Empowering Elderly Care Service through Inclusive CUI Design

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Abstract
This paper examines the current state of inclusive design in conversational user interfaces (CUIs) and proposes a specific design context for improving inclusiveness: CUI-supported care delivery systems for older adults with their caregivers. The paper highlights the barriers and challenges that must be addressed in such systems to meet older adults' needs and preferences and improve caregivers' technical capacity. The paper also suggests possible derivative studies and technologies required, such as voiceprint recognition and pre-trained large language models. Ultimately, this paper serves as a starting point for future experiments and research in improving the inclusiveness of CUI design in the context of older adults and their caregivers.

Author Keywords
Conversational User Interface; Inclusive Design; Gerontology Experiment.

CSS Concepts
• **Human-centered computing~**Human computer interaction (HCI)~HCI theory, concepts and model

Introduction
Voice assistants like Amazon Echo and Apple Siri have become increasingly popular due to their ease of use and convenience. However, the literature on how Conversational User Interfaces (CUIs) can be used to support the elderly is limited[14].

In the spirit of inclusiveness, we aim to develop CUI applications for the elderly in specific scenarios and caretaking. Leave the question of inclusiveness in CUI design remains unanswered; existing literature suggests that CUI designers have yet to fully understand the cognition and impairment of CUI use in the elderly, how CUIs should communicate with the

elderly[9, 18], and how anthropomorphism affects the service experience of CUIs among older adults[3, 13].

To address this gap, we believe that specific contexts are needed to explore the issue of inclusiveness in the use of CUI in the elderly. Instead of being designed to be general, specific CUIs services, such as voice assistants (VA), should be considered according to different scenarios and needs of users.

This article reviews the macro design discussion of inclusive design and the elderly. It explores developing inclusive CUI design for the elderly in specific scenarios, such as elderly care scenes (bridging caregivers and elderly with CUI). We argue that context-specific analysis is necessary when considering inclusiveness in CUI design for older adults. By developing inclusive CUI design, we hope to empower elderly care service design and improve the quality of life for the elderly.

Inclusive design with seniors

Inclusive design aims to make technology accessible to everyone, including seniors and people with disabilities. Traditionally, user-centered design approaches have been used to consider the needs of all user groups. However, with the complexity of the needs and characteristics of specific user groups, such as the elderly, researchers and designers have proposed new methodologies, such as user-sensitive inclusive design, to address the challenges of designing for these groups [12].

In the context of elderly care, it is essential to understand the services and needs of the elderly population, and inclusive usability design should be guided by a user-centered perspective[6, 11]. Two approaches have been discussed in the literature: the first approach is to show accessibility levels, and the second approach is to use design standardization processes, such as ISO 9241-210, which includes descriptions of target users with special attention to user diversity [8]. These approaches help to ensure that the needs and requirements of the elderly population are taken into consideration during the design process.

Furthermore, it is essential to involve seniors in the design process to ensure that the services meet their needs and are user-friendly [5, 7]. Involving seniors in the design process helps identify issues and barriers that may not have been apparent to the designer and can lead to more inclusive designs [15].

Challenges in designing CUI for older adults and caregivers

Despite the many benefits of CUIs, several inclusion issues need to be considered when designing for older adults. These issues include cognitive burden, technology gap, and speech recognition accuracy[4, 16]. The cognitive ability of older adults is relatively low, and using CUI requires specific voice interaction skills and an understanding of technical terms and operation methods, which may increase their cognitive burden [1, 10]. Some older adults need to be more familiar with and proficient at using electronic devices and the internet, which limits their ability to use CUI.

In addition to these gaps that directly affect the user experience, other factors such as frailty, narrative, elder design, and non-age-centered design must also be considered [5, 7]. While there is currently no research on the language CUI designers use when

designing for the elderly, it is important to contextualize these issues to better understand their impact on inclusive design.

From a media perspective, the initiative of the elderly to use CUI is also an essential factor. For some specific life scenarios of the elderly, the assistance of CUI (in the form of VA) can no longer make the elderly subjective perception of their own body and external information and form an understanding of their own body and external information and even extend beyond the broader caretaking service. Therefore, if the elderly have the initiative of CUI interaction, it is easier to form the binding behavior of CUI use.

Current situation of CUI in the elderly care industry

The use of intelligent systems in the elderly care industry has gained significant attention in recent years, and various countries have implemented different intelligent products and services to enhance elderly care. However, despite the benefits of these systems, there is still a need to consider the elderly's abilities and preferences when designing intelligent systems that can cater to their needs effectively.

Cases (e.g.[3, 9, 16, 17])from Japan, the United States, German, and China proved that CUI has been contributing to the elderly caretaking context. Despite the success of these systems, it is essential to note that the elderly have varying cognitive abilities and technical skills, which may limit their ability to use CUI effectively. Additionally, there is a need to contextualize design and consider factors such as frailty narrative, elder design, non-age-centered design, and language use by CUI designers when designing for the elderly.

Overall, applying advanced intelligent systems in the elderly care industry has significant potential to enhance elderly care. Still, it is crucial to design these systems with the elderly in mind, considering their abilities, preferences, and contextual factors.

A touchpoint in the elderly caretaking system

CUI technology can empower caregivers as a touchpoint in the elderly care system. By gradually incorporating the use of CUI into nursing behavior, some of the functions of the current caregiver can be supplemented, reducing their burden and improving the elderly care experience. CUI researchers have identified several potential use cases for CUI applications in elderly care.

However, it is essential to consider older adults' cultural and background factors when designing and using CUI. For instance, some older adults prefer natural language, while others prefer accents or dialects. Thus, in developing and using CUI, it is essential to consider the cultural and background factors of older adults to ensure the inclusivity and usability of CUI [2].

Designing CUI for empowering caregivers in elderly care

Our argument is that CUIs can support both older adults and their caregivers, particularly those with cognitive disabilities. Therefore, we propose the inclusive design of the caregiver service system supported by CUI to improve the care experience for older adults. By connecting caregivers with CUI, a comprehensive system of services can be provided to ensure the flow and quality of services and living conditions of older people in multiple contexts.

Combining CUI technology and caregivers can create a more personalized and holistic care experience for seniors. Moreover, advances in AI technology can enhance the ability of the VA to assist the elderly, allowing the VA to help the elderly more efficiently and accurately and meet some of the specific needs of the elderly.

However, to achieve CUI inclusion in this context, it is necessary to consider and measure the barriers caregivers and older adults may encounter when implementing CUI-assisted care systems. Caretakers may need additional training and support to understand synergistic CUI techniques and how to coordinate CUI care with their daily routines. In addition, caregivers must have the technical skills to interact effectively with CUI and provide support and services to older adults.

Traditional general-purpose VAs may not meet the needs and preferences of older adults because they seldom think of the unique needs of older adults. For example, older adults may need more interpersonal and emotional support than purely technical support. As we move to design for CUIs over inclusive design, we need to realize that there are many aspects beyond functionality that designers need to think about and consider.

Therefore, CUI care systems must be customized to meet older adults' needs and preferences to achieve inclusive service design. This can be achieved by conducting studies on the subdivided population in the region to understand the needs of the elderly in the different areas. The results of these studies can be diffused to other current VA systems to improve the overall inclusiveness of CUI.

In summary, the design of a caregiver service system supported by CUI has the potential to provide a comprehensive and personalized care experience for older adults. However, to achieve CUI inclusion, designers need to consider and measure the barriers caregivers, and older adults may encounter when implementing CUI-assisted care systems. CUI care systems must be customized to meet older adults' needs and preferences to achieve inclusive service design.

Conclusion

In conclusion, we argue that CUIs can be designed to support older adults and their caregivers, particularly those with cognitive disabilities, and that inclusive design should be guided by a user-centered perspective. By developing context-specific CUI applications for the elderly, we hope to empower elderly care service design and improve the quality of life for the elderly. Designers must consider and measure the barriers older adults and caregivers may encounter when implementing CUI technology, and CUI care systems must be customized to meet older adults' needs and preferences to achieve inclusive service design.

While implementing CUI-supported care delivery systems for older adults holds promise for improving inclusiveness, there may be additional variables and challenges to consider in specific scenarios. Therefore, further research and experimentation are needed to fully explore CUI technology's potential in this context.

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