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Supporting cognitive enhancement and social interaction among the elderly through use of tablet computing

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Abstract In recent years, society has succeeded in adopting an active approach to older adults, and technological innovations have been developed to support the elderly in their physical, cognitive, and social activities. In this paper, we analyse the need for an inclusive design approach for information and communication technologies (ICT) for the elderly, and analyse the opportunities offered by tablet computing. The research objective of this study is to analyse the appropriateness of tablet computing for the elderly. The methodology is based on a literature review and a case study analysis that is designed to study the socio-cognitive enhancement of the use of tablet computing among the elderly. The results point to the superiority of tablet computing in terms of information search and audio-visual communication, but also highlight the current limits of tablets for writing tasks and the need for training sessions to help the elderly independently use tablets.

Keywords Tablet Computing; Elderly; Active Ageing; Cognitive Enhancement; Social Interaction.

1. Active ageing in the knowledge society

In recent years, society has succeeded in overcoming the image of physical and cognitive decline in the elderly (Sawchuk, 1995) and has adopted an active ageing approach (Walker, 2008). The World Health Organization defines active ageing as (WHO, 2002, p. 12): “the process of optimising opportunities for health, participation and security in order to enhance quality of life as people age”; the OECD defines it as “the capacity of people, as they grow older, to lead productive lives in the society and the economy”. In the context of the knowledge society, active ageing implies empowering the elderly to participate in the knowledge society both as beneficiaries and as producers of knowledge. Some of the active ageing policies have included the knowledge society approach by “encouraging access to and training in computers and the internet” (Western Australia’s Seniors Active Ageing Benchmark Indicators, 2006). European initiatives such the “European Year for Active Ageing” and the “Ageing Well in the Information Society” action plan have highlighted the importance of older adults’ access to Information and Communication Technologies (ICT), and consequently, the importance of understanding their specific requirements when adapting ICTs for their socio-cognitive needs and specific uses (Ala-Mutka, Punie, & Redecker, 2008; Sourbati, 2009). In the UK, the Digital by Default initiative aims to make ICT accessible to as many people as possible by 2015, and includes a set of strategies to ensure the inclusion of the elderly (Mieczakowski, Hessey, & Clarkson, 2013). The elderly should benefit from ICT opportunities for active ageing, not only to avoid the “grey digital divide” (Swindell, Grimbeek, & Heffernan, 2011), but for using ICTs services for active ageing in terms of social capital, access to services, and assistance for independent living (Malanowski, Ozcivelek, & Cabrera, 2008). This paper aims to analyse the appropriateness of tablet computing for the elderly. In western countries, the elderly population is defined by the World Health Organization (WHO) as people over 65. The paper examines the relationship of the elderly with ICTs, focusing on the adaptations required and reviewing the literature on the use of tablet computing for the elderly. A case study is then presented, in which a group of elderly people are introduced to tablet computing.

2. Relationship of the elderly to ICTs

Despite stereotypes, older adults are often interested in new technologies when they are made available to them. Older adults also have their own approaches which contrast with the trial-and-error exploratory approach of youngsters (Cody, Dunn, Hopkins, & Wendt, 1999; Docampo Rama, 2001; Kiel, 2005; Selwyn, Gorard, & Furlong, 2005) and which warrant analysis. Indeed, research has shown that older adults may adopt a more strategic use of computers than younger adults. Older users often have a more reflective way of using technology and could benefit from social learning experiences by receiving encouraging feedback that reduces any computer anxiety (Czaja et al, 2006).

2.1. Technology innovations supporting active ageing

In recent decades several technology innovations have been developed to support active ageing. Some devices have been designed to support the elderly both physically and cognitively. Physically, technological devices need adaption to the sensory capacity of the elderly – who sometimes experience a reduction in vision and hearing as part of the normal process of aging (Boltz, 2011); as well as reduced manual dexterity, tactile recognition, vibration sensibility, and two-point discrimination (Desrosiers, Hébert, Bravo, & Rochette, 1999). Cognitively, older brain plasticity compensates for some of these functional losses (Mahncke, Bronstone, & Merzenich, 2006). Cognitive processes such learning and memorisation could be compensated by new strategies that offset functional losses (such as attention and perception accuracy). Technological innovations could help compensate functional losses and support mental plasticity strategies. In terms of memory, systems that record voice, image, and video have been adapted to meet the needs of older users (such as the MEM-X Vocal Memory Aid). However, one of the main motivations for the elderly to use ICTs is to remain active and independent, and be able to communicate with distant family and friends. One of the participants of the study directed by Morrison (Independent Age, 2010, p.15) affirmed social interest in the use of ICTs:

“when you live by yourself (and I don’t get out all that much actually), it’s contact. You feel that you’re with people. Well, it opened up a whole new world for me, doing things that I never would have done in a million years... It’s not just a resource centre, it’s a sort of a club, and it gives people a voice –it can empower people as well.”

The social uses of technologies are of primary interest to youngsters, but also to the elderly.

2.2. ICT support for active ageing cognitive and social process

Computers have been considered as cognitive tools (Jonassen, 1995; Jonassen, & Reeves, 1996) that help to support some cognitive processes for everyone, including the storage and retrieval of memories and organisation of information. Wagner, Hassanein, and Head (2010) suggest that computer use among the elderly may alleviate stress and loneliness, and increase a sense of well-being. To observe the influence of connectivity in perceptions of isolation and overall well-being, Mellor, Firth, and Moore (2008) developed a three-month experiment to provide the elderly with devices that enable them to connect to the Internet. The researchers observed that Internet access helped decrease loneliness and social isolation, but also found some negative effects, including low self-esteem in some cases. In contrast, other researchers have found that Internet increases the perception of emotional loneliness among older adults (Sum, Mathews, Hughes & Campbell, 2008). The literature review of Morris (2007) identified some of the factors that produce a “digital grey divide” among the elderly, including the “lack of interest, feeling too old, fear of new technology, lack of access to IT, lack of IT

skills and experience, cost, concerns about security, and problems associated with disability”.

2.3. The need to adapt ICTs for the elderly

Computer systems developed for the elderly typically introduce software adaptations. However, the elderly often have difficulty with the hardware design, including the mouse and keyboard, and the screen text size (Domenech et al, 2013). In the context of the use of ICT, the elderly suffer more than twice as many user difficulties as younger users (Nielsen, 2002), show a higher level of computer anxiety (Cody, Dunn, Hopkins, & Wendt, 1999), and may doubt their ability to master new technologies (Marquié, Jourdan-Boddaert & Huet, 2002). Despite their lower confidence levels, most healthy seniors are very capable of acquiring computer skills (Mayhorn, Lanzolla, Wogalter & Watson, 2005; Morrell, 2002), especially when receiving specific training (Temple & Gavillet, 1990).

3. Tablet computing for active ageing

New studies indicate that tablet computers, such as the iPad, have the potential to support the cognitive processes of older users (Alvseike, & Brønneck, 2012; Papadopoulos, Crump, & Wilson, 2010). Alvseike and Brønneck conducted a case study testing a smart hub technology based on an iPad that aimed to help the elderly live independently in their homes. They observed that the use of iPad technology is not related to the age of the elderly, but their levels of self-efficacy with computers and cognitive deficits. Papadopoulos, Crump, and Wilson (2010) also examined iPads as mobile technologies for monitoring how the elderly live independently. In both cases, the social use of tablets was not considered. Other studies have focused on the use of tablets for communication and social interactions. One of the features that has been highlighted is that videoconferencing enables the elderly to keep in touch with their relatives (Torres-Padrosa, Calle, Marzo, & Rovira, 2011), as well as health and social services. The TAM-TAM (Tele Assistance and Monitoring) project provided participants with “social support, remote consultation, remote monitoring and training or rehabilitation group sessions” (p. 11). Other research projects have focused on the development of tablet applications, such *ActiveLifestyle*, an iPad application providing a physiotherapy strength and balance training plan that includes video tutorials, notifications, and enables message sharing to help motivate the elderly to follow their physiotherapy training plans (Silveira et al., 2012). Despite the fact that most studies suggest the superiority of tablets in terms of ease-of-use for Internet browsing, instant messaging, and videoconferencing, Molenbroek (2012) observed a preference for keyboard computer devices among the elderly for writing tasks. This was because the lack of a traditional keyboard in tablets produces a greater number of typing errors, while: “the youngsters have fast learnt that mistyping is not much of an issue in their social media messages, but older people want to produce more formal texts with no errors. As a result, they often resent technology that increases the chance of making errors” (p. 43).

In terms of the human computer interaction, Escuder-Mollon and Esteller-Curto (2012) also observe that the elderly have some difficulties in the touch-based tablet interface: “when users touched the touch panel with the palm of the hand, or with the hand being used to hold the terminal, or when the finger moved while touching the panel, the action was misrecognised as a flick. Such errors are due to weakened control of the fingertips due to deterioration of the motor functions, or due to inadvertent contact caused by a poor sense of touch – something that is difficult for a senior citizen to notice.” (p.11). Additionally, Miyosawa, Hirose, Okuhara and Sato (2012, p.7) “realized that it is important to teach the elderly that the screen can be switched by the tab even when it is hard to understand the concept of a window that is often used on the whole screen”. Despite these reported difficulties, the elderly show a clear preference for the usability of tablets, revealing a high acceptance, usability, and satisfaction rate (Werner, Werner, & Oberzaucher, 2012), and showing a clear preference for tablets over traditional PC and laptops, and especially because of their audiovisual features (Vingerhoets, 2011). According to Werner and Werner (2012, p.1191) “the most essential advantage of tablets over common PCs for the elderly seems to be the non-technical look and feel accompanied by the simple touch based navigation of the devices, which lowers the barrier to adopting new technology”.

3.1. Tablet computing for creative collaboration among the elderly: the COCREAT case study

Based on the potential of tablet computers to support cognitive enhancement and social interaction among the elderly, the COCREAT project developed a case study aiming to analyse the use of tablet computers by the elderly living in a rural Finnish village (Romero, Hyvönen, & Barberà, 2012). The case study developed present and future-oriented activities within a network of elderly participants. Project members gave the 9 participants (7 women and 2 men, 70-84 years old) an introductory session on how to use the tablets to collect, share, and retrieve information. The participants worked together on the use of tablet computers to ‘collect’ memories through photos and videos. The case study generated a high rate of acceptance of tablets (iPad) amongst the elderly. In particular, the ergonomics of the tablets were evaluated as easy-to-use and well-adapted to the sensory capacities of this group of older users. In addition to these design issues, the case study indicates that tablet computer usage among the elderly could benefit from face-to-face interactions, in order to ensure the elderly develop a certain level of confidence before using the device autonomously. The tablets were successfully used by the elderly to retrieve or stimulate memories, to collect information in the present, and to permit the use of this information in the future.

4. Discussion

There is a new field of opportunities in the use of ICTs to support active ageing, not only for living assistance services (Alvseike, & Brønnick, 2012; Papadopoulos, Crump, & Wilson, 2010), but also for the cognitive and

social well-being of the elderly, by promoting the communication and social features of tablet computing (Romero, Hyvönen, & Barberà, 2012; Silveira et al., 2012; Torres-Padrosa, Calle, Marzo, & Rovira, 2011). At the same time, ICTs should be adapted to the requirements of the elderly in terms of usability and ease-of-use of hardware and software. Tablet technologies have been analysed in this paper as a promising support for the elderly because they overcome keyboard and mouse devices, and enable the elderly to easily manipulate a mobile lightweight device, which is specially adapted for the information search and audiovisual features involved in communication (Vingerhoets, 2011). To ensure the adoption of tablet computing and the development of successful socio-cognitive practices among the elderly, the COCREAT case study enabled the observation of the importance of introducing the use of tablets through face-to-face sessions, enabling the elderly to have on-demand guidance in their discovery of the technology, and enabling them to develop a certain level of self-confidence prior to using the tablets in their homes. Other observations have also lead to highlight the need for some training to teach certain features of the tablets, such the use of tab switching (Miyosawa, Hirose, Okuhara, & Sato, 2012). The need for face-to-face sessions for introducing these features leads us to believe that important efforts should be made to fully adapt tablets to the requirements of the elderly, but the promising results of the reviewed studies and the COCREAT case study enables us to be confident that tablets will evolve to meet the requirements of the elderly. In this way, all ages will benefit from the inclusive design approach used in tablet computing.

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