DIGITAL ASSISTIVE TECHNOLOGIES FOR AGEING PEOPLE – LEARNING BARRIERS AND EDUCATIONAL APPROACHES

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Abstract

This paper represents a "work in progress" report of empirical study on the attitudes of ageing people towards digital assistive technology solutions as potential tools to improve their health and wellbeing with the emphasis on potential learning barriers. The study was carried out among older adults aged 60 and over in the areas of South Finland using qualitative research methods, which include 51 semi-structured interviews conducted individually and in focus groups.

The results indicate that the most significant learning barriers among ageing people in Finland are related to the decline in physical and cognitive functions as well as lower digital literacy level compared to younger ones. Moreover, a major learning barrier relates also to the social environment of the seniors. The support to learning received from caregivers and family members as well as their justifications of the value of using the digital technology were acknowledged as an utmost importance. With a more older-user-friendly design and development of the technology these barriers could be partially overcome. This could also help to decrease the barrier of lower digital literacy. Based on the findings, we can argue that while older users have relationships with immediate relatives, caregivers, the authorities and technology providers, to a great extent it is how they work together and communicate the value of the digital technology use that affects attitudes of ageing people towards technology and its learning.

Keywords: Learning barriers, digital assistive technology, ageing people, educational approaches, learning

1 INTRODUCTION

Since the late 20th century, the process of population ageing is happening in most countries of the world. Together with increased life expectancy it brings challenges for governments regarding the provision of such living environment and elder care services that enable seniors to continue living at home longer with a good quality of life. Digital technologies, particularly health and wellbeing assistive devices and service solutions, are expected to permit ageing people to live independently in their homes longer (see e.g. [1]). These digital assistive technologies are claimed only not to bring new opportunities for improving the quality of social welfare and health care services, but also to create socially supportive and age-friendly living environments that enable people to enjoy longer, healthier and more independent lives from an early age up to seniority. However, in order to achieve these positive expectations, it is necessary that ageing people are able to use digital technology properly. If there are shortcomings in digital technology usage capabilities, there is a likelihood that these people will be unable to reach and to use several important social and healthcare services. Thus, it is increasingly important to support older adults' learning of digital technologies in order to maximize the potential that technology has to offer in elder care. However, ageing people have many special requirements for successful learning compared to the younger people. In particular, they are slower to learn new technologies, but will do so when they perceive technologies as valuable, for example in maintaining their quality of life [2]. It is natural, that normal *physiological changes* occur with aging, including e.g loss of vision and hearing, but

also different kinds of *cognitive changes.* These all have an effect on learning capabilities and furthermore, when *lower literacy level* is added to these, they together create major learning barriers for ageing people people [3]. For example, digital literacy is the ability to develop skills in the use of new technologies [4], and it covers most of cognitive skills that are needed while working in digital environments [5]. Moreover, it has become a "survival skill", which helps people to work intuitively in performing digital tasks [6]. Accordingly, it can be argued that digital literacy is strongly related to an individual's attitude towards technology. Low literacy not only indicates a lack of reading skills but it also limits a person's ability to understand verbal instructions [3]. These kinds of literacy skills are essential when learning new technologies. According to Munoz et al. [7] simple and meaningful interaction metaphors helps to increase the learnability and perceived usefulness of technology by the ageing people. Furthermore, user-friendly design [8] and situational and activity awareness mechanisms, such as visual notification badges and audio-enhanced user interfaces, could be used to persuade the ageing people to approach the new technology and eventually use it. In addition, support and simulation from family would facilitate older people to adopt technology [7] and perception of the value of having such kinds of tools installed in their homes [8] would enhance the adoption of new technology and learning process of the ageing people. Thus, also the *social conditions*, such as encouragement and justifications from the family or friends, can have an influence on the learning when it comes to the ageing people and technology.

In this empirical study, we aim to identify the potential learning barriers of ageing people to use digital technologies that support their everyday life in Finnish elder care context. Additionally, we intend to propose educational approaches to learning in order to overcome the identified barriers.

2 METHODOLOGY

Empirical study was carried out among ageing people in the areas of tree cities (Helsinki, Hämeenlinna and Tampere) in South Finland with qualitative research methods: semi-structured interviews, conducted individually and in focus groups. Individual interviewing is the most commonly used method of data collection [9], whereas interviewing in focus groups capitalizes on communication between all research participants and group interaction in order to generate data [10]. These methods were particularly useful for exploring ageing people's perceptions, feelings and beliefs regarding the usefulness of digital assistive technology and learning barriers to use it.

The semi-structured interviews focused on the attitudes of ageing people towards a broad range of digital assistive technology solutions. Emphasis was paid to the views about how they might use these solutions as potential tools to improve their health and wellbeing and what might impede or facilitate using them. The interview themes included background questions that reflected the functional capacity (physical, psychological, cognitive or social functions) factors and sociodemographic factors (age, gender, education and geographic location), and digital literacy of the interviewees. Other themes covered questions on their everyday needs and use of different kinds of digital assistive technologies and questions on the perceived benefits, challenges and risks as well as hopes for the future development.

Among 51 interview participants, 41 persons live in urban area and 10 of them live in rural area. The focus groups were built among older adults, who live independently in the same residence buildings designed for seniors aged 55 and over. A total of 41 older adults, including 26 women and 15 men, participated in seven focus groups, ranging in size from 4 to 8 participants in each group. Two focus groups were conducted both in Tampere and Helsinki, and three in Hämeenlinna between November 2018 and February 2019. Individual interviews with seniors living in rural area took place in Spring 2019. All interview participants were Finns older than 60 years of age, and the oldest was 96 years of age male person. Before interviewing, the purpose of the study, definitions and examples of new digital technology for assisted living were presented to all groups explaining. Taking into account the age of participants, interviews were planned to last a maximum of 90 minutes. Each group met once with the research team for a focus group interview, which lasted together with the briefing for approximately 120 minutes. Having received permission from the respondents, all interviews were digitally recorded. All recordings were transcribed verbatim into text in Finnish and then translated into English.

3 RESULTS

Physical and cognitive ability to use digital devices play an important role among ageing people people's learning. Among the 51 informants of the empirical study, there were represented around half and half

of ageing people reporting having no difficulties or restrictions concerning their physical, psychological, cognitive or social health and wellbeing, and on the contrary, people having physical difficulties like difficult to walk or see or having cognitive difficulties, e.g. in understanding or memorizing things and instructions. Finally 5 of them had also psychological difficulties concerning their mental health and 4 of them had social difficulties like to get friends or to interact with people. These disabilities can cause major learning barriers towards new technology, although at the same time these people would most likely also benefit a lot from the new kinds of innovative technologies.

3.1 Identified learning barriers

In next, we open up the identified learning barriers from the empirical data through quotes classified under the typical learning barriers proposed by previous research: physical conditions, cognitive conditions, low literacy and social conditions.

3.1.1 Physical condition related barriers

Among the studied ageing people, there were found different kinds of physical restrictions, like challenges in visual and audial senses and motoric challenges. However, of these the motoric challenges seemed to play the biggest role in learning new technology:

> M: ..but yes, for the old man who is on the way, there is a rocky way to bring a computer thing. I didn't need a computer in my workplace and three or four years ago I got a computer from my grandchildren and it was just, I was starting from scratch with it.. it has been hard with these fingers.

> F: Yes, and then how fast it works. That's why there was a reason for leaving from that ATM. It was much faster. Here you should automatically tap their numbers and not think about what it is next, what the next number was. Too fast for me..

3.1.2 Cognitive barriers

Cognitive difficulties, e.g. in understanding or memorizing things, can cause a tension between hopes and fears, i.e. preferences for easy to use applications and devices can meet the competence gaps based on fears and pitfalls of the users. However, in the empirical data there were only few mentions about these kinds of cognitive difficulties as a learning barrier. This could be, however, explained partly by the bias in the sample of the interviewees; those ageing people that may have the biggest cognitive difficulties were not easy to access for an interview, either.

> F: It's in that smart phone, that it's for smart people. And when one day you learn it, it will be forgotten. Forget, yeah [laughing]. It must always be searched again. Every day [laughs].

3.1.3 Low literacy related barriers

Empirical findings strongly brought up also the decreasing literacy among the ageing people, as can be found out from the following quotes:

> F: There are people who are technical and others that are less technical and they are in somewhere else better. For example, I can tell from myself that I am not a technical person. And my husband was a technical person and looked technological things fast, it was clear to him, and when I was, he could hear a little bit of trouble. He knew I wasn't that fast. I said I needed a lot more time so I understand it. But I don't trust myself because it's not so clear to me. But then when you find out that you have done it more than once, it will stay there.

> M: Then there comes all the times different updates to the tablet due to different programs. And then you think about updating or not updating. If you are going to

upgrade then there always come additional questions. And then there are the problems again.

F: First I didn't get it, but I wrote it there to whom I was bought it. So, in those instructions, what is this b-mark, what kind of disc will come out, music will come out? ... Bluetooth, yes, so it keeps doing so. But how to connect to it? And then, there was a bit of a little bit of a lead in it, and then at the other end there was something strange. And then I asked what should I do. There was no instruction given when I bought it. But then when I asked it later they advised me.

3.1.4 Social conditions related barriers

Few of the interviewed ageing people were identified to have some social difficulties like to get friends or to interact with people. These disabilities naturally can act as a learning barrier, as it makes harder to get help and encouragement in using the digital technology. However, lack of encouragement and support was also mentioned by such ageing people, that had close family relations.

M: It's a difficult question, of course, if you are talking about a device now, if it has a long career behind, then you can trust on that, in practice, you actually put it as trustworthy. But for something new, it can be anything that it takes a little while before it comes to, trust, unless someone encourages you.

M: I do not want to learn digitech, because the teaching person and myself would get angry, when no success with my studies

F: We do not have special needs for digitech, but a lot of hesitation: Can we learn to use them?

4   CONCLUSIONS

The empirical results indicate that the biggest learning barriers among the ageing people in the Finnish context are related to physical shortcomings and lower literacy level compared to younger ones. Moreover, a substantial learning barrier relates also to the social environment of the ageing people, especially to the support of the family and their justifications of the value of using the digital technology. Physical barriers usually can't be taken away, but with a more sophisticated user centric planning and development of the technology these barriers could be overcome at least partly. User centric design could also help to decrease the barrier of lower literacy. For communicating the value of the digital technology use, the family of the ageing people, as well as their other caregivers, could be coached by the society. These empirical findings and literature based propositions to overcome the barriers are summarized in following Table 1.

In the course of this study, it has become evident that much remains to be understood about the potential learning barriers to use solutions of digital assistive technology by older adults and the ways how to support their learning. However, in keeping with our findings, we would claim that observing and accurately evaluating older adults' learning barriers as well as needs and abilities to use the technology must be a dynamic, ongoing process. We would also suggest that a number of proposed educational approaches could help ageing people to learn and to use the technology as well as to scope with learning barriers.

First considering physical functions, we need to support older adults through the learning process, because it could be extremely stressful and frustrating for them particularly due to age-related declines in physical functions. Older-user-friendly design and development of the technology would also enhance learning and ease of use.

Secondly regarding digital literacy, with those older adults possessing lower level of digital literacy learning needs have to be taken to a deeper level focusing on why they failed not on what went wrong, or whether mistakes were made. This requires a comprehensive understanding of factors underlying

the older adult's needs, abilities and interests. Instructions for use of devises can be helpful if they are short and simple, focused and easy to follow.

Thirdly with respect to social environment, for learning to be effective, all stakeholders of the "support system" such as immediate relatives, caregivers, the authorities and technology providers need to be more integrally involved in order to encourage, support and acknowledge the value of digital technologies through the learning process.

Table 1. Identified learning barriers and proposed educational approaches to learning

	Physical functions	Digital literacy level	Social environment
Identified barrier	Age-related vision declines Age-related declines in muscle strength and motoric functions	Lower level or shortcomings in digital literacy Instructions are hard to understand or they are felt missing important and easy to apply points	Lack of encouragement and support from the immediate relatives, caregivers, the authorities and technology providers Value of the digital assistive technology not acknowledged Growing lack of social interaction and contact
Educational approaches to learning	Support through the learning process Older-user-friendly design and development of the technology	Learning needs to be taken to a deeper level	More integral involvement of stakeholders of "support system" in learning process Introducing benefits of technology

Additionally, a straightforward message received from the participants of this study was regarding their training needs and technical support that should be equally available for everyone in case of some problems while using technological devices. In this regards, the support from caregivers and family members was acknowledged as an utmost importance as well. This makes researchers to conclude that cooperation among all stakeholders underlying the elder care system is confirmed to be critical for ageing people's positive attitudes towards technology. However, this not only requires an effective technical training of caregivers, but also a deeper integration of digital technology solutions into the system of social welfare and health care services.

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REFERENCES

[1]   Niehaves, B., and Plattfaut, R. "Internet adoption by the ageing people: employing IS technology acceptance theories for understanding the age-related digital divide". *European Journal of Information Systems*, Vol. 23 No. 6, pp. 708-726, 2014.

[2]   Heinz M., Martin P., Margrett J. A., Yearns M., Franke W., Yang H.-I., Wong, J., and Chang, C.K. "Perceptions of technology among older adults". *Journal of Gerontological Nursing,* Vol. 39 No. 1, pp. 42-51, 2013.

[3]   Hussey, L. C. "Overcoming the clinical barriers of low literacy and medication noncompliance among the ageing people." *Journal of gerontological nursing*, vol *17 no* 3, pp. 27-29, 1991.

[4]   Ng, W. "Can we teach digital natives digital literacy?" *Computers & Education*, Vol. 59, pp. 1065–1078, 2012.

[5]   Eshet-Alkalai, Y. "Digital literacy: A conceptual framework for survival skills in the digital era". *Journal of Educational Multimedia and Hypermedia*, Vol. 13 No. 1, pp. 93-106, 2004.

[6]   Eshet, Y. "Thinking in the digital era: A revised model for digital literacy". *The Journal of Issues in Informing Science and Information Technology*, Vol. 9, pp. 267-273, 2012.

[7]   Muñoz, Diego, Francisco J. Gutierrez, and Sergio F. Ochoa. "Introducing ambient assisted living technology at the home of the ageing people: challenges and lessons learned." *International Work-Conference on Ambient Assisted Living*. Springer, Cham, 2015.

[8]   Bai, Xue, Yiqin He, and Florian Kohlbacher. "Older people's adoption of e-learning services: a qualitative study of facilitators and barriers." *Gerontology & geriatrics education* (2018): 1-17.

[9]   King, N., and Horrocks, C. "Interviews in Qualitative Research". London, UK: Sage Publications, 2010.

[10]   Kitzinger, J. "Qualitative Research: Introducing Focus Groups." *BMJ Clinical Research*. 311, pp. 299-302, 1995.