Use of Information and Communication Technologies by Older People with Cognitive Impairments

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ABSTRACT: *Driven by both classical theories on implementation of technology and erotological theories on social and emotional aging, and seek to better understand challenges and gains in the use of ICT among older people with cognitive impairing. It obtained a comprehensive picture of the role of ICTs in their everyday lives through qualitative interviews (N 35) within this community, as well as significant network members. First, finding was that older people with cognitive impairments perceive ICTs as useful when they contribute in terms of relationships, hobbies or daily activities to satisfying social and emotional needs. Secondly, ICT use among our group is determined jointly by perceived utility (PU) and perceived user-friendliness (PEU), with PU motivating individuals to increase PEU. Third, in encouraging and discouraging the use of ICT, the social network plays an important role: providing assistance, taking the first step, restricting access or indirect use. The latter refers to shared use, where other people operate the devices. Fourthly, we point out the importance of voluntary use of ICT: some participants have been so restricted in their use of ICT by others that this has reduced their perception of control.*

KEYWORDS: *ICT adoption, Social and emotional ageing, Cognitive impairments, Informal care.*

INTRODUCTION

Information and communication technology (ICT) has arisen as a promising method of operation to benefit people of health care, particularly care with dementia. Information and communication technology consists of digital and analog technologies that enable the gathering, recording, storage, encoding, delivery, distribution, and display of information and/or communication, including hardware, applications , networks, and media. ICT interventions can enhance trust in decision making, reduce emotional distress, enhance spousal tension, minimize limitation of behavior, increase self-efficacy and reduce the stress on caregivers. Researchers have shown that technology-based interventions can improve outcomes among people with chronic illnesses. In a systematic review that assessed the effectiveness of mobile technology interventions, the evidence suggests benefits for specific conditions including viral load reduction among people living with HIV and increased perceived self-care agency in lung trans-plant patients[1].

It is not clear that results from the use of mobile technology measures in other areas, such as diabetes, nutrition, vaccination appointment compliance, cardiopulmonary resuscitation preparation, asthma management, physical exercise, and psychological assistance, are clinically significant owing to their limited impacts on such outcomes. A meta-analysis of the efficacy of web-based treatments as opposed to non-web-based clinical effects measures showed changes in effects for consumers of web-based chronic disorders treatments. Researchers have shown that technology-based interventions can improve outcomes among people with chronic illnesses. In a systematic review that assessed the effectiveness of mobile technology interventions, the evidence suggests benefits for specific conditions including viral load reduction among people living with HIV and increased perceived self-care agency in lung trans-plant patients[2].

Similarly, ICT approaches have been found to promote successful care management by leveraging mobile and email contact with carers with dementia, reducing the burden and distress of caregivers. To caregivers of individuals with advanced dementia, the Alzheimer's Caregiver Support Online service, a web- and telephone-based information and support network, has been created. Participants in the Alzheimer's Caregiver

Counseling Educational therapy, administered across six web-care courses, reported substantial pre-test changes in self-efficacy for rehabilitation, reacting to intrusive patient activities, and managing upsetting feelings about treatment and progress in the stress of emotional caregivers, but little to no change in meaningful expectation. Information and communication technologies has been used to offer tools for research, correspondence and decision taking, as well as to offer information related to the illness, private messaging, question-and - answer forums and social media. Information and communication technology has also been used to help caregivers manage their health-care encounters and perform healthy behaviors for themselves and a dementia family member[3].

Information and communications technology (ICT)[4] is an extended term for information technology (IT) that emphasizes the role of unified communications and the integration of telecommunications (telephone lines and wireless signals) and computers, as well as the necessary enterprise software, middleware, storage and audiovisual systems, enabling users to access, store, transmit and manipulate information. The term ICT is also used to refer to the convergence of audiovisual and telephone networks through a single cabling or link system with computer networks. There are considerable economic incentives to merge the telephone network with the computer network system using a single unified cabling, signal distribution, and management system. ICT is a paragliding concept that encompasses any networking tool, including radio , TV, mobile phones, computer and network equipment, satellite networks, etc., as well as numerous facilities and devices such as video conferencing and distance learning[5].

ICT is a broad subject matter, and the concepts evolve. It covers any product that will electronically store, retrieve, manipulate, transmit, or receive information in a digital form (e.g., personal computers, digital television, email, or robots). The philosopher Piyush Mathur has identified theoretical differences between interpersonal communication technologies and mass-communication technologies. The Knowledge Technology capabilities system is one of the frameworks for ICT practitioners to identify and handle competencies for the 21st century.

Therefore in this study it is aim to explore the use of ICTs from a social and emotional perspective by older adults with cognitive impairments, addressing the following research questions: 1) 'How do older people with cognitive impairments use ICTs in their daily lives? and 2) 'What insights from social and emotional ageing studies can attribute to a better understanding of what ICT uses for them?

DETERMINANTS OF ADOPTED TECHNOLOGY

Four main determinants are critical for the purpose to and practical use of ICTs according to the prevailing technology implementation models. The first is the Perceived Usefulness (PU), or Performance Expectation, defined as the perception of prospective users that their task performance will be increased by the use of a particular technology. In other words: the more future consumers believe their job will change with the use of a tool, the more likely they will use it. The second key determinant is the perceived ease of use (PEU)[6], or expected effort, defined as the degree of ease associated with the system being used. That is, the easier people expect to use an application, the more likely they'll be using it. The third deterrent is Social Impact (SI), defined as the degree to which individuals consider important others to assume that the technology should be used. The final key determinant includes Facilitating Conditions (FC), defined as the degree to which potential users believe that the use of technology is supported by organizational and technical infrastructures. While these initial models focused on ICT use in professional settings, by adapting the UTAUT2 to the consumer context, Venkatesh and colleagues (2012) developed the UTAUT2. They have added three new decisive.

First, there was added hedonic motivation, defined as the pleasure derived from using a technology, an addition to PU which initially focused on utilitarian use of ICTs. Secondly, price value was added to PEU, or expectation of effort, which was initially primarily defined in terms of time and effort. Whereas UTAUT considered the intention to use ICTs as a predictor for actual use, the UTAUT2 considered habit to be a direct

predictor of the use of technology, describing habit as the degree to which people continue to behave spontaneously by learning.

Several studies have applied described determinants of ICT acceptance ever since. The applicability of these principles to specific systems and contexts, which demonstrates how the TAM has developed over time. They also talk about unexplored TAM areas including the older population. Several experiments have extended the models to older people and have found that the TAM and UTAUT2 are both helpful in the study of older adults, with the PEU as the most significant determinant. However, to better grasp older people's embrace of technologies, researchers suggested in these experiments that additional factors, relating to biophysical and psychosocial features, skills and perceived difficulties, should be used. A number of studies have been conducted in recent years which adapted the current models to the older adult population. Work on assistive devices, originally designed by older persons, has demonstrated that when they effectively lead to their wellbeing, older people view ICTs as useful.

In these studies, PEU was often associated with age-related health and disability characteristics of older adults; for example, the STAM model identified cognitive and physical decline as barriers to ICT ease of use. Furthermore, research on the usage of more general software apps by older adults have shown that PEU is a more significant problem for older adults compared with younger demographics. Finally, a small number of studies investigated determinants of the use of ICTs for entertainment purposes, demonstrating that enjoyment can be a significant element of PU.

SOCIO-EMOTIONAL AGEING

In this paper three hypotheses from the area of social and emotional aging suggested by earlier literature could be helpful in refining ICT adoption determinants.

The Theory of Socio-Emotional Selectivity

The first seemingly useful theory is the socio-emotional theory of selectivity. This theory describes how as humans age and shorten their life expectancy, they are increasingly focusing on those social relationships and things in life that provide short-term social and emotional satisfaction. Interaction with close people, for example, such as relatives, is preferred over relationships with peripheral and new contacts. Literature on older people with cognitive impairments also shows the relevance of this theory to our particular target group, explaining the increasing importance for this group of friendships, contact with loved ones and feelings of belonging. Research also on the use of ICT provides useful insights and demonstrates that social bonding is an important motivation for older people to use the Internet. These insights suggest that older adults prefer to maintain existing relationships rather than look for new online contacts. Though these findings have not been formulated in terms of socio-emotional selectivity, the connections are clear, as motivations for using the Internet turn out to be consistent with this theory. So it was assume that this theory can also be useful in exploring the use of ICTs in a broader sense[7].

Selective optimization of offset

The second theory was expected to be useful in understanding the use of ICT for our target group was that of optimizing selection and compensating. This hypothesis explains the compensatory action process for aging men. Selection refers to the definition of the most relevant goals (e.g., hobbies or relationships) that can be achieved realistically in this phase of life. Optimization can be defined as finding ways to optimize one's abilities make those goals come true. Compensation includes the strategies used when the usual way of achieving the targets is not possible. Several studies describe how older adults with cognitive impairments also develop compensation strategies to lessen the effects of the decline they experience Examples include using a diary to compensate for memory loss or seeking help from significant others in performing daily activities. Literature on the use of ICTs shows how useful the Internet is to these strategies. Slegers, van

Boxtel, and Jolles found that older adults regard the Internet as a useful tool in dealing with everyday issues. Other work described how older disabled adults replace offline tasks that they find difficult with digital apps, such as shopping online instead of going to the store, which is a compensation strategy. In addition, previous studies have established approaches used by older adults in using ICTs which may view as techniques for redress. For example, Luijkx, Peek, and Wouters (2015) found older people experiencing difficulties learning how to use new ICTs were asking for help from family members. Based on these insights, it is believed that this theory may help us to better disregard our target population's use of ICTs[8].

Life-span management theory

A third theory, which is considered relevant in this context, is the control theory of life span. This theory describes the importance of the life-long perception of control. Primary control generally takes primacy over secondary control. Primary control refers to one's external environment-oriented behavior, which aims to change this according to one's own needs. Secondary control is internally directed, in order to find inner peace despite the circumstances. Although older people are no longer necessarily able to influence the external conditions, they should always try to retain primary power for as long as possible, as this positively impacts feelings of well-being. This phenomenon is often found in older persons with cognitive impairments. In particular, these individuals experience the loss of ability to perform daily activities, and are constantly confronted with what they can no longer do. According to earlier studies, maximizing a sense of control is a crucial attribute to these individuals as they are more dependent on treatment. To avoid losses of self-esteem or feelings of control, they adhere to daily routines and remain engaged in the activities to which they have been used. [9].

Several scholars indicated that using online services gives older adults the feeling that they are still capable of managing their own affairs, or, in other words, primary control sentiments. Based on these findings and assumed that the life-span control theory may help us understand better the use of ICTs among our target group. This paper examine how older adults give substance to the traditional determinants of ICT adoption from a socioemotional point of view. This paper discussed how and how social and emotional ageing theory lets us to understand whether older people interpret ICTs as helpful or easy to use, and what function the social network can play to promote situations[10].

MATERIAL AND METHOD

Approach

This paper explored the use of ICTs through qualitative semi-structured interviews by older individuals with cognitive impairments. Using open, qualitative methods allows for a rich exploration of the experiences, considerations, interview participants interpretation, and helps to gain a thorough understanding of this relatively under-studied group's use of ICTs. The data-collection's interactive character enhances internal validity, as it enabled the researcher to test, and request clarification and additional information. Conducting face-to - face interviews helped the researcher advance understanding of the situation, which has been beneficial for data interpretation and reliability. To gain understanding of the use of ICT in older people with cognitive impairments, and interviewed these individuals (primary participants) as well as important individuals from their core network (secondary participants). As literature shows that the perception of people with cognitive impairments can differ from those around them, this multi-perspective gathering of data, a form of triangulation, has helped us gather more complete information.

Personnel recruitment and selection

Participants were recruited in the Netherlands in close cooperation with an umbrella of care farms. For recreational events, older adults with cognitive disability visit these farms once or many days a week but do not stay there. Recruitment participants from different farms was done to prevent biases and maximize the intrinsic validity of our study. First, an invitation letter was sent to care farms staff, focusing on our specific

target group (N 34), by email. Study was explained and asked them to contact us with potential participants (65), regular care farm visitors, diagnosed or suspended cognitive impairments, able and willing to have an interview, as well as someone from their informal network, any opinion on ICTs. Three care farmers, who connected us with four informal caregivers, gave us positive responses. MB called on these individuals to make further appointments and called non-responding care farmers to follow up on the email. Such phone calls resulted in three new informal care-givers getting in touch. Reasons for the care farms not to participate included a lack of time during that particular period (summer) or a lack of appropriate clients. In the interviews participants were asked to participate in and supplement our sample with other relatives.

Sample

The survey included 35 respondents, including elderly people with cognitive disability (N 1⁄4 11), their families (N 1⁄4 19) and farm caregivers (N 1⁄4 5) see Table 1.

Primary respondents

The primary participants were six males and five females, aged between 60 and 90 (average 75). Six had a girlfriend, four had lost their wife, and one never had a girlfriend. Five of the patients had vascular dementia; four had Alzheimer's disease; one had Lewy Body Dementia and one had moderate cognitive dysfunction. Most were diagnosed, some were still undergoing this process with strong assumptions of impairments of this type. Two participants were staying in an older home, the rest were living separately.

Secondary Surveyors

An informal caregiver either a parent, adult child or relative - often served with all primary participants. Additionally recruitment of eight younger generation relatives as literature showed that they play a substantial role in older people's acceptance and use of ICTs. Five were (adult) grandchildren; adult children were involved when these were too young. The interviewed caregivers, as the main participants spent a lot of time on the farm.

Table 1: Presents the sample of participants.

Type of participant			Sex	N
Older people with cognitive impairments (N 1⁄4 11)			Females	6
			Male	7
Informal caregivers (N 1⁄4 11)	Spouse		Female	3
			Male	4
	Child		Females	4
			Male	1
	Sibling		Females	2
	Child		Females	3
			Male	1
	Grandchild		Females	4
			Male	2
Professional caregivers (N 1⁄4 5)			Females	5
Total number of participants				42

DATA COLLECTION

Topics

The subject list that is used for the semi-structured interviews was influenced in part by the hypotheses mentioned above. We asked a number of background questions before starting the actual interview, including age, marital status, family situation and living conditions. To under-stand the broader context of the use of ICT and the participants' broader motivations, the questions in the interviews extended beyond their use of ICT. In the interview first it was asked, as a component of the socioemotional selectivity hypothesis, about the most important issues and individuals in the lives of the primary participants. Next it is discussed if the primary participants were interested to explore processes of selection, optimization, and reward in these essential items and individuals. In addition, many questions were asked about current and past tasks and responsibilities, such as hobbies or a volunteer or professional job, to explore the perception of control as an aspect of the lifespan control theory. The use of ICTs was introduced into these discussions: why participants viewed certain ICTs as beneficial, how they enhanced the ease of use of some ICTs, what a significant role others played in their use, and how certain factors encouraged the use of ICTs in their usage everyday life.

Forms of information and communication systems used for acquiring or exchanging knowledge or for communicating with others, either face-to - face or remotely. As it is aimed to investigate the use of ICTs among our population from different perspectives, and also discussed these topics with secondary participants (in relation to the primary participant). Furthermore, it was asked all secondary participants about their relationship with the primary participant and asked about the role of ICT in their care environment. In three pilot interviews at a day care center for people with dementia the topic list and the phrasing of the questions were tested and refined.

Carrying out interviews

Interviews were carried out in summer 2017. All interviews were conducted by MB to ensure a similar approach for each participant, and to increase our study's internal validity. It is aimed to conduct one-on-one interviews so that participants would not interrupt each other, feel reluctant to share information or shape their responses in relation to the third person. Most interviews (25/35) were held at the care farms, as this was an easy and comfortable meeting place for most participants. Nine interviews were conducted at the participants' houses, of which eight were with secondary sources. One interview was conducted over the phone with a professional. The interviews lasted about 45 minutes and were recorded with audio, after permission of the participants. Participants were given a gift card and a small present afterwards. Verbatim transcriptions of the interviews.

Ethical considerations

Before collecting the details, we spoke with the Faculty Ethical Committee about the need for ethical approval. The committee declared that there was no need for formal review so long as it included adult participants who were able to make their own decisions. After providing information about the study all participants were asked to sign an informed consent form. Further interview processed the interviews anonymously and stored these separately from the personal details and the informed consent forms signed.

Analysis of Data

In an iterative process, data were analyzed in order to optimize the study's internal validity. After the interviews were transcribed and coded the data in several rounds using Atlasti. First, it was focused on whether and how erotological themes addressed in the interviews might help us understand when and how ICTs were perceived by our participants as useful. Themes derived from this round included the contribution of ICTs to feelings of belonging; the contribution of ICTs to interactions with the most important persons in life; the use of ICTs in hobbies and passions, and the use of ICTs in daily activities. Next in the research team it was discussed which theories from social and emotional ageing studies were useful in explaining these findings.

While the topics addressed in the interviews were originally derived from specific theories of social and emotional ageing, bottom-up analysis of the data also revealed various additional mechanisms.

The second round of coding focused on the ease of use of ICT: when did our participants perceive ICTs as user-friendly and what strategies did they use to increase this? The developed themes included promoting the social climate and other projects through the use of ICT. Based on the results it was explored potential hypotheses from social and emotional aging that 4 with these approaches within the team.

Finally, as part of the other determinants, we looked at the role of the social environment in using ICTs other than those already discussed. It was discovered that this determinant was closely related to the facilitating conditions. This third round led to the discovery of two factors which had a direct effect on the use of ICTs by older adults by others: the active use of ICTs and those which limited the use of ICTs. Further themes is visualized and processes identified for each ICT determinant to show how these were related to the theories of social and emotional ageing.

RESULTS

In this section results are presented by interpreting from the viewpoints of our participants the classic determinants of technology adoption. Next, the types of ICTs used by our participants, and for what purposes is described. Next, elaboration on our findings regarding the technology adoption model and from a social and emotional ageing perspective and reflect on its different factors.
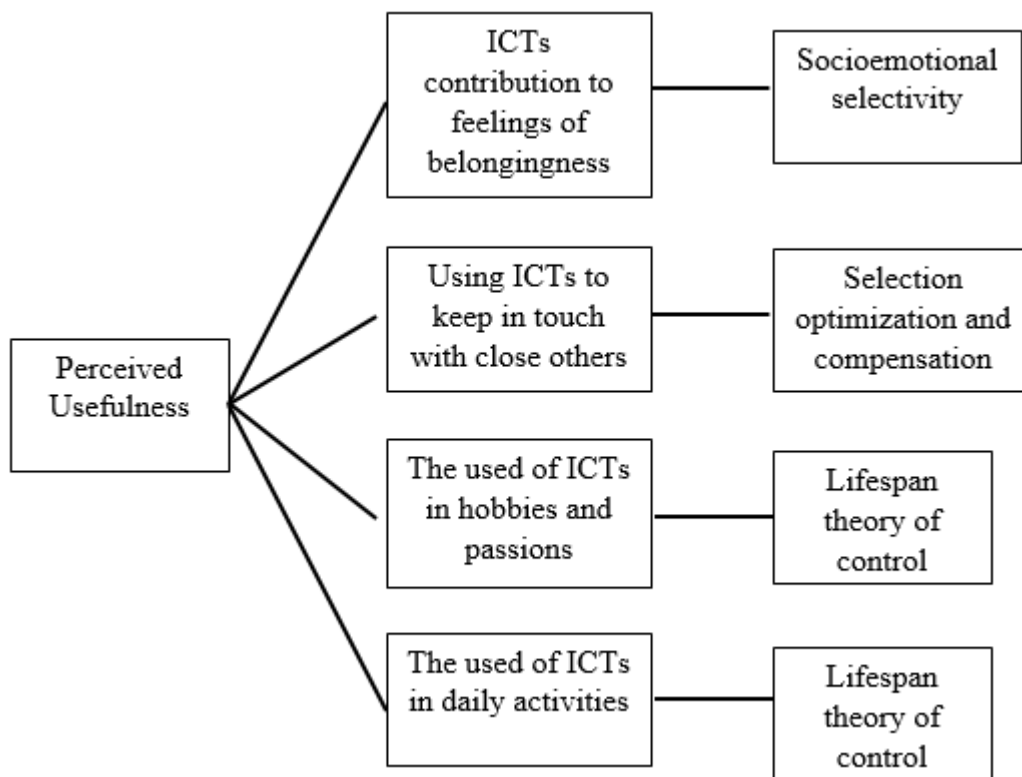
Figure 1: From themes to theory -Perceived Usefulness.

Use of ICT amongst participants

While (current) experience with using technology was not a strict criterion for recruitment, nearly all primary participants indicated that they used ICTs in their daily lives. The telephone (mobile, smartphone, or landline), (smart) TV, and tablet were the most popular devices. They also mentioned desktops and laptops. Virtually

all participants used instant messaging and e-mail (e.g. WhatsApp, SMS). A smaller number of participants cited applications such as Skype, Pinterest, Wordfeud and online banking. Many participants mentioned seeing pictures of loved ones as an important purpose for using various apps and devices and some also used their phones to take pictures themselves. For very specific poses, some participants used ICTs, such as watching baseball matches or writing music scores for a chorus. A small number of participants have mentioned that, for example, they used digital devices to play games to train the brain. Participants shared their reasons for using ICTs mainly in terms of usefulness, explaining how technology improved their lives. Similarly, the only participant who did not use ICTs said that he saw no additional value when using new applications. There was very little talk of a shortage of expertise and competence as concern.

Perceived usefulness

Participants perceived ICTs as useful in improving feelings of belonging, supporting interaction with others close to each other or allowing them to remain engaged in hobbies, passions or daily activities. Figure 1 Provides a description of which social and emotional aging hypotheses help to explain the results.

Feelings of belongingness

First-place primary participants perceived ICTs as useful when these contributed to feelings of connection in their lives with most important people. Many attendees enjoyed watching photos or videos of loved ones. The perception that ICTs can help get or stay connected to (grand)children, siblings and others with whom they have close relationships, even without interactive conversation, has been viewed as a major driver for using ICTs.

Let's illustrate this with stories coming from some participants:

A woman with Alzheimer's used a tablet with family pictures her daughter had prepared during the interview. She said when she was told her about the tool she didn't even know what it was. However she named the tablet a 'golden gem' after the pictures emerged. Although the interview with her and the conversations with her social network showed that although her social and digital skills were limited, the tablet helped her feel engaged with those close to her emotionally. Additionally, her granddaughter said this device helped her feel useful; great-grandchildren's pictures increased her feelings of being important as a caregiving grandma. Another primary participant's spouse told us about the pleasure experienced by her husband while spending time with their grandkids. Communication was often difficult for him, but he was given a lot of emotional satisfaction by watching these young people. He also enjoyed watching their children's digital holiday photos he received from WhatsApp.

In this case the emotional pleasure of seeing photos of loved ones is consistent with earlier research. Many study has indicated seniors are more likely to track others than to change their own electronic networking profile. Most of the previous research, however, was quantitative and restricted to social network sites, and did not elaborate on other types of ICTs, nor on our specific target group experiences. Our findings add an additional, qualitative perspective by providing motivations and feelings among our population related to this type of use of ICT. The perceived benefit of using ICTs to feel linked to a declining number of significant near people is clearly in line with the processes outlined in the socio-emotional principle of selectivity, which stresses the importance of retaining near relationships for people as they age. To this end, ICTs were seen as useful instruments.

ICT in daily activity

In addition to the use of technology in hobbies, participants perceived ICTs as useful tools in more general day-to-day work. Examples included the use of digital tools as part of regular activities, such as online banking, newspaper reading, or online shopping, as well as strategies that used ICTs to offset cognitive or physical declines. One fascinating case involved an elderly man using his laptop to search his online bank account. He found financial management an important part of his life and was pleased that he could use his

computer for this. Although this was often not specifically mentioned by primary participants themselves, conversations with secondary informants showed us the importance of using ICTs to maintain control feelings:

Wife: 'Nothing compares to rent. He prefers nothing to spend on. Everything is expensive, taking an extra time to the farm, having grandchildren over for a meal. He checks the balance of his bank account with the laptop, this is the bottom line.' Another way that primary participants perceived technologies as useful tools in daily life was when they were able to facilitate activities that had become difficult due to cognitive decline. A woman explained how her smartphone helped her find the right products in the supermarket if these looked different suddenly than before. Her daughter sent her photos of what the products looked like at the moment so she knew what to look for when shopping for groceries.

Lady: '(..) or send me a photo with my daughter. Like: 'At the moment, this is what the coffee looks like.' Then I might only take a look. Not that I do the telephone grocery stores, but I look at it at home and think: 'with...' The potential of ICTs to support older people in difficult everyday activities has already been described earlier. However, most of the previous studies focused on technologies that were developed specifically to support these activities, as was the case with the participant who used his laptop to check his bank account. Our data provided another insight and showed how the older people, either individually or through their network, managed to use general technology creatively, particularly for their daily activities. This way of using ICTs increased the feeling of being in control, rather than feeling dependent on help from others.

Perceived ease of use

While the topic list already provided some starting points for investigating the PU, a rather explorative exercise was to investigate the PEU. First it was interesting that the social network played a significant part in nearly all of the approaches. Time- or cost-investment considerations were rarely mentioned. Earlier literature on this topic indicated that the social network was already an important resource for increasing the PEU. However, our results provide a new viewpoint, identifying various positions that the social network can play, and describing them in terms of the theory of social and emotional ageing.

CONCLUSION

This research tried to understand better the use of ICT by older people with cognitive disability. Inspired by both classical technological adoption theories and erotological theories on social and emotional ageing, our interviews provided us with a detailed picture of the role of ICTs in our target group's everyday lives. This knowledge helps us to understand better how classical ICT usage determinants work in this group. Additionally, it is found that some aspects of ICT use that have not been reported extensively in previous research.

First, our interviews showed that PU should be viewed in the background of this group's unique needs. Older people with cognitive disorder impairments view ICTs mainly as helpful as they contribute to social and relational mechanisms, such as helping them communicate with others directly, retaining assumed power of their lives and enabling them to accomplish everyday activities. This is in line with the theories on social and emotional ageing that was employed, as these describe the relevance of feelings of belonging, primary control, and compensatory strategies to maintain acceptable levels of social and emotional contentment. Our analysis showed this, as well as how ICTs play a role in these processes. Second, it was found how older people with cognitive impairments use ICTs are jointly determined by PEU and PU, with PU as their most important condition. That was different from what was previously recorded. Initial studies on ICT adoption saw PEU as a significant condition for PU. However, when it comes to older people with cognitive impairments our data show a different pattern. When our primary participants perceived a technology as useful, they often decided to put a great deal of effort into mastering its use, even though at first this did not seem easy.

These findings show a different picture of older people with cognitive impairments from this group's stereotypical image, in which they are seen as hesitant, passive and declining. In line with the theories of social and emotional ageing that is discussed in the theory section of this paper, many of our participants have actively developed strategies to remain engaged in activities that are meaningful to them, even if that is challenging.

Fourth, the implementation of ICT models also interprets the social impact network as regards social norms: by changing the attitudes of a person on what effective and valuable technology means. Previous surveys on older people's use of technology have provided another significant function for the social network, namely that of supplying support as older people experience difficulties using ICTs. This was also recorded by the participants in our research. Furthermore, our interviews revealed a third aspect of the social network that is important in terms of the use of ICT in older people with cognitive impairment. Further it is labeled that this indirect use of ICTs, which is a situation in which significant others are actually using the technology and essentially passively incorporating the older individual with a cognitive impairment into the experience.

This way of using ICTs emerged as a very important way to engage older people with cognitive impairments in social processes from which they would otherwise be excluded and thus a significant way to increase their primary control feelings. Examples include looking at digital grandchildren's holiday pictures together or involving the older person in phone calls by placing them on speaker.

Fourthly, also linked to this sense of our participants' influence, our research showed the value of using or not using ICTs for our target community of voluntariness. Often near others prevented our primary participants to independently use ICTs, mostly due to a lack of faith in their skills and fear of negative repercussions. In view of the approaches discussed in the front end of this article, these constraints are troublesome as they significantly decrease the sense of participation and power, whereas sense of primary control is considered to play an significant role in preserving happiness and well-being. In the literature on ICT adoption the concept of voluntariness is well described. It is not discuss in advance as traditional models of ICT acceptance define this term specifically for the technical context. For example, studies have shown that the adoption of a new technology operates more smoothly in a work context if employees use this technology voluntarily instead of being forced to do so. The concept of voluntariness has a different meaning among our participants, namely the willingness to use an ICT, or not rather than being restricted.

Although several measures is to be taken to optimize the validity and reliability of our study, some limitations need to be mentioned, most of them related to the collection of data. Firstly, all of our respondents were care farms tourists, which may at least suggest a constructive outlook towards home-based events. While this does not automatically mean they have particular expectations for using ICTs, this category could be more than open to new practices on average. In addition, the participating farms were all in rural areas, and the majority of participants were also raised in those areas. Another view may be the elderly residents may have worked in urban environments.

Another restriction may be the role of care farm representatives in recruiting participants. While this approach seemed necessary to win trust from our target group, it is possible that these contact persons have selectively recruited participants, e.g. in terms of ICT affinity or suitability to participate in an interview. One final restriction may be that it didn't take different stages of cognitive decline into account. While earlier literature identified how the use of ICT by older adults with cognitive impairments declines over time, in our research it is not discuss.

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