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# Assistive Technology Devices For The Oldest-Old: Maintaining Independence For The Fourth Age

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**Abstract.** User interface design needs to be revisited for our oldest members of society. The literature has shown that over the age of 70 increasing numbers of older people find it difficult to learn, and the rapid changes in technology and associated interfaces make it particularly difficult for our oldest citizens to participate in the digital age. Focused on aged care residents, this is a perspective paper, outlining the needs and suggesting avenues for research in this under researched population of technology users. Also explored in attempts to overcome digital exclusion are the assistive technologies that aid members of this fourth age, as well as their family and professional carers.

**Keywords:** Assistive Technology Devices · Gerontechnology · Elderly · Fourth Age · ICT · Digital Divide- Ageing - Peer Training - Aged Care - Digital Inclusion

## 1 Introduction

The literature defines the elderly in stages: with the oldest-old being those in the 80+ age group [1,2,3]. Experiences of technology in this age-group, defined by [4,5] as the fourth age, are considered in this perspective paper. The global population of elderly people is steadily increasing [6,7,8,9,10,11,12]. It is generally accepted that while innovations in technology are advancing rapidly, the elderly are increasingly unable to keep up [6], [13]. In particular, those in the fourth age, many of whom have not been exposed to technology in their home or working lives, are at a disadvantage as more and more daily tasks are performed electronically [14]. Access to information, resources and services is increasingly reliant on technology. Indeed, computer operating systems are frequently being changed and upgraded, ultimately resulting in a quite different computer experience, again leaving the older users at a disadvantage when

they are presented with an interface which is quite different to what they have learned and to which they have become accustomed.

Given that relatively little work has been done in relation to technology use by the fourth age, this article's main contribution lies in its exploration of how such citizens can better be included in the digital age. While this fourth age group of people are not averse to learning how to use technology [15], attempts to assist older people with training courses aimed at their level of expertise, have had varying degrees of success. As people age they become less mobile and less able to attend such courses. They also experience increasing physical difficulties, including visual and motor coordination challenges. Advances in technology can lead to isolation and ultimately a digital divide [14].

There has been some research which investigates the training courses and online communities which assist the oldest-old, examining whether these are useful for those in the age group and if not, what might be the alternatives. Many of our elderly wish to remain independent and living in their own homes for as long as possible, but while it is acknowledged that they need support to remain there, a large number are restricted in their use of technology in these homes. A certain level of independence can be achieved by the use of assistive technology devices (ATDs), but the elderly need to be persuaded of their benefit and relevance to themselves. The alternative is often that they will need to move from their homes to retirement villages or assisted living environments [16].

As they become less mobile, the ability of the fourth age to take part in social activities is also decreased. Some have been introduced to social networking sites, such as Facebook but many prefer face-to-face communication. Smart phones and tablet devices provide easy access to information and social contact but this also requires knowledge, skill and financial resources. The fourth age, who lived through the years of the 'Great Depression', are averse to spending money on new equipment every few years. Yet, computer operating systems are constantly being upgraded and, over time, the interfaces are changing which leaves older users at the disadvantage of not only cost, but learning, in regards to those changes to technology, applications and interfaces.

### 1.1 Vignette

Rose, who is 85 years old, phoned in distress when her laptop had failed. Her computer was installed with Windows Vista – a very outdated operating system. The computer would not start up at all. When Rose was told that it might be impossible to recover the computer she was extremely upset and protested that it had not been used very much and indeed, was only bought after her husband had passed away, 6½ years earlier. In her mind, this was not a long time for an expensive possession to continue working; whereas in computer terms it was ancient. There followed some discussion around the possibility of her using an iPad instead, which might be easier to manage, since she only used her computer for email and internet browsing. 'No!' she protested. 'I want MY computer'. It was inconceivable to her that what was to her such an expensive piece of equipment should have such a short lifetime. She also believed

that she was approaching the end of her days and that to buy a new computer would be an unacceptable waste of money. But she had grown accustomed to being able to communicate with her family over email, and keep up to date with news stories online. She was delighted when the computer was eventually recovered, but being so outdated it is only a matter of time before it happens again. Rose is not comfortable with change, as is evident by her reluctance to change to a tablet device. She has also not been willing to embrace other assistive technology devices, such as hearing aids, or personal emergency devices when they have been suggested to her as tools to improve her health and well-being. She accepts that these may be helpful to other elderly people but considers that they are not relevant to her, despite her being profoundly hard of hearing and prone to falls.

## 2 The Digital Divide

As was the case with Rose, many information and communication technologies (ICTs) are perceived by members of the fourth age to be of little or no relevance or use to themselves, even though access to information, resources and services is increasingly reliant on technology. Learning to use technology and adapting to the ever changing interfaces present challenges for the oldest-old. For example, web guidelines for older people learning to access online communities have been shown to require longer learning times [17]. The oldest-old need to learn how to navigate the digital spaces, digital language and interaction styles, and ever changing technology. Literacy and learning are thus challenges that need to be addressed. This is true for all use of technology, by the elderly. Increasingly the elderly encounter tasks that were once familiar to them that are now performed digitally.

The learning divide is a sub-set of a wider digital divide (DD) to do with education. According to [18], the phenomenon could be generalised as addressing either some form of socioeconomic divide or some form of education divide. One can extrapolate that less well-educated seniors are likely to face more of an age-based learning divide than better-educated ones. It is also possible that the kind of work undertaken by seniors during their working lives, will have an influence on their ability to participate online. Three reasons for non-use of ICT by older Portuguese residents were identified by [19] as attitudinal, functional and physical. They define attitudinal as the elderly being willing to try technology but they are either generally indifferent or they lack the self-confidence to persevere. Functional is defined as a lack of access to a computer at home or they do not have the skills necessary to use it; and physical means they have physical or mental limitations preventing them from using technology.

## 3 Objectives

This paper discusses research that is in its early stages and the focus of which is to explore what factors facilitate or hinder the fourth age from taking advantage of Information Technology and to keep up with advancing technologies and ways to address that, now and in the future. The challenge is how do you bring Information Technology to them, making sure that it is relevant to them and enabling them to continue to access it? To address this dilemma, the following research questions have been identified: What factors influence the successful access to and continued use of Information Technologies for the oldest users? What are the enablers/inhibitors to the oldest-old embracing the use of assistive technologies?

These factors may include, but not be restricted to, the factors identified by [19]: Attitudinal, Functional and Physical. These questions are relevant to current problems faced by the elderly in coming to grips with advances in Technology, hence the research innovation and relevance.

## 4 Digital inclusion of the fourth age

Although the use of computers and the Internet among older adults is increasing, there is an age-based divide [18], [20,21] whereby, compared to other age categories, older people are reporting less use of PCs and the Internet. Comparisons of ICT penetration by age for various OECD countries in 2000, including Australia were developed by [18]. These comparisons showed that for people aged 18 to 24, close to 90% of them accessed the Internet, whilst for people aged 55–64 it was less than 50% and for people aged 65 and over, it was well under 20%. A report of ageing in Germany claimed, however, that the situation was changing, and that there were indications that technology could make a significant contribution to ageing successfully [22]. However, [19] calculated that 20% of 64-74 year-olds were frequent users, while 81% of 16-24 year olds embraced the technology. Indeed, 65% of older adults had never used technology. A large study by [23] revealed that those aged over 80 are still left behind in the use of the Internet and technology in the United States. Australian data correlates to these figures with 97% of 15 to 17 year-olds reporting use of the Internet, while only 46% of those aged 65 or older are Internet users [24].

An example of the age-based divide is that some seniors experience access limitations due to age-related disabilities [23]. It was reported by [18] that in 2000 people with disabilities only enjoyed half the benefits of Internet access at home, compared to those without a disability. A solution was put forward by [25] that “One way to alleviate this problem may be to provide a publicly accessible infrastructure to the information technologies; for example, a high-tech pavilion in a city park, a computer booth in a shopping mall, or an Internet kiosk in a restaurant, bookstore or library”. Given the prevalence of disability with increasing age and consequent geographical and mobility issues, public access through community centres, schools and libraries, alone, does not sufficiently overcome the challenges faced by seniors with age-related disabilities [26]. This can only be of benefit to those elderly who are still mobile.

What, though, of the "shut-ins": the elderly who do not venture to such places easily, who are reliant on friends or family to transport them and who spend most of their time inside their own homes? One explanation for the age-based divide is that, with increasing age, there appears to be a diminution of power (purchasing power, political power, and position in society). It seems that the Digital Divide may be closing as more seniors use the Internet, email and other electronic forms of communication. Sociological research has shown that 'experience counts'. That is, the longer people have engaged in online activities, the more use they find for the Internet. There is increasing evidence that amongst younger seniors such online engagement is taking place, as seen for instance with their use of social networks [27], and that they engage with each other online and they participate in online communities [27,28,29,30].

## 5 Assistive Technology Devices

There are a significant number of assistive technology devices, or gerontechnologies, which can be useful in assisting to maintain independence and continued well-being. Gerontechnology is the combination of gerontology and technology and can be defined as "the study of technology and aging for ensuring good health, full social participation, and independent living through the entire life span" [8], [13]. These gerontechnologies include assistive technology devices marketed to people with hearing loss, memory loss, cognitive and other disabilities. Bookings for buses, taxis, cinemas, and health appointments can all be done online. Health care was identified by [26], [31] as a particular reason for the elderly to take to the Internet for fact-finding related to their medical conditions.

A number of technologies are available to assist with age-related health issues. These include, but are not limited to, vision and hearing aids, mobility aids such as wheelchairs or scooters, communication devices to assist people with speech difficulties, emergency call buttons, and initiatives to provide health care in the home.

One of these initiatives introduced in Europe and America, and in particular, the Netherlands, to counteract problems with nursing shortages, is home telecare [32], which is defined by [12] as "an audio-visual connection between a home-dwelling client and remote healthcare professionals, using communication technologies". The connection with a health professional takes place through a computer or television screen and allows the elderly to maintain their independence in their own homes longer, while providing assurance to those caring for them that their health needs are being met. One of the perceived advantages of this system is its relative ease of use once relevant training has been provided. While these ATDs are helpful for anyone with a disability, regardless of age, they are particularly beneficial for the very old to enable them to remain independent for as long as possible [13], [33,34].

A number of focus groups were conducted by [13] with older adults living in communities in Europe. While they reported that the participants were aware of the digital divide of technology use between generations and were willing to embrace the use of various ICTs, they nevertheless displayed a lack of interest in assistive technology devices which they perceived as having negative connotations.

So it appears that while it has been shown that elderly people are willing to learn about computers, they are still reluctant to embrace assistive technology devices in their lives [9], [10], [13]. This reluctance of elderly people to acknowledge their need for assistive technology devices was investigated by [9] who introduced them to robot technology. While the participants could see that they might be helpful for others, they were not ready to accept the technologies for themselves. These perceptions would need to be taken into account when configuring artificially intelligent devices for the elderly. Perhaps the use of the term "robot" was a reason for the lack of enthusiasm, as some of the responses from participants related to perceived size of robots along with reduction of jobs for humans and possible safety issues [9].

In contrast, [35] concluded that the elderly are willing to embrace technology if they perceive it has value to their situation. However, they highlight the issues with increasing functionality of devices, much of which is not relevant and not user-friendly to the elderly. Devices targeted to the elderly need to be more closely designed to their requirements and abilities. Perhaps one initiative would be to investigate methods of addressing Rose's protestation earlier in this paper "I want MY computer". The elderly may be better equipped to handle changing technology around them if their personal devices and interfaces remain familiar to them, dissociated from the underlying technology.

Benefits can be obtained from exploring what factors facilitate or hinder people from using technology. A great deal of research has been undertaken using surveys and a number of theoretical models to gain an understanding of the factors which influence the use of technology. While surveys are useful for gathering and evaluating statistical data, they do not shed a lot of light on what influences the elderly to accept or reject technology [10], [36,37,38,39,40,41,42,43,44,45,46, 47,48,49]. While design of technology for the elderly needs to take into account their specific requirements, training is of particular importance in assisting with their acquisition of self-confidence and continued use of the technology. Interestingly, the elderly do not like to be taught by younger people or their children and they recommend that these training environments should be led by older adults [50].

Consideration also needs to be given to the future sustainability of assistive technology devices for the elderly. Those who currently are reliant on these technologies for their health and well-being are not always considered with the inevitable upgrades and improvements that are made. For instance, the Royal Automobile Association in Adelaide, South Australia recently warned that the new National Broadband Network roll-out by the Australian Government will put at risk a large number of users of personal alarms which, they assert, are not compatible with the new network. While this is not insurmountable, it will involve changes to current installations, disruption to users, possible failure of devices, and depending on the provider, may also incur a cost [51].

## 6 Conclusion

Since global populations are ageing, at least in the western world, one implication is that more seniors than ever before will be needing to have access to technology and acquire the skills to use it. This trend is likely to continue as governments and other agencies involved with seniors require more electronic interaction in order to save costs and increase access. Yet, many of the oldest seniors are unprepared for this change and are lacking in the skills and confidence to be able to access the required data. There are efforts taking place to train the elderly to provide them with these tools and skills to attain and maintain access. It would seem that assistive technology devices have the potential to be extremely beneficial to our fourth age population yet many are reluctant to take advantage of these ATDs for various reasons. Clearly, perceptions by the elderly of a need for the technology as well as its ease of use, will dictate whether acceptance is positive or negative. Research needs to be ongoing to determine the factors that encourage or inhibit the elderly to take advantage of these technologies. If they do not, they risk becoming further isolated and further disadvantaged, as services become increasingly tied to technology. Closer attention also must be paid by governments and other authorities when planning infrastructure changes which may impact on technologies used and relied upon by our oldest citizens.

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