural Systems*, *183*, 102874. https://www.sciencedirect.com/science/article/pii/S0308521X19314477

Simkute, A., Luger, E., Jones, B., Evans, M., & Jones, R. (2021). Explainability for experts: A design framework for making algorithms supporting expert decisions more explainable. *Journal of Responsible Technology*, *7*, 100017.https://www.sciencedirect.com/science/article/pii/S266665962100010X

Song, Y., Yang, Y., & Cheng, P. (2022). The investigation of adoption of voice-user interface (VUI) in smart home systems among chinese older adults. *Sensors*, *22*(4), 1614. https://www.mdpi.com/1424-8220/22/4/1614/pdf

Zhou, C., Zhan, W., Huang, T., Zhao, H., & Kaner, J. (2023). An empirical study on the collaborative usability of age-appropriate smart home interface design. *Frontiers in psychology*, *14*, 1097834. https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1097834/pdf