

The Struggle for Simpler Interfaces for Users with Cognitive Disabilities

An STS Research Paper
presented to the faculty of the
School of Engineering and Applied Science
University of Virginia

by

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May 11, 2023

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Technological developments often serve some populations better than others. Even when access to new devices and features is equitable, usability may vary widely. Some new devices and features may be less usable to some populations; for example, in the aggregate, old users may find them less usable than young users. Persons with cognitive impairment (CI), regardless of age, are more likely than others to face usability barriers (Ayon & Dillon, 2021). Approximately 10.9% of the U.S. population are impaired by a cognitive disability (CDC, 2023). CI impedes executive function, complicating daily tasks. Mild cognitive impairment (MCI) and dementia are common age-related diagnoses that can diminish usability and the capacity to learn new techniques. When patients with CI can use digital devices themselves, they can enjoy greater autonomy (Wu et al., 2015). In response to the exclusions, some device manufacturers, system developers, and advocates for CI users are promoting device and feature designs that better serve CI populations. Some offer services such as technology assistance or instruction; others have developed specialized devices for CI populations. For tech companies, however, the largest profit margins lie in devices crowded with features. Advocacy therefore remains essential to inclusive device design.

Literature Review

Inadequate efforts to serve CI populations compound the practical disadvantages of CI itself. Comparing aged study subjects with and without cognitive impairments, Diaz-Orueta et al. (2014) found that healthy subjects with no cognitive decline used a remote device to control a television much more successfully than diagnosed subjects. Researchers are seeking ways to bridge this digital divide (Schepens Niemiec et al., 2022). Digital health technologies (DHTs) are accessible software platforms approved by the Food and Drug Administration (FDA) to reduce

material wastes and costs of digital treatments (FDA, 2020). DHTs form connections between CI patients and their medical contacts (caregivers and medical workers). Interactive monitors can report emergencies, promote inclusive access, and provide real-time responses to remote requests for medical aid. For the CI population, adoption of DHTs can prolong independence; to manage DHTs independently, patients must become familiar with them. Wu et al. (2015) interviews CI participants for their opinions on information and communication technologies (ICTs). Most CI users are motivated to learn and actively engage through ICTs for self-care and to stay in touch with family and society. Sachdeva et al. (2015) concludes the absence of an universal solution to CI digital disparities as the complex diversity of CI conditions complicates the needs of its users. Depending on the diagnosis and influence of social factors, digital support varies for every patient.

Technological innovation is not enough to bridge the gap in device use. Social incentives are vital when addressing inclusion and accessibility issues for CI users. Interviewed users voice their concerns of being left behind by younger or non-CI generations (Wu et al., 2015). Several cases describe the disparity of a digital versus non-digital mindset. Users familiar with devices experience frustration and criticize the slow intake of digital learning that CI users face. The collective voices represented in the literature desire services mindful of the needs and pace of CI users. Some users feel “social injustice” due to the decline of options with a shift towards a digital age. ICTs are now a common method of contact between peers, family, and society. Likewise, public services and information are digitized in many contexts, coming in online formats or accessed through the web. This expands coverage and convenience by making services accessible at any time or location; to be socially included, CI users must adopt the digital devices that host these changes (Wise, 2012). Some CI consumers hesitate to purchase

digital devices due to socioeconomic factors like cost-benefit analysis (Sachdeva et al., 2015). For the predicted amount of use, are the costs worth the purchase? Costs are a barrier for CI consumers who may not use ICTs as much as the general population.

For device manufacturers, non-CI consumers are a vast and attractive market; the market for CI-friendly devices, however, is far smaller. To compensate, nonprofit organizations, patient support groups, relatives and caretakers advocate for the usability needs of people with CI. Companies that respond typically do so in their product design and marketing practices. To better serve people with CI, device implementation must reflect their needs. Instructional services may be necessary. Device and operating system design can be adapted to the needs of people with CI; marketing that recognizes their needs can also help. Companies that offer digital services to people with CI can also improve device usability.

Efforts to Better Serve CI Populations

Accustomation through Digital Gradation

Newer and recent device models are built with a plethora of functions and extra features. For the technologically adept, complex systems with all-in-one functions are a convenience used in the completion of tasks. Companies may raise prices for newer models with increased utility as they continue to expand upon each device generation with mass updates. CI users, often older adults, find the number and complexity of features challenging to use. The loss of motivation and the limited learning capacity of CI users restrains the purchase of digital devices. Simpler devices with limited functions, often customized, can boost usability. CI users who start with a simple device can gradually develop the skills necessary to use a more complex device given practice.

‘I hope that people who design new technologies will take into consideration what the elderly talk about instead of conceiving things that they find formidable... that in reality are not at all adapted to older people... this is an opportunity for us to express our opinions... I hope that it allows a mutual enrichment’ (Wu et al., 2015).

Responding to reports of exclusion, mobile device companies have designed simplified phones. These simplified mobile phones offer only essential phone features. RAZ Mobility (2023) offers their RAZ Memory Cell Phone, catered to the needs of CI users by limiting phone function solely for contact purposes.



Figure 1. A sample model of the RAZ Memory Cell Phone. The front (and only) screen of the phone is of contacts, with large icons for visibility and easy interactions (RAZ Mobility, 2023).

With a single screen for saved contacts, the only service the phone provides is in sending and receiving phone calls (Fig. 1). Extra features are included for emergent conditions like 911 or for cases of necessary remote control by a caretaker or medical assistant. On such simple phone models, even users with CI have learned to make calls, send text messages and use other basic features (Hedman, Lindqvist, & Nygård, 2016). Other inclusive phone models come with software that lets users choose between simple and complex modes (Samsung UK, 2023). In the same phone model, the user is able to switch on/off internal modes of the phone that displays a simpler interface. If the CI user wishes to advance to the original, more complex display, they can do so at their discretion. Non-CI users can choose not to use these features. By altering the

software, companies are able to market their inclusive services on the same products for the general population to include CI consumers.

‘Its unique UI (user interface) boasts a whole host of features that are easy to use and make every interaction effortless. From simple fonts to handy widgets, every feature and function is designed to be instinctive and understandable...No fuss or complications, just a simple, everyday smartphone’ (Samsung UK, 2023).

Some advocates serve as mediators between manufacturers and consumers, helping people with CI to choose the right device best suited to their needs (Molloy, 2023). Instead of advocating for companies to change ICT designs, these mediators focus their agendas towards the CI population using what exists in the market. With the diversity of cognitive conditions, each user needs different services - presenting a barrier for a broad solution to close the CI digital divide. Creatively, some systems originally intended for non-clinical purposes can replace DHTs for CI users. Tracking devices with features like motion sensing or emergency contact functions are suited for wandering dementia patients (Sauer, 2018). While many options exist for like purposes, each product has distinct properties that impacts user preference; specific devices have unique details that may address the needs of a certain CI condition. By condensing and reviewing information on these non-clinical, alternative devices, advocates are able to shorten the search for CI-friendly devices. Their efforts are conveyed in articles, blogs, podcasts and related media forms in their filter of devices suited for certain CI conditions. Often, the ICT alternative systems are simpler versions of general models or contain features that can accommodate CI users. Both customized and non-specific devices are ranked in public posts by CI advocates based on their own interpretations, investments and experience.

Analysis of existing practices show that attempts at inclusivity are being made. However, to reach the target audience, socioeconomic factors also need to be considered. Software features

are easier to update remotely, providing more opportunities to grow without the struggle of costs and time when purchasing upgraded new models. By using the same models as general users, CI users can gradually transition towards the original, complex digital systems at their own pace - effectively reducing the gap in digital use. However, the advantage of a simplified hardware model is that the reduction of features could imply cheaper costs. As financial cost-efficiency is a concern that limits CI users, if reduced costs are possible for a model with the bare minimum, these products may be more suited for the CI audience. An original product with select software options (simple modes) likely comes at the price of a full package, including the costs for the base features that are still included with the device. Limited services also allow for quick adoption with continuous use of the same features with time - more focus is spent mastering the basic functions than exploring extra functions.

The Transition to Technological Dependency

People with CI who depend on others for digital tasks may forego skill development they could manage, at a cost to their independence. Many rely on caregivers or relatives to handle the devices, therefore escaping the frustration and overload of information that comes with digital systems. Instead of advocating for changes in device design, informational activists aid in the uptake of digital systems by CI users. They provide or promote technical support to encourage CI users to gain independence from relying on others and to instead, depend on digital systems like DHTs or similar options. Machines with no emotions or fatigued bodies are incapable of bearing mental or physical stress - resolving the common issues caregivers face when attending to CI users.

Through public services, many users with CI can train themselves or request for help in learning how to use the devices they need. The National Institute on Aging (NIA) is a sponsor of CREATE (Center for Research and Education on Aging and Technology Enhancement) and PRISM (Personal Reminder Information & Social Management). CREATE evaluates devices for their usability by older adults (CREATE, 2019). PRISM is a simple software meant to promote social connections, store memory data, and provide supportive services for its users (PRISM, 2019). CREATE researchers are expanding PRISM to include senior and CI populations. The American Association of Retired Persons (AARP) offers free services to its members to help elderly, CI communities fulfill their practical needs by fostering digital dependency (AARP, 2023). The AARP offers support through its free courses, online guidance, digital support services, and updates on their agendas or recent trends. It offers support short of the device reforms promoted by CREATE.

Some advocates direct their efforts towards the caregivers and relatives for whom CI users are generally dependent upon. For the CI community, there are caregivers - in the form of public health workers, volunteers or family relatives - that contribute their time and care to maintain the quality of life for the CI individual. Mental and physical burdens that follow caregiving exist in the form of fatigue, stress, burdened emotions and a lack of personal time. DHTs are a solution for providing autonomous aid and relief to caregivers (FDA, 2020). Depending on the case, motorized devices, smart systems, simple monitors and ICTs between caregivers and patients allow for immediate aid to the patient from a remote location (Piper et al., 2016). Even large-scale smart homes for elderly CI users are being designed to host sensors and other communicative devices placed throughout the household (Chimamiwa et al., 2022). An example application of a smart home is retirement homes - integrating the building to have

built-in DHTs, ICTs and similar devices catered to the needs of CI users. While these efforts in making CI-friendly digital systems are focused towards the users, benefits exist for the caregivers as well. The shift to digital over human dependency alleviates the burdens caregivers face, allowing them to focus on their private lives and personal use of time.

Unlike human support, devices and mechanical systems are available at any time or location, providing simple, remote services regardless of the setting. With ICT systems, real-time contact can be delivered in moments for efficient service. Caregivers are able to monitor and respond to emergencies via prompt communication techniques. In-person checks are not needed as much if both caregivers and CI patients are consistent users of digital systems. CI users can maintain their independence without the physical presence of a human aide while caregivers can comfortably and efficiently make use of existing services to provide care.

Efforts in Sociotechnical Reform

To make a large-scale impact, advocates for political reform are expanding their agendas by influencing applications of inclusivity towards CI populations. Stakeholders are continuously lobbying and advertising for changes to current protocols and policies on a federal scale. Some press for reform towards research, manufacturing and design requirements. Others impact how the devices are presented to the population via marketing and sales or through project application. By affecting the foundational practices of digital development and implementation on a national scale, widespread coverage of CI communities can provide a common measure for CI inclusion.

National advocacy organizations seek to spread awareness of CI struggles through data collection and advances in research. The Alzheimer's Association is a nonprofit organization

promoting efforts to raise awareness, sponsor preventative research, and increase care and accessibility to Alzheimer's Disease (AD) and dementia patients (Alzheimer's Association, 2023). The association is responsible for several public policy changes: increasing federal funding of dementia research and informing the public of available Medicare services. Their recent agenda is to enable coverage of FDA-approved AD treatments (AIM, 2023). A key aim of CREATE is to develop principles and protocols to monitor the development, regulation, and use of technology by senior and CI users. CREATE supplies data to alter policy debates in a way that is favorable towards CI users and relevant stakeholders. This allows for a variety of supportive services, expanded coverage, and the gain of more data. Eventually, the improving specifications of CI user needs with progressive data leads to in-depth comprehension of user-device relations and what social science factors impede digital adoption in CI communities.

Federal action in consideration of CI users enforces digital communication rights to address the CI disparities. The Federal Communications Commission (FCC) held a summit to discuss potential solutions to the hurdle CI populations face when using digital systems or devices (FCC, 2016). At the summit, user advocates voiced the struggles of CI users, including mental comprehension, memory recall, navigation difficulties, and the lack of technical support services. In most cases, CI users require customized aid to learn and overcome digital use. As a result of the summit, the FCC created a guide of best practices for effective utility of ICTs for CI users in the nation. The guidelines are divided into device/system design functionality and tips to spread awareness and increase knowledge of ICTs. Company stakeholders should actively seek to understand CI conditions and the urgency of ICTs that can prolong user independence. As a result, product development and research should consider such factors in addition to the supply of services and detailed instructions on digital system operation. The Office of Disability

Employment Policy (ODEP) began the Partnership on Employment & Accessible Technology (PEAT) to introduce accessible (or assistive) technologies (AT) to the workplace (PEAT, 2020). PEAT provides conferences for company stakeholders on AT integration with the workplace, how to support CI employees with ATs, and collaboration opportunities across IT industries. ODEP supplies programs like the Employer Assistance and Resource Network on Disability Inclusion (EARN) and guides to address inequality issues in settings related to CI users and ATs. The National Council on Disability (NCD) advocated for the passing of a Technology Bill of Rights for Americans with Disabilities (ODEP, 2016). The NCD took action due to the shift in power balance towards technologically dominant environments. Data of the transition describes the increasing role that technology plays in employment, healthcare, education, and independence.

Conclusion

The personal disadvantages of foregoing digital devices have grown. Digital systems offer advantages of efficiency, personal health and safety, and convenience. CI users, including a large share of aged people, struggle to use said devices and find themselves on the wrong side of the digital divide. To bridge this divide, companies, advocacies, and caregivers are seeking ways to develop more inclusive systems.

Public policies and organizations should continue to advocate for more inclusive digital services. Regulations should be revised to ensure companies account for the CI users that seek to stay updated with digital advances. Changing the base requirements for digital product manufacture and sales allows for more coverage, especially if additional features are marketed as they should. Many CI users are unaware of the supportive features that complex devices contain

and often lose the motivation as they are left behind. Companies need to actively promote their services to both general and CI consumers to effectively offer their support.

Areas for future research involve focusing on the social sciences that hinder digital adoption by CI users. Sociological, economical and psychological factors that stakeholders face are underlying limiters of technological adoption. If CI users lack the motivation to learn and keep up with the modern times, there is no purpose in investing in custom devices if they are not going to be used. A major social limiter is societal pressure - especially from the young, technically adept population. Criticism for slow, difficult learners despite their medical conditions leads to isolation and hesitancy in overcoming digital challenges. The reassurance of having a caregiver or someone to turn to for handling the digital aspects in place of learning oneself is another socio-psychological dependency. With complex multi-functional devices that hold better coverage, comes high prices. The more capable a device is in providing various utilities, the more expensive the costs to the consumer. For various reasons such as difficulties in employment, CI communities tend to struggle financially, lacking the funds to invest in a device. In other cases, the cost-efficiency in device use frequency and benefits are not worth the high costs.

However, to address these social factors, changes sponsored by advocacy groups are showing signs of improvement. With the rapidly developing digital era, many public systems are now dependent upon digital devices to function. The presence of artificial intelligence and autonomous machines, smart systems, and machine learning have become dominant figures in everyday life. These software systems enable digital autonomy to the device, relying on basic, simple commands to perform tasks. Automated devices are ideal for CI users as simple or minimal input is necessary to handle the device. The device interprets user commands and is

capable of acting independently from manual instruction. Technological stakeholders, as a result of regulations and struggles for equality, continue to expand on ways to improve CI inclusivity. Recent developments, through smart technology and services, show promise in decreasing costs and usage complexity for smoother CI user integration to digital systems.

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