An alternative view of ICTs use by older people in Human-Computer Interaction

Similarities, digital content creation and perceived well-being

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Aos meus pais.

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Abstract

Within Human-Computer Interaction, older people (60+) are often characterized as a heterogeneous group of consumers of digital content that use ICTs in a limited way due to age-related changes in functional abilities. By drawing on an ethnographical study of ICTs use by approximately 220 older people over a 5-year period in Spain and on two rapid ethnographical studies, in Denmark and Brazil, with around 180, this dissertation presents an alternative view of ICTs use by older people. The results portray older people as creative digital content creators, provide qualitative evidence of how the process of using ICTs have a positive impact on their perceived well-being and argue that their ICTs use is not so heterogeneous as one might think. This dissertation also suggests that fostering the digital inclusion of older people in developing countries such as Brazil rests upon going beyond providing them with physical / technological infrastructures.

Resumen

En Interacción Persona-Ordenador, las personas mayores (60+) se suelen caracterizar como un grupo heterogéneo de consumidores de contenidos digitales. Basándose en un estudio etnográfico del uso de las TIC por parte de aproximadamente 220 personas mayores en España durante 5 años, y en otros dos estudios etnográficos, de más corta duración, en Dinamarca y Brasil, con 180, esta tesis presenta una visión alternativa del uso que hacen de las TIC los mayores. Los resultados los presentan como creadores de contenidos digitales creativos, aportan evidencias cualitativas del impacto positivo que tiene utilizar estas tecnologías en su percepción de bienestar y plantea que el uso que éstos hacen de las TIC no es tan heterogéneo como se piensa. Esta tesis también sugiere que incrementar la inclusión digital de los mayores en los países en vía de desarrollo como Brasil se debería basar en ir más allá de proporcionar infraestructuras físicas / tecnológicas.

Resum

Les persones grans (60+) es solen caracteritzar com a un grup heterogeni de consumidors de continguts digitals que utilitzen les TIC de forma limitada. Aquesta tesi presenta una visió alternativa de l'ús que fan les persones grans de les TIC. La tesi és basa en tres estudis etnogràfics; un realitzat a Espanya amb 220 persones grans durant cinc anys, i els altres dos, de més curta duració, a Dinamarca i Brasil, amb 180. Els resultats presenten a les persones grans com a creadors de continguts digitals creatius, donen evidències qualitatives de cóm utilitzar les TIC impacta positivament en la seua percepció de benestar, i mostra que l'ús que fan d'aquestes tecnologies no és tan heterogeni com es podria pensar. Aquesta tesi també planteja que incrementar la inclusió digital de les persones grans en països en via de desenvolupament (p. ex. Brasil) hauria d'anar més enllà de proporcionar infraestructures físiques / tecnològiques.

Resumo

Em Interação Humano-Computador, os idosos (60+) são muitas vezes caracterizados como um grupo heterogêneo de consumidores de conteúdos digitais que utilizam as TIC de forma limitada. Baseando-se em um estudo etnográfico do uso das TIC por cerca de 220 idosos, ao longo de um período de 5 anos na Espanha, e em dois estudos etnográficos rápidos, na Dinamarca e no Brasil, com aproximadamente 180, esta dissertação apresenta uma visão alternativa da utilização das TIC pelas pessoas mais velhas. Os resultados retratam pessoas idosas, como criadores de conteúdos digitais criativos, fornecem evidência qualitativa de como o processo de usar as TIC têm um impacto positivo na sua percepção de bem-estar e argumentam que o uso das TIC pelos idosos não é tão heterogêneo como se poderia pensar. Esta dissertação também sugere que para promover a inclusão digital das pessoas idosas nos países em desenvolvimento, como o Brasil, deveria se ir além de apenas proporcionar-lhes infra-estruturas físicas / tecnológicos.

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1. INTRODUCTION

An ever-growing ageing population and the ubiquity of Information and Communication Technologies (ICTs) in our everyday lives have motivated Human-Computer Interaction (HCI) scholars[1] to explore the relationship between older people (60+) and ICTs. Qualitative and quantitative studies of their attitudes towards, and use of, several ICTs, ranging from mobile phones ((Fernández-Ardèvol & Prieto, 2012), (Leme, Zaina, & Casadei, 2014)) and Online Social Networks (OSN) (Gibson et al., 2010) to digital games ((Iversen, 2014), (Brown, 2012)) and video-sharing sites ((Harley & Fitzpatrick, 2008), (Sayago, Forbes, & Blat, 2012)) have been carried out. Assistive technologies, apps, OSNs and other computer-based tools, such as e-mail systems, have been specifically designed to help older people to conduct (instrumental) activities of daily living, ranging from keeping in touch with their relatives (Rodríguez, Gonzalez, Favela, & Santana, 2009) to being able to remember when they have to take their medication (Lee & Dey, 2011), (McGee-Lennon, Wolters, & Brewster, 2011). Within this body of knowledge, older people have almost unambiguously been characterized as:

(i)   a very heterogeneous segment of the population, because "with increasing age there is an increase in inter-individual differences in rate, onset and direction of change in most functions and processes. This means that older people vary considerably in their abilities, skills and experiences" (Czaja & Lee, 2007, p.344),

(ii)   a user group "with a set of specific characteristics: they have a range of health concerns, they experience physical and cognitive decline, they are slow at performing with technology, and experience social isolation and a loss of independence" (Vines, Pritchard, Wright, Olivier, & Brittain, 2015),

(iii)   consumers, rather than producers, of digital content, e.g. "(even) social technologies designed specifically for older adults often prioritize functions that allow users to easily access content produced by others, rather than to

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[1] Amongst others, such as Sociologists, Psychologists and Gerontologists

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create and share their own digital media" (Waycott et al., 2013, p. 39).

Within this characterization of older people, "technologies that can help compensate for people's frailties and the assumed needs that arise when getting older" (Rogers et al., 2014, p. 3913) is the most predominant design approach.

This dissertation does not claim that this portrayal of older people within HCI is inconsistent, although I consider that there might be reasons for thinking just the opposite: how can a heterogeneous user group be uniformly regarded as consumers of digital content with a set of specific characteristics? Ageing is a cultural, multifaceted process of gains and losses (Gilleard & Higgs, 2000). Thus, it should come as no surprise to see older people running marathons or leading an active and social lifestyle while others are homebound, living in nursing homes and socially isolated. Yet, this heterogeneity does not prevent older people from exhibiting fairly similar interaction practices when they use ICTs to, for instance, look for information online or keep in touch with their friends and children. Age-related changes in functional abilities (especially in cognition, vision and mobility) hinder considerably older people's interactions with technologies. Have you ever heard of older people complaining about the small size of mobile phones, or struggling to use the mouse? Moreover, if they find it difficult to access digital resources, how (and why) would they want to engage in digital content creation activities? In light of the interaction issues they are faced with, which sometimes become impossible barriers to cross, it is reasonable to assume that their ICTs use is more limited and/or poorer than that of other user groups (think, for example, how teenagers use smartphones). Accommodating for declines in functional capabilities in user interface design is therefore of paramount importance to make ICTs more accessible to older people and enable them to make the most of these technologies.

This dissertation argues that characterizing older people as a heterogeneous group of consumers of digital content with a set of weaknesses/limitations is not enough to understand their relationship with ICTs, since people with a profile similar to Maria's, a 73 year-old Spanish woman, have not received enough research attention. This dissertation also claims that compensating

for age-related changes in functional abilities is not sufficient to design ICTs that people like Maria would want to incorporate in their everyday lives. Who is Maria? She lives with her husband in a flat in Barcelona, visits her grandchildren during the weekends and keeps in touch with her children, who lead a hectic lifestyle and are living in towns nearby, via e-mail, *Facebook* and *WhatsApp*. Maria started to learn computers and the Internet around 8 years ago. Currently, she has experienced changes in her vision, sometimes forgets things, such as the name of a person she has recently met or where she has left her keys at home. Maria also acknowledges that learning a new computer program is becoming a more and more challenging task. Maria makes her own digital videos of her trips - not without difficulties, though. She still does not remember all the steps to take in order to transfer video files from her tablet to her desktop computer. Maria teaches other older people, with a similar profile and interests, how to use computers and the Internet in an adult educational centre. How does Maria fit in the current views of older people within HCI? How can the 'downside of ageing' (Rogers et al., 2014) approach help us to design technologies that are not only accessible and usable, but also meaningful in her life?

This dissertation draws heavily on an ethnographical study of ICTs use by approximately 220 older people conducted over a 5-year period in Barcelona (Spain). It also draws on two rapid ethnographical studies (Millen, 2000), one conducted in Denmark and another in Brazil, over 4 and 2 months, respectively, with around 180 older people (90 in each study). This dissertation shows how older adults with mild-to-moderate age-related changes in functional abilities can (and indeed, did) move from seeking online information, e-mailing and voicing similar attitudes towards a perceived lack of privacy in OSN, which are oft-reported tasks and interaction behaviours associated to older people in HCI, to engaging in not so widely reported activities, such as creating their own digital videos with contemporary technologies (i.e. not designed specifically for them, such as Windows Movie Maker) and exhibiting creativity while editing them. They used digital videos as a means of keeping in touch with trusted members of their social networks. They also showed remarkably similar interaction practices, such as a perceived need of taking control over 'who sees what' when they share digital media online, such as photos and videos, despite having different cultural backgrounds. By editing

digital media with contemporary ICTs, and sharing it with those they care for, older people in Barcelona, Denmark and Brazil reported feeling more useful, socially and digitally included, and this provides qualitative evidence of the impact of using ICTs on their perceived well-being.

These results present an alternative view of ICTs use by older people that differs deeply from the one that emanates from how this user group is characterized within HCI. These results invite us to re-imagine HCI research with older people by reflecting upon, and questioning, for instance, the following issues:

(a) How older people are and should be *conceptualised* within HCI. While it is difficult to argue against the fact that they are a heterogeneous user group, this dissertation claims that when their ICTs use as a group is examined from *within*, i.e. from ethnographical lenses and over prolonged periods of time, more similarities than differences as far as their concerns, attitudes and interaction practices are concerned can be found.

(b) The *design space and approach*. This dissertation does not argue against the fact that some older people might need special tools. Yet, this dissertation suggests that re-framing the design space in terms of supporting and facilitating older people's creativity, which has mostly been overlooked, could potentially widen the design space, wherein compensating for the downside of aging will be just one (important) part of the task to design more usable, accessible and meaningful ICTs for (and with) this user group.

These and other related issues are discussed further in Chapter 4. I move on to present a succinct account of the main research carried out and contributions made.

1.1 Five years of ethnography

We understand the way (older) people interact with ICTs as a socially constructed, dynamic and diverse cultural practice (Dourish, 2004). Thus, we turned to ethnography (Fetterman, 2010), as we consider that depth, natural settings, intensity, holism, non-judgmental orientations, and giving voice to people in their own local contexts (Blomberg, Burrell and Guest, 2003; Hammersley,

2007), which are foundational elements of this way of looking, listening, thinking and writing about social phenomena, should (and could) help us reveal and explain older people's ICTs use.

The crux of this dissertation is a 5-year (2010-2015) ethnographical study conducted in Àgora[2], a 35-year old highly participatory adult learning community in Barcelona, Spain. Since the 1980s, Àgora has been fostering the social inclusion of people who are, or might be, excluded from the Catalan society, such as immigrants and older people. To this end, Àgora provides free courses, which are mostly run by volunteers and adopts a dialogical learning approach (Aroca, 1999), which empowers the students - using Àgora's terminology, *participants* - to decide what they want to learn. Over this period of time, I participated in 21 computer courses and 18 drop-in sessions, resulting in a total of 298 hours of fieldwork with 217 older people (aged 60 to 85; women: 120; men: 97) with different levels of experience with ICTs. In these activities, older people interacted with several ICTs, such as desktop computers, tablets, mobile phones, e-mail, ONS and video editing platforms. Courses lasted up to 12 weeks and were run in weekly sessions of two hours long. Workshops were usually run in a 2-hour session. I either ran the sessions or helped the person in charge of them. Participants reported having been using computers and the Internet from three months up to eight years. Informal conversations revealed that they were born in different Spanish regions and had low levels of educational attainment (70% finished primary school).

Given that older people are often regarded as a very heterogeneous user group, we considered that doing fieldwork activities in countries with different levels of economic development could (and should) help us understand how similar or different their ICTs use is. This research was conducted in Casa do Idoso[3], a centre where older Brazilian people take computer classes and carry out other social activities, such as handcraft courses or playing cards, and in three social centres[4] in Denmark in which computer sessions for

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[2] Agora, Escola d`Adults de La Verneda-Sant Martí, Barcelona, Spain, http://www.edaverneda.org/.

[3] Casa do Idoso, São Jose dos Campos, Brazil, http://www.sjc.sp.gov.br/secretarias/desenvolvimento_social/casa_do_idoso.aspx.

[4] FoF, Aalborg, Denmark, http://www.fof.dk/AfdelingForside.aspx?enhed=1. Borger Datacenter (affiliated with Ældremobiliseringen), Jerslev, Denmark,

older people are organized. Brazil is my home country. With respect to Denmark, while undertaking this PhD dissertation, I had the opportunity to participate in Life2.0, a EU-partially funded project aimed at designing innovative services for supporting older people's independent life by enhancing social interaction among their neighbours[5], in which there was collaboration with Danish local senior services. Denmark and Brazil have very different levels of ICTs development. For example, in 2013, Denmark's percentage of individuals using the Internet was 94,63% (ITU, 2014) while in Brazil this percentage was 51,60% (ITU, 2014) and 86% of the older population (60+) had never gone online (CETIC.br, 2013). In both studies, I conducted first-hand observations of, and conversations with, older people (78 in Brazil from December/2011 to January/2012, and 79 in Denmark from February/2012 to May/2012) while they were using computers and the Internet in the courses organized in the social centres. I took part in these activities by helping the person in charge of the courses. In both countries, I also carried out home-based interviews about older people's use of TV, mobile phones, tablets PCs, computers, Internet and opinions regarding iTV services (Brazil: December/2012 to January/2013, Denmark: March/2012 to May/2012). These interviews included 13 participants in each country and explored the opinions and ICTs use of older people that were not enrolled in computer classes in the social centres.

Fieldnotes were taken (on paper and/or on PC) mostly immediately after the sessions in the courses, due to my active participation in most of them. Fieldnotes were taken *in-situ* in the interviews. The analysis of the fieldnotes, which is detailed in the body of this dissertation and related publications, followed the interpretation by Nigel Gilbert in *Researching Social Life* (Gilbert, 2008) of Strauss and Corbin (Strauss & Corbin, 1998) Grounded Theory's methodology.

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http://www.jerslev.net/view.asp?soc=158.
Kastaniegården, Frejlev, http://aktivitetscentre.aalborg.dk/vest/kastaniegaarden.
[5] Life2.0: http://gti.upf.edu/life-2-0/

1.2 Main contributions

After having presented succinctly the methodological approach and the environments where the fieldwork activities were conducted, on which this dissertation is based, I summarize the four main contributions this dissertation makes to the field of HCI with older people.

A. An alternative view of ICT use: creative, active and positive relationship with ICTs

Whilst "current research concerning design technologies specifically for older adults often focuses on providing access to digital resources, rather than creating and sharing their own content" (Waycott et al., 2013), this dissertation portrays older people as both consumers of digital content and active, creative makers of digital videos with contemporary video capturing, editing and sharing technologies. This dissertation shows a social appropriation of digital videos in which these artefacts become meaningful objects within inter- and intra-generational communication, and where privacy, controlled and meaningful sharing strategies play a key role in the acts of appropriation. These results show an alternative, more positive and active view of ICTs use by older people, and prompt us to suggest that there is room for re-framing the relationship between them and ICTs in a different way. In addition to accommodating for age-related changes in functional abilities and helping them to access to digital resources, tapping into older people's creativity and seeing them as (potentially) digital content creators can (and should) inform the design of (usable and accessible) ICTs that enrich their everyday lives.

B. Using ICTs has a positive impact on older adults' perceived well-being

Drawing upon a comprehensive literature review, Dickinson and Gregor came to the conclusion that "computer use has no

demonstrated impact on the well-being of older people" in 2006 (Dickinson & Gregor, 2006). Seven years later, drawing upon another literature review, Parra *et al* pointed out that an important limitation of research on active ageing and ICT is that "much IT is being developed but there is a minimal amount of research and testing on the efficacy of these technologies. To what extent do they really accomplish the goals of prevention, care, compensation and enhancement is a topic that must be further explored in the future" (Parra, Silveira, Far, & Daniel, 2014). This dissertation fills this gap by drawing upon three ethnographical studies, which can be seen as a long-term, real-life evaluation of contemporary ICTs[6]. This dissertation provides evidence of how the process of using these technologies (e.g. in social settings, in company of peers) did have a positive impact on the perceived well-being of older people, by, for instance, making them feel more socially and digitally included, closer to their relatives and keeping up with the times.

C. Their ICTs use is not so heterogeneous as one might think

We agree on the fact that age-related physically changes are different for each individual (Durick, Robertson, Brereton, Vetere, & Nansen, 2013), and that different aspects should be considered when characterizing an older person besides her age, such as abilities, experiences and attitudes (Redish & Chisnell, 2004). However, this dissertation shows that older people with different cultural backgrounds and previous experience of using ICTs presented remarkably similar interaction practices, concerns, interests and needs in their use of ICTs. My participants appropriated popular contemporary ICTs to enrich aspects of their lives, such as OSN to keep in touch with family members and friends. Communication serves critical functions as we grow older (Nussbaum 2000), and reducing social isolation and being closer to those one care for is important for (many) older people. My participants also expressed fairly similar concerns with respect to

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[6] Ethnography is widely used and seen as part of requirements gathering and participatory design within HCI. Ethnography as an evaluation method is, to the best of our knowledge, still not explored in full. We discuss this way of using an understanding ethnography in HCI in Chapter 4.

trust and the need of privacy online. Their life experiences are likely to play an important role in this finding, since the lessons learned over a person's lifetime determine to a great extent his or her current behaviour. Yet, I found differences too. For example, the need of using e-shopping or e-government applications in Denmark, which has a high level of digitalisation of these services, was not found in Brazil, because of different levels of digital technological development.

D. Going beyond physical infrastructures to foster digital inclusion in developing countries

Toyama (Toyama, 2010) argues that global development presents a largely unexplored territory for HCI research and that this terrain will become increasingly relevant in the near future. By drawing upon the rapid ethnographical study conducted in Brazil, and taking stock of the results in Barcelona and Denmark, this dissertation argues that providing older Brazilian people with physical and technological infrastructures is not enough to strengthen their digital inclusion. Thus far, telecentres take on a prominent role within the current ICT ecosystem in Brazil. They are seen by a great many as a key means to foster the digital inclusion of the population in the country. Yet, this dissertation argues that if older people's basic and non-instrumental needs when it comes to using ICTs (e.g. learning how to use the mouse and keeping in touch with relevant others via video-conference) are not taken into consideration in defining educational activities to be carried out in physical environments, it is difficult (if not impossible) to truly foster the digital inclusion of the older population in Brazil and, arguably, in other developing countries.

1.3 Aligning the contributions with a growing research strand

Central to the four main contributions outlined above is the fact the relationship between my participants and ICTs can be regarded as positive. They are interested in incorporating ICTs into their everyday lives, sign up for courses on computers and the Internet and even agree to take part in research activities aimed to

understand their ICTs use. On the one hand, this positive view differs greatly from the negative one that dominates HCI. On the other hand, however, it reinforces an emerging strand of research aimed to capitalize on the strengths of older people and positive aspects of ageing. Noteworthy examples of this research strand are (Rogers & Marsden, 2013), who draw attention to the need of moving beyond the "rhetoric of compassion", in which the focus is on providing for a lack of something, to an approach that promotes empowerment through technology, and (Carroll, Convertino, Farooq, & Rosson, 2011), who regard ageing as a resource, and argue that "Technology can improve the quality of life for elderly persons by supporting and facilitating the unique leadership roles that elderly play in groups, communities, and other organizations."

1.4 Relevance and some implications

After having reviewed the main contributions, and indicated how they were made, at this stage, before delving into the details and engaging in a discussion on the novelty and limitations of the research presented in this dissertation, it might be worth remaining mindful of and reflecting briefly on the relevance and implications issue, which every dissertation (and scientific work) should address.

This dissertation presents an alternative view of ICTs use by older people in which the predominant 'downside of aging' does not play a pivotal role. Instead, digital content creation, fairly similar interaction practices, and a positive impact on the well-being of older people stand out. This view incorporates into the current agenda of HCI research with older people a topic that has mostly been overlooked: creativity. It is true that older people experience age-related declines in some functional abilities, and accommodating for these changes in design / research is needed and to be commended. However, it is also true that older people are, or can be, creative ICTs users, as this dissertation has shown, and other scholars (in the field of ageing) have pointed out (e.g. (Fozard, Bouma, Franco, & Bronswijk, 2009)). Why has creativity been mostly overlooked in HCI with older people? Probably, because of the stereotyped views of old age that researchers introduce to scientific work. Another reason might be related to the study of ICTs use in out-of-laboratory conditions. The field of HCI with

older people tends to be dominated by surveys and studies conducted in laboratory conditions (Sayago & Blat, 2009), which might not be suited well enough for witnessing creativity.

This dissertation argues that the taken-for-granted view that "older people are different" (Gregor and Newell, 2001) does not always hold true. If we look at them as a group of ICTs users, the results presented in this dissertation show more similarities than differences in how they use these technologies. Despite the fact that every (older) person is unique, and that differences might be evident in usability or psychological tests, this heterogeneity does not always mean that they do not have a set of common needs or aspirations, such as keeping in touch with their younger relatives and making contributions to their communities and families. By the same token, they are faced with remarkably interaction issues due to ageing, such as difficulties in remembering steps, learning new technologies or using the mouse, which are tasks that tend to become more difficult to carry out as we grow older.

This dissertation suggests that fostering the digital inclusion of older people in Brazil (and probably, in other developing countries) rests upon going beyond providing citizens with physical infrastructures. While this conclusion might be regarded as expected by some scholars, it is not widely accepted yet, as the focus on telecentres in Brazil illustrate. Thus, the claim made in this dissertation needs to receive further support to become more widespread.

Whereas using or not using ICTs might not have a clear impact on their perceived well-being yet, brain training games are a noteworthy example (Owen et al., 2010), the ethnographical lens through which we looked at ICTs use by older people enabled us to realize that learning, taking up intellectual changes, sharing concerns with peers, socializing, helping others, realising they are still able to carry out activities they thought they would never be able to do, are all part of what makes using ICTs a positive and worthwhile experience for our participants. This shows that ethnography is not only useful for gathering requirements and informing participatory / co-design activities, but also for identifying the impact of ICTs use on the perceived well-being of older people.

1.5 Organization of this dissertation

The body of this dissertation consists of three journal papers. One of them has been published in the *Technology & Disability* journal. The other is under review in the *Information Technology for Development* journal, after a first round of reviews, which encouraged us to 'revise and re-submit'. And the third paper is to be submitted to the *Behaviour & Information Technology* journal. These papers have been organized thematically into two chapters. Each chapter is preceded by a one-page summary of results.

Chapter 2, *Older people as digital video creators*

- Ferreira, SM., Sayago, S. and Blat, J. (2015). Older people´s production and appropriation of digital videos: an ethnographical study. To be submitted to *Behaviour & Information Technology*, IF: 0.839, Quartile: 3.

While most of today's children, young people and adults are both consumers and producers of digital content, very little is known about older people as digital content creators. Drawing on a 3-year ethnographical study, this paper reports on the digital video production and appropriation of approximately 200 older people (aged 60 to 85), who produced 320 videos over the course of the study. We show their motivations for engaging in digital video production, discuss their planned video making and highlight their creativity while editing videos. We also show the different meanings they ascribed to digital videos in their social appropriation of these objects, the controlled and meaningful strategies they adopted for sharing videos, and the solutions they developed to overcome or cope with interaction issues they faced over time. We argue that the results portray older people as active and creative makers of digital videos with contemporary video capturing, editing and sharing technologies. We also argue that this portrayal encourages us to re-consider how older people should be seen within Human-Computer Interaction and Universal Access, and helps frame future research and design activities that strengthen their digital and social inclusion.

Chapter 3, *Exploring ICT use in countries with different developing levels*

This chapter focuses on the differences and similarities in ICTs use amongst older people in Barcelona, Denmark and Brazil. It presents two papers:

- Ferreira, SM., Sayago, S. and Blat, J. (under review-2015). Going beyond telecentres to foster digital inclusion of older people in Brazil: lessons learned from a rapid ethnographical study. *Journal of Information Technology for Development*, IF: 0.421, Quartile: 3.

Telecentres take on a prominent role within the current ICT ecosystem in Brazil. They are seen by a great many as a key means to foster the digital inclusion of the older population in the country. This paper draws upon a rapid ethnographic study conducted with 78 older people in a centre that teaches computer classes to seniors in Brazil. The results show that providing older people with technological infrastructures is not enough to strengthen their digital inclusion if their basic and non-instrumental needs are not taken into consideration in defining educational activities to be carried out in public centres. Participants' basic needs when it comes to interacting with ICT, such as coping with accessibility issues, were dynamic, whilst non-instrumental needs, fulfilled by using these technologies, such as interacting with relevant others, remained fairly constant throughout the study. Drawing on the results of the study, strategies for fostering the digital inclusion and well-being of older people in Brazil that go beyond telecentres are suggested.

- Ferreira, SM., Sayago, S. and Blat, J. (2014). Towards iTV services for older people: exploring their interactions with online video portals in different cultural backgrounds. *Technology and Disability*, 26, 4 (2014), 199–209.

With a growing ageing population and the advent of interactive TV (iTV), understanding how older people use iTV services is a timely and important task. Working towards this end, this paper reports on in situ conversations of, and observations with, almost 400 older people, with different levels of educational attainment and experience with ICTs, while talking about and using online video

portals and similar interactive systems in Spain, Brazil and Denmark. The results show more similarities than differences in their reasons for adopting online video portals and patterns of use. All our participants used these portals for keeping or remaining in touch with people they trusted. The results also show that privacy online was a common concern to all the participants. Differences in the acceptance of e-government services and the type of content that drove most of their interactions were also found. Implications for designing more accessible and meaningful iTV services are discussed.

Chapter 4, *Discussion and Conclusions*

Following up on the discussion started in Chapter 1, and after presenting the core papers of this dissertation, the final chapter discusses the main conclusions and contributions in a broader context, along with the significance of the findings, implications and limitations. This chapter also outlines future research perspectives.

This dissertation also consists of the following two appendixes:

Appendix I, *International Recognition*

I received the "Best Paper and Presentation Award" in the Young Researchers Consortium in the International Conference on Computers Helping People with special needs in 2012. I was also a finalist in two consecutive editions of the "Google Anita Borg Memorial Scholarship", Europe, Middle East and Africa. This appendix summarizes the papers and reports related to these awards, and discusses their relationship with the three core papers presented in the body of the dissertation.

- 2013 & 2012 - Finalist of the Google Anita Borg Memorial Scholarship.
  Google, Europe, Middle East and Africa (EMEA).
- 2012 - Best Paper and Presentation Award in Young Researchers   Consortium.
  International Conference on Computers Helping People with special need (ICCHP).

Over the course of my dissertation, I was also awarded four grants to attend top conferences, such as ICTD and SIGACCESS, and present my research in doctoral consortiums and pre-conference symposiums:

- 2013 - Pre-conference Symposium (OUI-ITD) and ICTD Scholarship.
  Canada's International Development Research Centre and International Conference on Information and Communication Technologies and Development (ICTD).
- 2013 - Grace Hopper Celebration of Women in Computing Scholarship.
  Google-Global International.
- 2012 - Young Researchers Consortium Scholarship.
  International Conference on Computers Helping People with special need (ICCHP).
- 2010 - Doctoral Consortium Fellowship.
  International ACM SIGACCESS Conference on Computers and Accessibility.

Appendix II, Other Publications

This appendix summarizes three papers (in EuroITV, ACM womENcourage and SIGACCESS newsletter) in which partial results of my research have been published, and discusses their relationship with the three core papers presented in the body of this dissertation.

- Ferreira, SM., Sayago, S. and Blat, J. (2014). Towards understanding how older people use iTV. *Poster in ACM womENcourage Europe*.
- Ferreira, S., Sayago, S., Righi, V., Malón, G., Blat, J. (2011). Online iTV use by older people: preliminary findings of a rapid ethnographical study. *Poster in European Interactive TV Conference series –EuroITV*.
- Ferreira, S., Sayago, S., Arroyo, E., & Blat, J. (2011). Towards designing more accessible interactions of older people with digital TV. *ACM SIGACCESS Accessibility and Computing*, (99), 24-29.

While I was undertaking this dissertation, I took part in *Life 2.0*, a EU-partially funded project aimed at designing innovative services for supporting older people's independent life by enhancing social interaction among their neighbours, and in *WorthPlay*, a two-year international project funded by Obra Social "laCaixa" and Fundación General CSIC, aimed to understand what makes digital games sufficiently appealing, playable and meaningful for older people. As a result of my activities in these two projects, wherein I conducted ethnographical research and contributed to Participatory Design and evaluation activities, I co-authored a journal paper (currently, under review), a technical report and a conference paper. Appendix II presents the abstract of these works.

- Sayago, S., Rosales, A., Righi, V., Ferreira, S.M., Coleman, G., Blat, J. (minor revisions needed) On the Conceptualization, Design and Evaluation of Appealing, Meaningful and Playable Digital Games for Older People. *Games & Culture*
- Rosales, A., Righi, V., Ferreira, S., Tirado, J., Sayago, S. & Blat, J. 2014. D8.1 Second report on experiences of digital game play. Proyecto Cero Worthplay (WorthPlaying Digital Games for Active and Positive Ageing). Available at: http://worthplay.upf.edu/node/181
- Righi, V., Malón, G., Ferreira, S., Sayago, S., & Blat, J. (2011). Preliminary findings of an ethnographical research on designing accessible geolocated services with older people. In *Universal Access in Human-Computer Interaction. Users Diversity* (pp. 205-213). Springer Berlin Heidelberg.

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Waycott, J., Vetere, F., Pedell, S., Kulik, L., Ozanne, E., Gruner, A., & Downs, J. (2013). Older Adults As Digital Content Producers. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 39–48). ACM. doi:10.1145/2470654.2470662

2. OLDER PEOPLE AS DIGITAL VIDEO CREATORS

This chapter presents a detailed account of digital video creation, edition and appropriation by older people. This chapter consists of a journal paper to be submitted to the *Behaviour & Information Technology* journal. This paper reports on an ethnographical study of ICTs use conducted in Àgora over a 3-year period with approximately 200 older people, aged 60 to 85. We argue that the results portray older people as active and creative makers of digital videos with contemporary video capturing, editing and sharing technologies. We also argue that this portrayal encourages us to re-consider how older people should be seen within Human-Computer Interaction and Universal Access, and helps frame future research and design activities that strengthen their digital and social inclusion.

2.1 Older people's production and appropriation of digital videos: an ethnographical study

Abstract: While most of today's children, young people and adults are both consumers and producers of digital content, very little is known about older people as digital content creators. Drawing on a 3-year ethnographical study, this paper reports on the digital video production and appropriation of approximately 200 older people (aged 60 to 85), who produced 320 videos over the course of the study. We show their motivations for engaging in digital video production, discuss their planned video making and highlight their creativity while editing videos. We also show the different meanings they ascribed to digital videos in their social appropriation of these objects, the controlled and meaningful strategies they adopted for sharing videos, and the solutions they developed to overcome or cope with interaction issues they faced over time. We argue that the results portray older people as active and creative makers of digital videos with contemporary video capturing, editing and sharing technologies. We also argue that this portrayal encourages us to re-consider how older people should be seen within Human-Computer Interaction and Universal Access, and helps frame future research and design activities that strengthen their digital and social inclusion.

Key words: older people, digital video production, digital video appropriation, ethnography.

A. Introduction

"As the capacity to capture video is being incorporated into increasingly diverse artefacts (such as mobile phones), the opportunities for non-professional video-makers to make, watch and

exchange video have equally increased" (Kirk, Sellen, Harper, & Wood, 2007). How do non-professional video-makers aged 60+ produce and appropriate digital videos in their everyday lives? By appropriation we mean "the way in which technologies are adopted, adapted and incorporated into working practice. This might involve customization in the traditional sense, but it might also simply involve making use of the technology for purposes beyond those for which it was originally designed, or to serve new ends" (Dourish, 2003). This rise in prominence of digital videos in today's participatory culture (Jenkins, 2009), along with an ever-increasing ageing population and efforts to make Information and Communication Technologies (ICTs) more accessible and usable to older people, prompted us to examine the digital video production and appropriation of older people with diverse age ranges and previous practical knowledge of ICTs. The main contribution this paper seeks to make is to portray older people as active and creative makers of digital videos with contemporary video capturing, editing and sharing technologies over an extended period of time. This portrayal suggests that the way in which older people tend to be conceptualized within Human-Computer Interaction and Universal Access should change deeply, as they "are normally characterized as consumers, rather than producers, of digital content" (Waycott et al., 2013), and presents a number of opportunities for informing future research and design activities that strengthen older people's digital and social inclusion.

This paper draws on an ethnographical study of ICTs use conducted in a Catalan adult educational center over a 3-year period (2010-2013) with approximately 200 older people (hereinafter, participants), age 60 to 85. The study was initially aimed at understanding the usability and accessibility of a broad number of ICTs, ranging from tablets to Internet browsers, for this user group. However, as the study progressed, we witnessed how our participants moved from seeking and watching videos on YouTube to producing (i.e. creating and editing) their own digital videos and sharing them. Participants' production of digital videos was significant. They made 320 digital videos over the course of the study. Thus, we decided to examine their digital video production and appropriation.

By sharing with their grandchildren and close friends the videos they had made, our participants saw an opportunity to increase and enrich inter- (intra-) generational communication. Self-expression was another important motivation behind participants' interest in making digital videos. By painstakingly choosing the right texts, colors and music, participants were able to express their love to their grandchildren, personal tastes and how important their close friends were to them in a digital, and, arguably, socially inclusive way. While current research in Human-Computer Interaction (HCI) and Universal Access with older people is mostly driven by coping with the "downsides of ageing" (Rogers et al., 2014) and dominated by the "biomedicalisation of older people" (Vines, Pritchard, Wright, Olivier, & Brittain, 2015), our results suggest that adding *creativity* to current research efforts can potentially inform the design of ICTs that are not only more usable and accessible for older people, but also more meaningful in their everyday lives.

Our participants emphasized privacy, control, and perhaps, most importantly, meaningfulness in how they appropriated digital videos. It was scary for them to think that the "whole Internet", as they put it, could watch their videos. They did not see why they were supposed to make their videos available to everybody on online video sharing sites, when their videos would, in their opinion, only be useful to few people, mostly their relatives and friends. Instead of being discouraged by this 'public' factor, our participants developed their own strategies for sharing videos by using ordinary (i.e. not specifically designed for them) technologies in a private, controlled and meaningful way. They shared videos in their wall of Facebook when they considered that the content of the videos could be of interest to their friends. When the content of the videos was highly personal, however, they shared videos either face-to-face (e.g. DVDs or USB flash drives) or via e-mail. If this appropriation is compared with how most people share digital videos, it could be undervalued for its lack of novelty. But a different perspective emerges when considering (a) ageing myths, which portray older people as "being unable to use technologies", (b) popular views of older people in the field of Universal Access, such as "older people are different" (Gregor & Newell, 2001), and (c) the need for designing ICT specifically for them, because "if (they) are to become digital content producers as well as consumers, it is necessary to provide tools enabling them to easily create and

share content in non-threatening and supportive environments" (Waycott et al., 2013). We argue that these results dispel myths, challenge predominant design approaches, and suggest that older people might not be such an heterogeneous group and so different with respect to other user groups, at least in terms of digital video appropriation, when their use of video capturing, editing and sharing technologies is seen through an ethnographical lens. These results open up a number of design and research opportunities, which are discussed later in the paper.

Creating, editing and sharing digital videos were not straightforward tasks for our participants, who had to cope with a number of interaction issues, which ranged from too much information displayed on user interfaces to unfamiliar terminology. Carrying out these tasks also entailed the use of ICTs (e.g. professional video editing suites) that, in the opinion of the participants, could potentially help them to improve their production of digital videos. Consequently, participants had to learn how to use ICTs that were new for them. By drawing upon the long-term aspect of the study, we show whether participants' difficulties in using familiar and unfamiliar ICTs were due to a lack of experience with them, typical of most of today's older people, or due to ageing issues, which will continue when today's adult people who have grown up with digital technologies grow older (Hanson, 2009). While learning, new and specialized terminology was achieved over time, i.e. with more experience with ICTs, participants always complained about having to deal with too much information on physical (e.g. video camera) and software (e.g. Facebook) user interfaces. To overcome, or, at least, cope with these time-persistent barriers, participants came up with their own solutions, which we show and discuss in an attempt to (a) enrich current design guidelines for older people and (b) inspire the design of more accessible and pleasant to use user interfaces for the current and the next generation of older people.

B. Related work

Studies of digital video production and appropriation by older people are surprisingly rare. Surveys show that older people are "beginning to use social media more and more" (Hope, Schwaba, &

Piper, 2014) and increasingly adopt mobile phones (Ling, 2008) and tablet PCs (Werner, Werner, & Oberzaucher, 2012). Research studies suggest that recording and watching home videos might be a familiar activity for most older people (Chalfen, 1988), and that "digital content production can provide important opportunities for older adults for social engagement and self-expression" (Waycott et al., 2013). Moreover, "news, public discussions and product marketing emphasize the possibility to have a video camera in settings and situations previously unlikely" (Lehmuskallio & Sarvas, 2008), and "one only has to look at online repositories of video such as YouTube to begin to understand how growing access to digital video is widening participation in a new culture of video production, exchange and viewing" (Kirk et al., 2007). However, previous studies[7] that have examined (a) digital video practices by non-professionals ((O'Connor & Fitzpatrick, 2009), (Lehmuskallio & Sarvas, 2008), (Kirk et al., 2007), (Chalfen, 1988)), (b) emerging issues introduced by personal media (photos and videos) on the web, such as ownership and remix ((Marshall & Shipman, 2011), (Marshall & Shipman, 2013), (Diakopoulos, Luther, Medynskiy, & Essa, 2007), (Kruitbosch & Nack, 2008)), and (c) video-user generated content, such as popular videos and patterns of user participation ((Gill, Arlitt, Li, & Mahanti, 2007), (Cha, Kwak, Rodriguez, Ahn, & Moon, 2007), (Rodriguez, Cha, & Kwak, 2009), (Cheng, Liu, & Dale, 2013), (Park, Jung, & Lee, 2011)), have not been conducted with, or have not considered, older people. An exception is an online survey in which 290 online Korean people aged 50+ participated, conducted by Ryu *et al* (Ryu, Kim, & Lee, 2009), who argued that the respondents reported being willing to adopt video creation services if some conditions, such as ease of participation, usefulness, and enjoyment were satisfied. Another exception are Harley and Fitzpatrick's studies ((Dave Harley & Fitzpatrick, 2009), (D Harley & Fitzpatrick, 2008)), which analysed 8 videos generated and uploaded by an older person, Peter, also known as 'Geriatric1927' and the subsequent responses, arguing that intergenerational contact, reminiscence, reciprocal learning and

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[7] The papers cited are the most popular or recent ones found in our desk-based search using different combinations of the words: video, videowork, user-generated content, UGC, YouTube, video content creator, understanding, uploader, user and behaviour, in 4 academic databases: Scopus, Web of Science, Google scholar, ACM DL.

co-creation of content, emerged from how the videos produced by Peter were used in YouTube.

Thus, there is room for claiming that little if anything is known about how older people produce and appropriate digital videos in their everyday lives. In this paper, we aim to reduce this gap in knowledge.

C. The ethnographical study

C.1 Background

We regard people's interactions with ICTs as situated, because "people's understanding of the world, themselves, and interaction is strongly informed by their varying physical, historical, social, and cultural situations". We also consider that "the specifics of particular contexts greatly define the meaning and nature of an interaction" (Harrison, Sengers, & Tatar, 2011). Thus, ethnography, with its focus on "gaining an insider's view of a situation" (Blomberg & Burrell, 2009), should help us understand the situated digital video production and appropriation of older people.

Ethnography has been one of the basic and transversal themes in CHI papers since 2004 [27]. Ethnography is also a key element in the evolution of paradigms (or waves) of HCI research (Bødker, 2006). Yet, most studies with older people conducted within HCI and Universal access thus far have adopted a survey or a lab-oriented approach (Sayago & Blat, 2011).

There are several forms of ethnography, ranging from the traditional first-hand observations and conversations over an extended period of time [30], to quick-and-dirty ones (Hughes, King, Rodden, & Andersen, 1994), which have been developed to fit ethnography within software engineering development processes. We adopted the former because we considered that the key features of classical ethnography (natural settings, holism, description and members' point of view) (Blomberg & Burrell, 2009) were key to attain our goal of understanding older people's digital video production and appropriation.

C.2 The setting

We conducted our study in Àgora (AG)[8], a 30-year-old adult educational centre in the district of La Verneda-St. Martí in Barcelona (Spain). Since the 1980s, AG has been fostering the social inclusion of people who are, or might be, excluded from the Catalan society, such as immigrants and older people. To this end, AG adopts a dialogical learning approach (Aroca, 1999), which empowers the students - using AG terminology, *participants* - to decide what they want to learn in free courses. Their decision is usually based on needs they aspire to fulfil in their everyday lives, e.g. learning ICTs or Catalan. AG participants consider ICTs as instrumental in fostering social and digital inclusion, and ICTs courses take place daily. These courses are mostly attended by older participants. Volunteers, who are mostly also older people who have became fairly independent ICT users by enrolling in ICTs courses in AG, and now help to run them. Other volunteers are Bachelor, Master or PhD students conducting academic fieldwork activities.

C.3 Participants: profile and recruitment

202 older people (women: 113; men: 89. 50% aged 60-69, 46% aged 70-79, 4% aged 80-85) took part in our study. Informal conversations between one of us (the first author – fieldworker) and the participants revealed that they came from several Spanish regions and that their educational attainment was low (around 70% had completed primary school only). They often reported knowing each other because of living in the same neighborhood and/or taking part in the same activities in AG. Most participants reported, and our observations confirmed, that they conducted basic and more advanced computer tasks, such as looking for information online and e-mailing, without requiring much help from volunteers or helpers.

Participants in courses and workshops were recruited through the standard AG procedure, which consists of signing up for activities via the secretary, where they are informed about who organizes them and what they are about. Their participation was voluntary and

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[8] http://www.edaverneda.org/edaverneda/en

the main inclusion/exclusion criteria were (a) the activity was full and (b) level of experience with ICTs (there were activities targeted at beginners and others at experts at ICTs). This level was assessed by AG staff on the basis of what participants told them about their practical knowledge of computers and the Internet while signing up for courses and workshops.

C.4 Activities: courses and workshops

Seventeen courses and 10 workshops were conducted from December 2010 to December 2013. They took place in AG's Internet room, which consisted of 9 desktop computers (Figure 1) running Windows XP. The maximum number of people allowed in that room was 19 (2 participants sharing a PC and the person in charge of the activity).

Figure 1. Participants in the Internet room.

Table 1 describes video content creation activities ran by the fieldworker. Table 2 and 3 describes other ICTs courses and workshops attended by the fieldworker as part of her immersion in AG and initial goal of understanding ICTs accessibility and usability for older people. Table 2 presents the courses in which the field worker had a role of volunteer helping the person in charge of the course. Table 3 presents the courses conducted in colaboration with other researchers (four researchers in the field). The number of participants and the duration of the activities are detailed. 51 participants enrolled in video creation courses and half of them (24)

in two or more courses (Table 1). Courses lasted up to 12 weeks and were run in weekly sessions of two hours long. Workshops were usually run in a 2-hour session.

Activity	Participants	Description of the activity	Sessions
Introductory Workshops	G1: 14 (6m - 8f) G2: 09 (9f)	Hands-on activities on creation of video content.	G1: 02 sessions G2: 02 sessions
Video Creation Courses	G1: 09 (6m - 3f) G2: 16 (2m - 4f) G3: 18 (8m - 10f) G4: 14 (9 m - 5f)	Hands-on activities on video creation, watching, editing and sharing.	G1: 06 sessions G2: 10 sessions G3: 10 sessions G3: 10 sessions

Table 1. Video content creation courses – Teacher.

Activity	Participants	Description of the activity	Sessions
Course on Natural Parks	G1: 11 (6m - 5f) G2: 11 (6m - 5f) G3: 13 (6m - 7f) G4: 11 (5m - 6f)	Download and edit pictures from the web. Create/share documents (MS Power Point).	G1: 04 sessions G2: 06 sessions G3: 05 sessions G4: 04 sessions
Project Activities: Connect [9]	G1: 08 (4m - 4f)	Discuss project outcomes and making a video with participants.	G1: 04 sessions

Table 2. General ICT Courses - Teacher Assistence.

Activity	Participants	Description of the activity	Sessions
General ICTs course	G1: 12 (6m - 6f) G2: 18 (7m - 11f) G3: 18 (8m - 10f) G4: 18 (9m - 9f) G5: 17 (9m - 8f) G6: 16 (8m - 8f) G7: 18 (10m - 8f) G8: 16 (8m - 8f)	Hands-on activity using computer and/or tablets PCs. Main technologies: Communication (E-mail, Web Blogs, Skype, Facebook, Life2.0 project platform[10]); Search for information (Google search tools, Google Maps, Youtube, Spotify, video web portals, buying online, Picasa); Editing multimedia	G1: 05 sessions G2: 12 sessions G3: 12 sessions G4: 05 sessions G5: 12 sessions G6: 06 sessions G7: 04 sessions G8: 04 sessions

[9] Connect: European project on older people's virtual communities and social learning (http://www.connect-project.eu).

[10] Life 2.0: European project aiming at generating opportunities for local interaction by creating new services for older adults (http://www.life2project.eu/).

		(Picnic, Windows Movie Maker).	
Project Activities: WorthPlay[11]	G1: 16 (8m - 8f) G2: 14 (9m - 5f) G3: 11 (1m - 10f) G4: 14 (7m - 7f) G5: 10 (2m - 8f)	G1, G2: Participatory design activity: Creating and playing games. G3 to G5: Hands-on activity using computer and/or tablets PCs as a device to interact with Worthplay platform creating and playing games.	G1, G2: 01 session G3: 03 sessions G4, G5: 01 session
Participatory design workshops	G1: 10 (5m - 5f) G2: 11 (5m - 6f) G3: 17 (6m - 11f)	G1: "Collaborative maps and blogs". G2, G3: "Designing my online video portal".	G1, G2, G3: 01 sessions

Table 3. General ICT courses – Projects.

C.5. Data gathering and analysis

The fieldworker took notes in her computer of what she observed and what participants did and said in courses and workshops immediately after the activities, which were so active that they often hindered *in situ* note-taking. Notes were also taken of the fieldworker's face-to-face conversations with those participants that turned up a few minutes before a session was due to begin or when they met up for a coffee near AG.

The fieldworker also took notes in her computer on a daily basis of what participants wrote in Facebook. Indeed, a Facebook group was set up by the fieldworker to provide a closed channel of communication for the most active participants (44), and those who were interested in using it. The fieldworker was a Facebook friend of 50 participants and followed the YouTube uploads of three of them throughout the study.

Data analysis followed Gilbert's interpretation (Gilbert, 2008) of Grounded Theory (Strauss & Corbin, 1998), which provides practical guidelines to carry out the analysis of the data. The

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[11] WorthPlay: International project aiming at understanding what makes digital games worth playing for older adults and developing these games (http://worthplay.upf.edu/).

fieldnotes were coded line-by-line (Open Coding), resulting in several preliminary categories (Axial Coding). Open and axial coding were both conducted at the end of the courses. This analysis was used for planning the next courses and workshops. The preliminary categories that emerged from Axial Coding were discussed among the authors until a clear outcome was agreed. In these discussions, we changed the name of some categories, deleted and grouped them into other categories. This data analysis led to the following main and subcategories, which we use to present the results:

- Digital video production: motivations, planned video creation, creative editing, final videos.
- Digital video appropriation: social appropriation, privacy, controlled and meaningful sharing.
- Interaction issues over time: issues, solutions, evolution over time.

D. Digital video production

D.1 Motivations

By creating digital videos, our participants perceived that they could:

- Share with their relatives and friends key moments of special occasions, such as a trip around the Mediterranean: "*I want to create a video with the photos I took with my digital camera during my trip with my friends and partner in Tunisia. We had such a great time. I want to burn the video into a DVD and give it to them.*" [75, M3]
- Keep alive memories of their relatives, especially those who were deceased, and share these memories with other family members: "*I've created a video about my family. I've got many pictures of my family, old ones, from people that are already dead, and more recent ones, from the new generation. One day I came up with the idea of creating a video representing my family tree and passing it on to the youngest members of my family*" [75, M27].
- Take forward their journey towards ICTs proficiency: "*the good thing about creating videos is that there are many effects and*

cool things (...) there is always something new to learn" [68, M28].

- Feel more socially included, "*nowadays, it's important to know how to use computers in order not to be excluded from society*" [63, F13].

The first important result that our ethnographical study helps us to identify is the importance of an event, documenting family history and achieving personal objectives that made digital videos relevant for our participants and encouraged them to engage in digital video production. Keeping and sharing memories have motivated older people with a different cultural background than our participants to engage in user-generated content ((Karahasanović et al., 2009), (D Harley & Fitzpatrick, 2008)). Recording events have also motivated adult people in families to find value in digital videos (Kirk et al., 2007). By contrast, attaining personal objectives, such as learning more about ICTs and feeling more socially included, seem to be more specific motives of our participants. This might be due to the setting of our study and the profile of our participants. It is worth noting that our participants' curation, "a growing phenomenon" (Thomas & Briggs, 2014), by keeping memories of relatives, is actually becoming digital.

D.2 Planned video making

As opposed to teenagers, who have been found to "spontaneously use (digital) cameras at any and all times, and not, so to speak, at 'special times'" (Kirk et al., 2007), the making of digital videos of our participants was much more planned. When they intended to keep and share memories of special events, they used compact digital cameras, camera phones or tablet PCs (Figure 2 and 3). When their motivation was to take their ICTs learning forward, they tended to download online pictures from Google Images and put them together into a digital video using MovieMaker, which was installed in the computers in AG Internet room.

Figure 2. Participant recording dance presentation with a tablet computer.

Figure 3. Participant using digital camera to record event in school.

Interestingly, most of the planned digital videos also had music. The fieldworker did not teach participants how to download music from the Web. They reported that they had learned to do so by themselves or with the support of younger relatives. Most participants had a USB stick with a collection of their favorite songs, which they added to their videos, "*I choose the songs that I really like and then I save them in my computer. I've the pen drive full of songs.*" [60, F25]. While the results of a recent and novel study about DIY (Do-It-Yourself) and older people pointed out that an "unexpected finding was the pivotal role of actively collaborating to play music" (Rogers et al., 2014), participants' initiative to add music to their videos was, in light of the illustrative

extract quoted above, not unexpected at all. Indeed, the role of music in participants' digital video production concurs with the importance of music in older people's lives (Hays, 2005).

D.3 Creative editing

All participants, regardless of being more or less familiar with ICTs, showed a high level of creativity while editing videos. This creativity stood up in the selection of animations, colors, fonts and music, as the following edited extract of our fieldnotes illustrates.

> Maria, a 77 year-old woman, created a digital video and projected it on the big screen to show it to the course participants. The video had two parts. The first was about the *castellers*, a Catalan tradition of building up human towers. The second showed people cooking *paella*, a traditional dish with seafood and rice. The first part did not have music, so we could hear the background music of the *castellers* and the voices of the people. Maria had used traditional Spanish music for the second part. Besides its title and credits, the video had textual comments overlaid in different scenes. Maria told us that she had written these comments, which were descriptive and humoristic. Some participants pointed out that the music was not very well finished. I took the opportunity to explain them how they could change the volume of the different audio tracks. Maria asked: "*So if someone says something interesting in the video, can I put the volume down just for a few seconds and put the music back later on?*" Maria took advantage of this session to ask the fieldworker further details about animations and how to overlay text. A few days later, Maria e-mailed the fieldworker a new version of the video. She had fixed the problems with the music and changed the colors of the texts in a creative way.

While editing a digital video that is going to be displayed and talked about is a reasonably expected practice – in other words, something that everybody does or is likely to do - the creativity shown by our participants is worth noting, because current research in HCI with the older population is dominated by removing usability and accessibility barriers due to ageing, "as if creativity (and outstanding performance) were not significant parts of aging" (Cohen, 2006).

D.4 Characteristics of the videos produced

During this study, we registered 320 videos produced by the participants[12]. In keeping with their motivations, 57.8% of them were about special events, such as birthday parties or trips, documenting memories of their relatives or their hobbies. 42.2% were about other events meaningful for them, such as neighborhood parties or AG activities. 38.7% were created with still images using a video-editing suite. 61.3% were recorded using camera phones, tablets or digital cameras. The overwhelming majority of videos lasted between 1 and 3 minutes and had an mp3 file (a song) attached.

E. Digital video appropriation

One way of assessing the potential significance of the digital video production presented is to address the question of how videos were appropriated, as "it is through their appropriation that artefacts become authentic objects and achieve significance" (Silverstone & Hirsch, 1992). In other words, how did participants take possession of digital videos? What meanings did they ascribe to them? How did digital videos move from artefacts to meaningful objects? Did anything "unusual" appear in the acts of appropriation of our participants?

E.1 Social appropriation

Participants' appropriation of digital videos was highly social. Participants perceived that sharing their digital videos with people they cared for, especially their children, grandchildren and close friends, could strengthen their ties with them. Sharing a video was a way of:

- Giving a present, "*My daughter's birthday is in February and I want to give her a video as a present. She is a bit sick so I want to do something nice for her.*" [60, F25]

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[12] A number of videos, which participants decided to share publicly, are available at https://www.youtube.com/channel/UCYT5CYWdgdv5O6QrbNkxbFg

- Saying 'Hi', *"I liked the video a lot, it nearly gave me goose bumps!"* [41, F70e] *"Hi! Show it to your mom please! A special kiss for both of you!"* [64, F16] (Conversation on [64, F16] Facebook's wall)
- Catching up with friends, *"We're watching a video on my iPad. I recorded a couple of videos of my grandchildren this weekend and I was showing the videos to them before the session with you was due to begin. We took advantage of this to catch up on things, you know."* [76, F39]

Participants also reported, and our observations confirmed, that their perceived digital and social inclusion increased when other participants and relatives recognized publicly, for instance, in Facebook, their technological expertise when sharing a digital video, *"It is beautiful! Next time we meet you should tell me how you recorded it!"* ([74, M2] comment on a video posted in Facebook by [77, F9]) or *"Congratulations for your progress!"* ([75, M3]'s Facebook friend comment in his wall).

These results show that participants ascribed different meanings to digital videos when they *owned* them. Videos of special events and deceased relatives showed participants' proficiency with ICTs or care for people they loved. These videos became an important element of their inter and intra-generational communication. This appropriation of digital videos has not been discussed in previous research on Computer-Mediated Communication (CMC) with older people, wherein videos are used as either synchronous or recorded conversations that help to 'connect families' ((Judge, Neustaedter, Harrison, & Blose, 2011), (Brush, Inkpen, & Tee, 2008)) and provide older people with 'social support' (Xie, 2008).

E.2 Privacy

It was scary for all our participants to think that the "whole Internet", as they put it, could watch their videos. As one might expect, this concern was especially apparent when the content of the video was personal: *"Why do I have to upload it on YouTube? There everyone can see it... I don't want everyone to watch it, just us in the class is ok. Well, never mind, I'll send it by e-mail then."* [75, M3] More surprising, especially in terms of ageing myths when it

comes to ICTs, e.g. "incapable of learning new things and technologies" (Durick, Robertson, Brereton, Vetere, & Nansen, 2013), might be the fact most participants showed a critical attitude towards the 'broadcast yourself' model promoted by video sharing sites, especially YouTube. "*No, this thing isn't for me (talking about uploading videos in YouTube). I created a PowerPoint video tutorial to share it with my students. I can share it with you, if you want. You can share it with any person you want but online with unknown people no. If I share it with people I know, I know they'll like it, and they will show their gratitude to me. But people from the whole Internet… Why would I share it with them?*" [68, M28] This shows that not only did participants learn how YouTube works, but also decided how, in this case, not to use it.

Despite older adults being widely regarded as a very heterogeneous user group (Gregor & Newell, 2001), privacy concerns with respect to public access to personal media on the web have been reported in older people with different cultural backgrounds in how they use SNS ((Gibson et al., 2010), (Lehtinen, Näsänen, & Sarvas, 2009), (Dave Harley, Howland, & Harris, 2014)), video-sharing sites (e.g. YouTube, (Sayago, Forbes, & Blat, 2012)) and in their attitudes towards emerging digital legacy tools (Thomas & Briggs, 2014). These findings seem to suggest that they, in terms of privacy online, they might not be such a heterogeneous user group.

E.3 Controlled and meaningful sharing

There is room for thinking that privacy concerns could have hindered or prevented the social appropriation of digital videos from happening. Yet, participants adopted three different strategies for sharing videos in a controlled and meaningful way.

- <u>Co-located one-to-one and one-to-few</u>. The content of the video was always personal and shared with people participants knew well. For example, participants put videos on USB drives or DVDs and passed them on to relatives: "*I used to have my videos in the computer. But some people of my family wanted to watch them, so it is easier for them if I record the videos on a DVD and give it to them.*" [66, M29] "*This weekend I'll visit my*

son, he has a modern TV. I'll bring the pen drive to show him the videos I made in the course on his TV." [75, M41]

- <u>Online one-to-one and one-to-few.</u> An alternative sharing strategy was observed when participants created a video and wanted their friends and family members to watch it. Then, the most common way of sharing it was to send the video file via e-mail, either as an attachment or a link using file transfer tools (e.g. *WeTransfer*). The more experienced participants shared videos via *WhatsApp* too*: "Look, this is the video I recorded from the lunch last weekend* (showing the video in a *WhatsApp* conversation). *I sent it to my partner's son, who was also there. He told me that he liked it a lot.*" [75, M3]

- <u>One-to-many in SNS</u>. Only those participants who had more practical knowledge of ICTs shared videos on SNS, especially in Facebook. They did so by uploading videos in their profile pages or in their friends' walls. The videos shared were mostly related to artistic presentations, such as a typical Spanish dancing. Participants pointed out that sharing these videos on SNS allowed them to reach people that could be interested in them in a non-intrusive way. E-mails were not considered appropriate for doing so: "*I give the name of my YouTube channel to people, so if they want, they can go and watch the videos. This way, I don't have to e-mail them every time I create and upload a video. If their friends are also interested in the videos, they can also watch it, I don't mind. These videos aren't private.*" [74, M2]

Thus, participants came up with their own solutions to share digital videos in a controlled and meaningful way. These different sharing strategies reinforce the creativity found in digital video production (section 4).

F. Evolution of interaction issues over time

Thus far, digital video production and appropriation have been presented as though creating, editing, and sharing digital videos were straightforward tasks for our participants, which is not true. Table 3 presents the most important interaction issues that participants had to deal with. We use the term 'issues' rather than 'barriers', which is a word typically used in the field of Universal

Access with older people (e.g. (Sayago & Blat, 2009)), to highlight the fact that some of them were overcome as participants' experience with ICTs increased over time, while others were time-persistent (i.e. independent of their previous experience with ICTs).

Issues	Description and examples	Type and evolution
Too much information	Participants struggled to identify the "upload" function in Facebook and YouTube because their user interfaces were, in their opinion, full of options and cluttered. Participants complained about the large number of functions in video editing suites such as Adobe Premiere or Sony Vegas Pro, "*I installed Adobe Premiere into my computer but I don't know how to use it. It's too complicated!* [73, F24]	Type: Time-persistent. Evolution: All considered that the user interfaces of video editing suites and sharing sites, and SNS, provided them with too much information and functionalities.
A network of devices	The digital video production of our participants involved a network of devices, such as video/photo cameras, computers and USB sticks. This network forces them to know how to operate, for instance, a camcorder or a mobile phone, the computer and to connect both devices by means of a USB cable. Participants found it difficult to deal with this network of connected devices.	Type: Time-persistent Evolution: This issue did not disappear as the participants' ICTs experience increased. Instead, the more experience our participants had, the more new devices they added to the network, such as smart phones and tablets.
Too many steps	Installing video editing suites in PCs or setting up SNS accounts on mobile devices involved far too many steps for our participants. "*I want to share the videos from my iPad to my YouTube channel but I don't know how to do it. Can you configure it for me, please?*" [74, M2]	Type: Non-time persistent Evolution: Change of participants' behavior. Participants exhibited an explorative behavior when they felt more confident about their abilities to use ICTs than they did when they had less experience with these technologies.
Lack of feedback	When recording videos with their digital cameras (such as Sony dsc-s730) for the first time, the recording time feedback provided by the system was not clear enough.	Type: Non-time persistent Evolution: This apparent lack of feedback was only important when

	This apparent lack of feedback made participants feel confused, as they did not know whether they were recording a video or not. "*Yesterday I tried to make a video for the first time. I thought I had done it well but now I cannot find the video.*" [61, F27]	participants did not have much experience with the tools they were using.
New terminology	Computer jargon such as 'media file formats', 'computer file systems', 'projects', 'timeline' and 'file size limitation' were new words for our participants. When they first read them they did not understand them. Failing to understand the meaning of these terms led to participants not being able to share videos by e-mail on their own.	Type: Non-time persistent Evolution: As participants' experience increased, they learned new terms and did incorporate them in their conversations about these technologies, e.g. "*I often convert my videos to VLC so that I can watch them on the TV.*" [66, M29]

Table 4. Interactions issues over time.

F.1 Interaction issues likely to be faced by the next wave of older people

Table 3 suggests that the next generation of older people (Hanson, 2009) will probably need to cope with issues where ageing results in changes in cognition, especially those concerned with crystallised / fluid intelligence and selective attention (Czaja & Lee, 2007) have an impact, i.e. those associated with having to deal with too much information and learning to use unfamiliar ICTs (there will be new ones) − provided that future user interfaces do not improve their designs in these terms. By contrast, other interaction issues they might face, such as unfamiliar terminology, too many steps to conduct tasks, or poor visual feedback will probably be overcome through practice, as our results have shown. In fact, difficulties in reading from computer screen were mostly coped with by wearing reading glasses, and tasks demanding a high eye-hand coordination where declines in manual dexterity take on an important role, such as cutting videos, were successfully carried out when participants used the mouse − there were no joysticks in AG - with both hands or marked the correct place where to cut the video on the computer screen with a pen before using the mouse.

F.2 Enriching current design knowledge

Within HCI and Universal Access, numerous efforts have been made to help designers cope with diversity, spread design awareness and best practices. Working towards this end, a substantial number of guidelines for designing more accessible user interfaces for older people have been produced ((Echt & Morrell, 2002), (Hodes & Lindberg, 2002), (B Holt, 1999), (BJ Holt & Morrell, 2002), (Morrell, 2003), (Zajicek, 2006), (W3C, 2010)). One way of appreciating how our results enrich this design knowledge is to discuss how the interaction issues summarized in Table 3 relate to the current body of design guidelines.

On the one hand, no design guidelines for older people, to the best of our knowledge, have taken into account the temporal aspect of usability and accessibility issues (i.e. how they evolve as older people's experience with ICTs increases over time). Our results suggest that distinguishing between those interaction issues that disappear, or become less important, over time and those which remain time-persistent is important to inform user interface design. On the other hand, most of the interaction issues faced by our participants, such as too much information, unfamiliar terminology, and privacy control have been addressed by guidelines (e.g. (Zaphiris, Kurniawan, & Ghiawadwala, 2006), (Chisnell & Redish, 2005), (Fidgeon, 2006), (Hodes & Lindberg, 2002), (Carmien & Manzanares, 2014)), and in recommendations for designing SNS for older people (e.g. (Lehtinen et al., 2009), (Dave Harley et al., 2014)). This concurrence of interaction issues can be seen as a validation of the design knowledge spread in the guidelines and reinforces the need of addressing them in future designs. It could be argued that there is no need for doing so, as participants' efforts to cope with and actually overcome some interaction barriers were effective. However, the strategies adopted by our participants (a) highlight the fact that there are *still* barriers, and (b) can inspire future designs[13]. Participants' willingness to use ICTs should not be taken as an excuse to take no heed of older people's needs.

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[13] We have refrained from providing design opportunities, as they need to be discussed within the context of the particular interactive system to be designed.

Finally, whereas too much information or too many steps are user interface design issues, on which guidelines tend to focus, it is worth noting that the 'network of devices' is a contextual aspect of technology use that does not seem to have been addressed by the guidelines cited above, despite emerging technological paradigm shifts towards the establishment of interfaces that are embedded in all kinds of objects (e.g. wearables (Barfield & Caudell, 2001), pervasive computing (Satyanarayanan, 2001)), which are expected to affect (older) people's interactions with ICTs in the future and become an important part of research in the field of Universal Access (Stephanidis, 2014).

G. Where do we go from here?

The title of this section is borrowed from the seminal "Design for older and disabled people–where do we go from here?" (Newell & Gregor, 2002), as this section intends to discuss the extent to which the digital video production and appropriation presented in this paper aids in understanding further the relationship between older people and ICTs, and informing future research and design activities in the fields of Universal Access and HCI with the older population.

G.1 Are technologies designed specifically for older people always needed?

It is fairly well established that older people find most ICTs difficult to use and there is growing awareness that if we want them to use ICTs and bridge the grey digital divide, we need to design technologies for them (Waycott et al., 2013). Our participants created, edited, published and shared digital videos with a number of ordinary technologies over a 3-year period. However, they did find difficulties and their profile is fairly representative of most of today's older European people[14]. Thus, what might set our participants apart is their strong motivation to incorporate ICTs in their everyday lives. Other studies have focused on what makes

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[14] They experience normative age-related changes in functional abilities, have a moderate practical knowledge of ICTs and fairly low/moderate levels of educational attainment.

older people unwilling to use ICTs ((Kurniawan, 2007), (Fernández-Ardèvol & Prieto, 2012)). Unlike them, we decided to capitalize on our participants' motivation to examine their use of ICTs, and found that older people might not *always* need technologies specifically designed for them, as one might be tempted to believe when first thinking about or witnessing older people using ICTs for short periods of time. This is not to say that technologies specifically designed for older people are not needed. There are older adults, especially those with major declines in functional abilities, who will probably benefit from them. Our results suggest that general and important claims, such as "older people are different" (Gregor & Newell, 2001), which aim to encourage researchers and designers to appreciate the diversity in needs and abilities of older adults in order to design more accessible and usable technologies for them, should be approached with caution and within the everyday lives of older people.

G.2 Older people are a heterogeneous group. Yet, how heterogeneous is their use of ICTs?

We do not dispute claims that older people are a heterogeneous user group. Yet, we have found more similarities than differences in how our participants made and appropriated digital videos in their everyday lives. Although this finding might be due to the fact that our participants belonged to the same lifelong learning community and our study was conducted in courses in which the needs and interests of participants prevailed over researchers' interests, we also observed that privacy concerns with respect to SNS and digital legacy exhibited by older people with different cultural backgrounds resonate with those of our participants dealing with digital videos. Furthermore, the relevance of communication in our participants' digital video appropriation could be expected, as communication serves key functions in ageing (Nussbaum, Pecchioni, Robinson, & Thompson, 2000). Whilst differences between older people with more or less experience with ICTs might emerge under laboratory conditions (e.g. (Czaja & Lee, 2007), (Hanson & Crayne, 2005)), when older people's interactions with ICTs are examined in out-of-laboratory conditions and over an extended period of time, differences might not be so clear cut.

G.3 Re-framing the relationship between ICTs and older people in more positive terms

Much HCI research with older people can be summarised in terms of the "rhetoric of compassion" (Rogers & Marsden, 2013), i.e. helping older people to conduct instrumental tasks with ICTs by accommodating for normative age-related changes in functional abilities. While helping older people to cope with changes that come with ageing is to be commended, and our results have shown the relevance of this approach, we also consider that there is room for re-framing the relationship between older people and ICTs in a more positive way. Participants' creativity stood out in how they made videos and overcame some of the interaction issues they were faced with. Instead of thinking of how to make the task of recording a video through a camcorder or mobile phone more accessible and usable for older people, we could re-write the question as how to support and facilitate their creativity when recording videos with these devices. Re-framing the question in this way would widen the design space, wherein compensating for the downsides of aging will be just one part of the answer, albeit a very important one.

G.4 Understanding real users in real contexts of use towards achieving social impact

We consider that digital video production and appropriation is difficult, if not impossible, to examine in studies conducted within laboratory conditions. We were lucky enough to perform ethnography over a 3-year period, and our results, as we have already discussed, present a different and novel portrayal of older people that reduces a gap in knowledge, challenges some taken-for-granted ideas and encourages reflection on 'where do we go from here'. How do we know whether older people need different ICTs or improved versions of existing ones in their everyday lives? Why did creativity emerge as a key finding in our study? Answers to these and other similar questions rest heavily on understanding older people's situated use of ICTs, and ethnography is, or should be, well placed to do so. However, ethnography has seldom been adopted in the studies addressing the topic of this paper discussed in our literature review, despite the fact that, within Universal Access, there is a growing interest in "shifting the interest of designers from an artificial "average user" to real users in real contexts of use"

(Luigi, 2009). Moreover, the results showed that our ethnographical approach turned out to be *useful* for the participants, who reported, and our conversations confirmed, learning a wide range of ICTs and feeling more confident about their abilities to effectively use and incorporate these technologies in their everyday lives. This usefulness is, we consider, worth stressing if research in HCI and Universal Access aims to achieve social impact. We do not claim that other research approaches should be avoided. Instead, combining ethnography with studies conducted in more controlled situations or adopting other approaches (e.g. online data mining) can potentially help us achieve a deeper understanding of older people as consumers and producers of digital content and to inform the design of better, more usable, accessible and meaningful, ICTs.

H. Conclusions and future work

Over the course of an ethnographical study of ICTs use by a group of older people, we witnessed a change in their relationship with digital videos. They shifted from looking for and watching Internet videos to making their own digital videos, ascribing diverse meanings to these objects and appropriating them in their everyday lives. These findings, along with the pervasiveness of digital videos by non-professional video makers in today's society, and a growing ageing population, encouraged us to examine what is currently known about digital video production and appropriation by older people. Our literature review indicated that little if anything is known about how older people produce and appropriate digital videos, and we decided to focus on this topic with the aim of reducing this gap in knowledge and taking further current research in HCI and Universal Access with older people. Drawing upon the results, discussed throughout the paper, we argue that we have achieved these goals.

This study portrays older people as active and creative makers of digital videos with contemporary video capturing, editing and sharing technologies over a prolonged period of time. We have described a social appropriation of digital videos in which these artefacts become meaningful objects within inter- and inter-generational communication, and where privacy, controlled and

meaningful sharing strategies play a key role in the acts of appropriation. We have discussed how similar or different the key elements of digital video production and appropriation of our participants are with respect to the use of digital videos and other technologies by other user groups, and argued that participants' production and digital video appropriation is not so heterogeneous as they, as a group of older people, are. By drawing upon the longitudinal aspect of the data gathered, we have also been able to discuss which interaction issues are likely to be faced by the next generation of older people, and how this design knowledge enriches current design guidelines for older people.

We have argued that several deep implications for future HCI and Universal Access with the older population can be drawn from the results, as these challenge important taken-for-granted ideas, such as older people being passive consumers of information or being a very heterogeneous user group. This study also provides a different way of looking at older people. Not only can they become active ICTs users but also creative ones. The results prompt us to suggest re-framing the relationship between ICTs and older people in more positive terms, rather than on 'removing problems', which does not capitalize well enough on older people's strengths. The results also suggest conducting further research with real users in real contexts of use in an attempt to inform the design of more accessible, usable and meaningful ICTs for older people, and research activities with more social impact.

Our participants were motivated to use ICTs, and this can be considered a limitation of this study. Also, we have not addressed in depth the patterns of older people participation in video sharing sites with a broader user group. Future studies can explore these aspects. In addition to this, given that older people might be familiar with photo and/or videowork, it is reasonable to question whether other forms of digital content production (such as blogging or contributing in crowdsourcing platforms) would yield similar or different results. Further face-to-face or online ethnographical, or participant observation studies, of digital content production by older people, should help us understand this important aspect.

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3. EXPLORING ICT USE IN COUNTRIES WITH DIFFERENT DEVELOPING LEVELS

This chapter focuses on the differences and similarities in ICTs use amongst older people in Barcelona, Denmark and Brazil. This chapter consists of two journal papers. One of them is being reviewed in the *Information Technology for Development* journal (Section 3.1). The second journal (Section 3.2) was published in the *Technology & Disability* journal in 2014.

Section 3.1 presents the lessons learned from a rapid ethnographical study conducted in an educational centre in Brazil. 78 older people took part in this study. The results show that providing older people with technological infrastructures is not enough to strengthen their digital inclusion if their basic and non-instrumental needs are not taken into consideration in defining educational activities to be carried out in public centres. Drawing on the results of the study, strategies for fostering the digital inclusion and well-being of older people in Brazil that go beyond telecentres are suggested.

Section 3.2 reports on *in situ* conversations of, and observations with, almost 400 older people, in Spain, Brazil and Denmark. The results show more similarities than differences in their motivations and ICTs use. All our participants used ICTs for keeping or remaining in touch with people they trusted and showed a high interest in digital media (such as images or videos). The results also show that privacy online was a common concern to all the participants. Differences in the acceptance of e-government services and the type of content that drove most of their interactions were also found. Implications for designing more accessible and meaningful iTV services are discussed.

3.1 Going beyond telecentres to foster the digital inclusion of older people in Brazil: lessons learned from a rapid ethnographical study

Abstract: Telecentres take on a prominent role within the current ICT ecosystem in Brazil. They are seen by a great many as a key means to foster the digital inclusion of the older population in the country. This paper draws upon a rapid ethnographic study conducted with 78 older people in a centre that teaches computer classes to seniors in Brazil. The results show that providing older people with technological infrastructures is not enough to strengthen their digital inclusion if their basic and non-instrumental needs are not taken into consideration in defining educational activities to be carried out in public centres. Participants' basic needs when it comes to interacting with ICT, such as coping with accessibility issues, were dynamic, whilst non-instrumental needs, fulfilled by using these technologies, such as interacting with relevant others, remained fairly constant throughout the study. Drawing on the results of the study, strategies for fostering the digital inclusion and well-being of older people in Brazil that go beyond telecentres are suggested.

Keywords: older people, digital inclusion, ICT use, ethnography, ICTD.

A. Introduction

Despite important efforts to foster digital inclusion in Brazil, most of its aging adults have never accessed the Internet. In this paper, we aim to contribute to foster the digital inclusion of older people in

Brazil. Thus far, we argue that social policies have concentrated on providing older people with an appropriate technological infrastructure, which is of the utmost importance if we want them to access to digital resources. Without a technological infrastructure it is very difficult (or impossible) to bridge the digital divide. However, we argue that assuming that this physical aspect of digital inclusion will encourage older people to use computers and the Internet is risky. If they have the infrastructure and technology, but we do not know how to put them at the service of our older citizens, we might not achieve our objective.

"A core concern that has emerged among ICTD scholars over the last few years is a disproportionate emphasis in current ICTD discourse on fulfilling basic needs of users in low-resource environments without adequate attention to user-motivated concerns addressing which would enrich their lives rather than merely provide access and satisfy of basic needs" (Johri & Pal, 2012). We argue that a similar concern can be raised in the field of ICT and ageing, wherein most technologies designed for older people (60+) are intended to help them to conduct basic activities of daily living on their own, such as bathing and cooking, without paying enough attention to the question of how these technologies enable them to meet non-instrumental needs, such as personal growth and self-expression (Vines, Pritchard, Wright, Olivier, & Brittain, 2015). These two concerns, together with the potential digital exclusion of older people, especially in developing countries, demand further ICTD studies that address older people's basic and non-instrumental ICT needs.

Although providing citizens with a technological infrastructure and places (e.g. telecentres) where they can use computers and go online is a step forward towards increasing their digital inclusion, why would older people want to go to telecentres? What daily needs do they have that could be fulfilled by using ICT? And how do we enable older people to meet their needs in public access centres (PAC)? Do we organize formal or informal courses, or both? Warschauer (M Warschauer, 2004) claims that what is most important is not so much the physical availability of computers and the Internet but rather people's ability to make use of these technologies to engage in meaningful social practices. We consider that understanding older people's situated use of ICT is important,

as answering these and related questions should (and could) help us to identify a number of basic and non-instrumental needs in their ICT use and serve to inform the design of technologies and social policies that truly enrich their lives.

Statistics regarding technology penetration show that although the Internet access in Brazil is increasing, the older population is not included in this digitalization process. Telecentres have been put forward as a way of putting Brazilian people online. Discussing about open ICT ecosystems and the developing world, Smith and Elder (Smith & Elder, 2010) highlight the fact that "*each successive round of new ICTs brings new possibilities to improve or transform human activities and relationships*". The digitalization of the Brazilian population brings possibilities to use new services, such as communication, searching for information or leisure. This transformation poses the risk of increasing the social exclusion of those individuals who are not keeping up with these new trends. In our study, we have focused on older people, who, despite running the risk of being digitally excluded, have mostly been overlooked from ICTD research (Fernández-Ardèvol, 2014).

In addition to technological infrastructures, which seem to have been the focus of current policies in the ICT ecosystem in Brazil, we considered that understanding how (older) people – another, element of an ICT Ecosystem (Open e-Policy Group, 2005) - use ICT is key to introduce effectively these technologies in developing countries, given that why people use these technologies and how they use them should provide us with challenges and opportunities to inform the design of technologies (and infrastructures) that give support to a number of their basic and non-instrumental needs.

We present the lessons learned from a rapid ethnographical study (Millen, 2000) conducted in an educational centre in Sao Jose dos Campos, Brazil (Casa do Idoso), with approximately 80 older people with little to moderate previous experience with ICT. The results show that the basic needs of our participants to use ICT were dynamic. Their non-instrumental needs, which were not so strongly connected with conducting tasks with the technology, but with the benefits of carrying them out, remained fairly constant, i.e. were independent of their experience with ICT. The basic needs were related to being able to use ICT independently. Participants without

previous ICT experience had difficulties using the keyboard and the mouse. By contrast, those with more experience with ICT, had more difficulties in creating accounts and performing tasks that require a large number of steps for them, such as sharing files via Skype. The participants' basic needs changed as their experience with ICT increased. With respect to their non-instrumental needs, interacting with relevant others was seen as a way of reducing isolation and a strong motivation for learning (and using) ICT. Sharing multimedia content and feeling in control of their privacy were key and time-persistent (i.e. regardless of ICT experience) elements of this computer-mediated communication. Online videos, such as those available on YouTube, enabled evocation of memories and were seen as a potential means of increasing knowledge and skills.

A number of implications for fostering the ICT uptake in Brazil can be drawn from the results. We argue that ICT courses which take (basic) and non-instrumental needs at their core can make a substantial contribution towards empowering older Brazilian people to uptake ICT, and that using multimedia and communication tools in these courses is key to keep them digitally engaged and increase potentially the fit of ICT in their lives. We discuss these opportunities further at the end of the paper. We review previous and related works in the section that follows.

B. Related work

B.1 Changes in the ICT ecosystem of Brazil and the situation of older people

Due to the low level of Internet access in Brazil, policy makers have issued laws and social programs aimed to increase physical access to technology and thereby overcome digital inequalities. In 2005, the Brazilian government invested in various programs, equipment, infrastructure and tools to extend technological access to the poor (Nemer, Gross, & True, 2013). This first attempts were mostly concerned about lowering the price of computers and pushing them into people's homes, failing to provide social and educational programs that could lead to appropriation of the technology. This strategy was not as successful as planned because the target people

did not use the technologies as they were supposed to (Nemer et al., 2013) and the number of computers acquired did not live up to expectations (Passos, 2012). The government's current approach is geared towards individuals and communities, promoting the spread of LAN houses and telecentres. These centres seem to take on a central role in the ICT ecosystem of Brazil, by providing Internet access to the general public and, in some cases, offering computer sessions to communities (Nemer et al., 2013).

Whilst the number of households in Brazil with at least one computer increased from 10,6% in 2000 (IBGE, 2000) to 38,3% in 2010 (IBGE, 2010), a 2013 survey on the use of ICT in Brazil (CETIC.br, 2013) shows that 86% of the people aged 60+ has never accessed the Internet and 84% has never used a computer. This percentage is much higher than the entire population (41%). The survey argues that the most significant reasons for this non-use of computers amongst older people in Brazil is a lack of interest (81%), followed by a perceived lack of ICT literacy (67%). Although the penetration of mobile phones among older Brazilian people is higher (61%) than that of computers and the Internet, older people in Brazil use mobile phones chiefly for making and receiving calls: only 3% reported having accessed to the Internet from their phones in the survey. Other groups who are also mostly digitally excluded are young and adult people living in rural areas (70% of them) or in poor families (75% of them).

Focusing on reducing Brazilian digital inequalities, previous ICTD studies argue that public access centres can promote digital inclusion in the country (Reinhard & Anne Macadar, 2006), (Lemos & Martini, 2010) & (Nemer et al., 2013). Yet, recent research draws attention to the fact that centers of public access "may be bringing the benefits of computers and the Internet to a broader sector of the younger population in low-to-medium socio-economic status, but further marginalizing those that are worse off (those in extreme poverty, and the elderly, among others)" (Gomez, 2014). In fact, those centres are known to be primarily attended by the youth (Madon, Reinhard, Roode, & Walsham, 2009), (Lemos & Martini, 2010) & (Gomez, 2014). Figure 4 shows the age distribution of users of public access centres in 25 countries (including Brazil). The figure depicts that usage tends to be heavily concentrated around youth and dramatically declines among older adults. A

recent survey on centres of public access in Brazil showed that 62% of the users were aged between 16 and 24 years old and only 4% were older than 60 years old (CETIC.br, 2014).
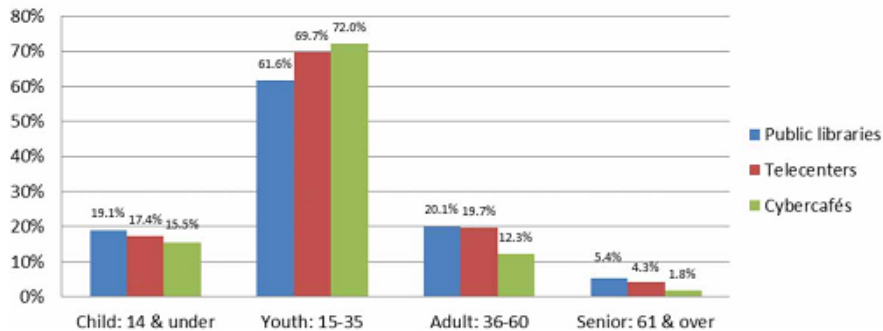
Figure 4. Age distribution of users of public access centres (Gomez, 2014)

This low participation of older people in centres of public access can be accounted for the fact that they feel intimidated by the high presence of youth (Roman & Colle, 2002) or because there is a shortage of activities targeted at them. While we could have decided to focus on this element of the ICT ecosystem in Brazil – namely, why older people do not turn up in telecentres - we decided to work with those who do take computer lessons in other places in order to (a) understand their situated ICT use and (b) inform the design of better strategies and technologies to increase their digital inclusion in the country.

B.2 Children and women in ICTD…and older people?

Whilst it is widely agreed that the older population runs a severe risk of being digitally and socially excluded, this user group has mostly been overlooked in ICTD research. ICTD scholars tend to focus on children (Hussain, 2010), (Salinas & Sánchez, 2009), women (Shroff & Kam, 2011) or low-literate people (Thies, 2014). To illustrate this fact, we conducted a desktop-based search using different combinations of the words: elderly, older people, older adults, ICTD and ICT4D in two databases - Scopus and Web of knowledge - and Journals - Information Technology for Development and International Journal of Educational Development. This search yielded a few studies, which we review next.

Sa-nga-ngam and Kurniawan (Sa-nga-ngam & Kurniawan, 2006) addressed the browsing behaviour of older people from three different countries: UK, USA and Thailand, finding that older people from developing countries had more difficulties in browsing than those from more developed ones. Bailey and Ngwenyama also made an interesting contribution to the field (Bailey & Ngwenyama, 2010). They focused on the intergenerational interaction in five telecentres in Jamaica. Their research highlighted that the digital inclusion of older people facilitates their social inclusion too. The results showed that the involvement of the older generation in the telecentre environment is useful for exposing older users to ICT, building new social ties and promoting knowledge transfer. The outcomes of their empirical study also highlighted that despite the fact that the older generations faced more difficulties in the ICT introductory lessons than did the other groups, there was much less sponsorship of classes for them. Fernández-Ardèvol (Fernández-Ardèvol, 2014) pointed out that most empirical studies in ageing and ICT refer to developed countries. She conducted a case study on the use of mobile phones by 20 older people in Peru. The results revealed that voice calls was the most used service and that the participants of her study had difficulties in using the device due to a lack of skills. The results also suggest that the participants were dependent on their children for using or obtaining a mobile phone. Similar findings were highlighted in a survey conducted with 271 older Internet users in Brazil (Leme, Zaina, & Casadei, 2014), which showed that although most of the participants had mobile phones they experienced difficulties in handling them. Yet, those aged 50-60 and with higher educational attainment reported having fewer problems using their mobile phones than those aged 60+ and with lower educational levels.

With the exception of (Leme et al., 2014), none of the studies reviewed above have worked with older people in Brazil. Our study, which combines opinions and first-hand observations of ICT use, deepens and widens the results of the survey presented in (Leme et al., 2014), as we discuss later.

B.3 *Design of ICT for older people*

As stated in (Rogers et al., 2014), the focus of previous research into digital technologies for older people has primarily been on the

"downside of ageing", i.e. helping to compensate older people's frailties and the assumed needs that arise with age. Research on assistive technology is a noteworthy example of this trend (e.g.: (Magnusson, Hanson, & Borg, 2004), (Hening, Cottrell, Teoderescu, Kurniawan, & Mantey, 2013) and (Bobillier Chaumon, Michel, Tarpin Bernard, & Croisile, 2014)).

We are Human-Computer Interaction (HCI) scholars interested in contributing to the well-being and social inclusion of older people mediated by ICT. While assistive technologies can and should work towards this end, we aim to explore how contemporary ICT are used by older people, in developed and developing countries, who experience normative age-related changes in functional abilities, i.e. are able to conduct daily activities on their own (Ferreira, Sayago, & Blat, 2014). Achieving this goal rests on understanding older people's situated use of ICT. To this end, we have turned to ethnography, we consider that its focus on "gaining an insider's view of a situation" and "gathering information in the settings in which the activities of interest normally occur" (Blomberg & Burrell, 2009) should help us to achieve the goal of our research. However, and despite being the backbone of HCI research over the last decade (Liu et al., 2014), and among the first methodologies used in ICTD research (Toyama, 2010), ethnography has seldom been conducted in the ICTD studies with older people reviewed above.

C. Description of the study

C.1 Approach: rapid ethnography

Due to time and resources limitations, we conducted what has been named as rapid ethnography (Millen, 2000), instead of a more classical, longer-term approach. Rapid ethnography is a collection of field methods intended to provide a reasonable understanding of users and their activities in a limited time in the field (Millen, 2000). The core elements applied in this study were narrowing the research focus, using key informants and interactive observation techniques, and drawing on computer-assisted analysis.

C.2 Setting: a reference centre in Brazil

Casa do Idoso, São José dos Campos [15] – is a reference centre in Brazil that promotes free activities in the areas of welfare, education, sports, recreation and culture for people aged 60+. These activities are offered as either regular courses, which require prior registration, or free activities throughout the day. Coordinated by the Department of Social Development of the Municipality of São José dos Campos, the first unit was founded in the city centre in 2007. With the success of the first centre, the project was expanded and at the time of writing this manuscript there are three operational units in the municipality of Sao José dos Campos.

We conducted our study in the city centre unit, which receives around 600 older people on a daily basis. Computer classes are organized as part of regular courses, whose sessions last one hour and a half and are conducted twice a week. The computer room has 15 computers and participants tend to work individually with them. During the rapid ethnographic study, 8 initial level and 4 advanced courses were running in the centre. Conversations with members of the staff indicated that the ICT courses attracted so much interest that there was a waiting list.

C.3 Participants: a mix of women and men

78 participants, aged 60+, took part in the study (43 women, 35 men). 44 of them were enrolled in the course of introduction to the ICT. They had less than 6 months of experience with computers. The focus of the course was on learning how to use the mouse, keyboard, MS Word and on providing older people with basic aspects of Internet use (e.g. access to websites and e-mail). 34 participants were enrolled in the advanced level course. They had more than 1 year of experience with ICT and were familiar with several Internet applications, such as e-mail, online social networks, search engines or newspapers portals. In conversations with the instructors of the course, they told us that the course focused on Internet because participants were very interested in using online

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[15] Caso do Idoso, São José dos Campos:
http://www.sjc.sp.gov.br/secretarias/desenvolvimento_social/casa_do_idoso.aspx

communication tools (e.g. sharing files on the e-mail, Skype, online chats or Social Network Sites), accessing to information online (e.g. online maps or videos) or using online media edition and creation tools (e.g. creating and online card or editing a photograph).

The staff of the centre reported, and our observations confirmed, that most of the participants that take part in the activities in Casa do Idoso come from poor families and have low levels of educational attainment. One of the instructors [IIM2][16] claimed that the computer classes attracted a few users with a higher socioeconomic level: "There is one participant that has been city councilman. There are others that their children are for instance lawyers or journalists." Our observations and conversations with the participants revealed that most participants had low socioeconomic levels. Their educational attainment was low (most of them had completed primary school only). Still, they were all capable of reading and writing. Most participants came from poor families from the municipality and only 7% did come from middle class families.

Four course instructors (2 women, 2 men), aged between 28 and 38, also took part in our study as key informants. Two instructors held a Computer Science degree and were the official teachers and responsible for the ICT courses (introduction and advanced levels). The other two were teaching assistants.

D. Data gathering and analysis

Over one month, the fieldworker – and first author of the paper- was a teaching assistant in these courses (60 hours). She conducted participant observation (DeWalt & DeWalt, 2010) in order to develop a close-up view of the participants' interactions with ICT. She observed how they interacted with several ICT (such as Skype, e-mail systems, Social Network Sites, MS Word and multimedia editing tools), talked with them about their experiences of using

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[16] The code for participants' identification consists of: (a) their role in the research (P=older participant, I=instructor), (b) the course level on which they were enrolled (I=initial, A=advanced), their sex (F=female, M=male) and the numerical ID that the fieldworker assigned to them.

these technologies and with teachers of the courses as well. While teachers of the introductory course to ICT proposed most of the activities, these were suggested by the participants themselves in the advanced level course.

Following up on the active role of the participants, the fieldworker also carried out 4 Participatory Design (PD) (Spinuzzi, 2005) sessions in order to explore further their interests. In particular, participants showed big interest in online video portals. Thus, PD sessions focused on strategies for searching, watching and sharing online videos. 32 older people participated in these sessions. Firstly, examples of video sharing sites (such as Youtube or Vimeo) and video on demand portals from local TV channels were presented to the participants. Secondly, the participants created their own prototype by selecting among several key interaction elements of these portals, such as content searching and video recommendation modules, and functions for sharing and writing comments. Finally, these participatory design activities were aimed at stimulating the discussion about the video portals and possibilities for searching and sharing content online, and participants voiced their opinions about these aspects (Ferreira et al., 2014).

Semi-structured interviews were also conducted with 4 computer instructors in an attempt to understand further the context and triangulate the results. The interviews were carried out individually, in the cafeteria or at the classroom in the centre, before or after the courses. The interviews were conducted at different stages of the study. Before starting the participant observation activities, an interview was performed with the main course instructor in order to understand better the setting and practices. During the activities, short interviews were conducted in order to gain the point of view of the different instructors (and teaching assistants) and validate / challenge the observations and conversations with the participants, all of which helped us to plan the following activities (e.g. observations, conversations and interviews). At the end of the data collection period, a final round of interviews was carried out with the course instructors with the aim of deepening and widening our initial findings.

Fieldnotes of *in situ* observations and conversations with the participants (and instructors) were taken during or immediately after

the sessions (interviews), depending on our participation in them. The entire body of collected data was coded line-by-line (Open Coding), resulting in several preliminary categories (Axial Coding), applying an adaptation of the Gilbert's interpretation (Gilbert, 2008) of Grounded Theory (Strauss & Corbin, 1998). Open and axial coding were both conducted at the end of each day of field work. This analysis was used for planning the following activities (e.g. observations, conversations and interviews). The preliminary categories were discussed amongst the authors until agreement was reached. This data analysis led to the following main and subcategories, which we use to present the results[17]:

A. *Basic ICT-mediated needs*: accessibility, access to technology, need of support.
B. *Non-instrumental ICT-mediated needs:* keeping in touch with friends and relatives, multimedia enriching their leisure and communication, searching for information related to their hobbies and interests.
C. *Main off-putting factors*: privacy, interaction is content dependent.

E. Results

E.1 Participants' basic ICT-mediated needs

Coping with technical accessibility issues (e.g. size of elements of user interfaces), difficulties in having physical access to computers and a lack of independence (i.e. relying on support provided by relatives or instructors) when using them were the most important and basic needs that participants had to fulfil in order to use ICT autonomously and truly uptake these technologies. We discuss them next.

E.1.1 Accessibility

Participants had to cope with several accessibility problems due to their low ICT literacy and the fact that most of the technologies they used in the courses were not well enough adapted to their needs.

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[17] More details on the data analysis process are presented in Annex 1.

When starting to use computers, the most important accessibility issue was related to a low familiarity with the input devices, i.e. keyboard and mouse. However, with more experience, difficulties typing and using the mouse were largely overcome, or, at least, reduced to a great extent. By contrast, a recurrent accessibility issue was setting up accounts and signing in. The comment made by [PAF30] from the advanced level course about the Captcha when creating an account illustrates this fact: "*What is this? I can not see anything!*" Another common difficulty was to perform interactions that required too many steps. To be able to overcome these interaction issues, the participants had to develop their own solutions, such as taking notes about punctuation and accentuation keys, as depicted in Figure 5. More details on the accessibility issues and the solutions adopted by the participants are presented in Table 5.
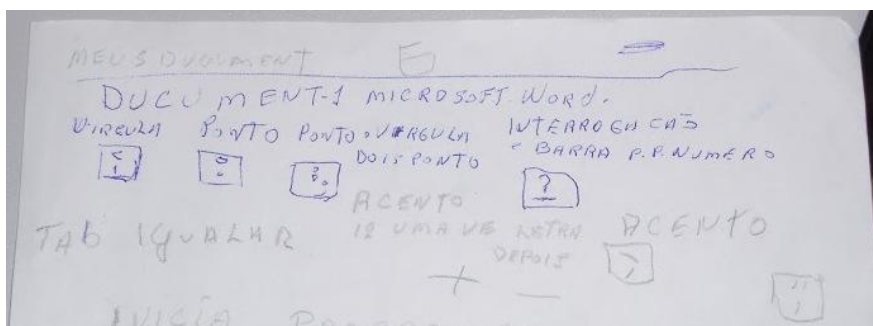
Figure 5. Participant's notes regarding punctuation and accentuation keys

Issue	Description	Participants' solutions
Using the keyboard and the mouse.	The keyboard main accessibility issues are the size of the symbols and understanding the function of some keys (such as enter, shift or tab). The punctuations and accentuations keys are too small and many participants could not see the difference, for instance, between the dot and the coma.	In order to minimize these difficulties, participants take notes related to the keys and their functions.
	Coordination problems and lack of precision made it difficult for the participants to use the mouse	To improve their coordination with the mouse participants practiced and performed a lot of exercises, such as drawing in Ms Paint.

	when, for instance, using the Windows Start pull down menu.	
Creating accounts and login	The participants needed support to sign up online (e.g. e-mail or Skype) and could not accomplish the task independently.	Relying on the support of other people for registration.
	Another main issue is to remember their username and password to sign in.	Taking notes of their username and password.
	An extra difficulty is added to the process when the system requires a Captcha test to finalize the process. Participants did not understand why they did not write what they could barely see in the image.	
Too many steps	For those participants without much ICT experience, interactions that require few steps, less than three, and use the main function of the application, were easy to perform. For instance, once the video player on YouTube is already opened, running a video only requires one click in the play button. On the other hand, more complex tasks, with many steps and that differ from the basic flow of the application, such as adding a new friend to or receiving a file via Skype, were difficult for those participants without much ICT experience and they required support.	Participants with little ICT experience tend to focus their interaction on the basic features of the applications and start to explore more complex tasks when they feel more confident (practice).

Table 5. Main interaction issues and solutions

E.1.2 Access to computers

Participants and instructors claimed that their first encounters with the Internet were mostly through computers borrowed from younger family members or the ones available in free public spaces (such as

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Casa do Idoso). Some participants pointed out that sharing computers with other family members often lead to arguments, as the comment made by [PAF17] from the advanced course shows: "*I used to use my son's computers at home. But now he has put a password and I can't use it anymore. He says I do a mess on everything, can you believe it*?" Participants also considered that a pro-active behaviour was essential for them to get access to Internet. This factor can be an issue if we acknowledge the fact that the majority of today's older people exhibit a passive behaviour when they start using ICT.

With more ICT experience, most participants either bought their own computer or asked their sons to pass on their old computers to them. As one of the instructors [IAF4] said to the fieldworker: "*It is very common that they come to the initial level course without a computer and after some time they buy one. In the advanced level course most of the participants have a computer at home.*"

E.1.3 Peer support

Participants with low ICT experience reported needing support when using computers. Their first strategy was to ask their children for help. Yet, this strategy often did not solve all their needs. Some participants complained that their children did not have either enough time or the patience to teach them. Another strategy, more successful, in their opinion, was to apply for ICT courses targeted at older people. Indeed, one of the teaching assistants [IIM2] told the fieldworker: "*They often come to ask questions out of class. They ask about everything, e-mail, Facebook…*" Figure 6 shows a participant receiving support during the course of introduction to ICT.

Figure 6. Participant receiving support during a introduction to ICT class

E.2 Participants' non-instrumental ICT-mediated needs

We observed, and participants confirmed, that they took advantage of ICT to enrich several aspects of their daily lives. By using ICT, our participants had the opportunity to open and use new communication channels for them, such as e-mail or online social networks. Using these tools made them feel more socially included and keeping up with the times, thanks to having access to popular communication channels amongst the young. Working with different types of media was considered a very pleasant leisure activity, contributing to their well-being and also enriching their communication. Furthermore, participants used the Internet to search for information related to their interests.

E.2.1 Using the computer for keeping in touch with friends and relatives

Most participants used the computer for keeping in touch with family members and people from their community. An example of this situation is when, at the end of an advanced level class, a participant [PAF15] called the instructor [IAF4] to show a video she had received by e-mail: "*Come to see it! It is a video about my grandson. It is from his graduation day! My daughter sent it to me.*"

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The e-mail was the most popular computer-mediated communication tool. The participants started learning to use the e-mail in the initial level course, but many of them already used it, before coming to class, even with a limited knowledge about computers. After having some ICT experience, participants started to use social network sites (SNS), which became a very popular tool among them. Sharing pictures via e-mail and SNS was a very common practice, as the instructor of one the courses [IIM1] told the fieldworker: "*Many of them publish things in Facebook, add pictures… For instance yesterday a student published something on my wall.*" The participants with more practical knowledge of ICT also used Skype to talk with their family members (mostly living abroad) – probably, in an attempt to spend less money on intercity phone calls.

E.2.2 Multimedia, enriching their leisure and communication

Working with multimedia content motivated the participants to learn ICT. For instance, the participants used search engines for seeking pictures online. They also downloaded pictures from their cameras and transferred them onto the computer in order to send them via e-mail. Participants reported that they enjoyed looking at pictures of, for instance, their birthday party on the computer. This brought back nice memories of key moments in their lives. Figure 7 illustrates this fact showing two participants watching an opera video in their free time.

Figure 7. Participants watching video in their free time

Another, much stronger motivation for working with multimedia was related to communication. Participants were very motivated to search, edit and share content with people they knew. Receiving a picture, video or a multimedia presentation by e-mail triggered their interest in learning how to work with this type of content.

- Instructor [IAF4] talking with the fieldworker about advanced level course participants: "*They enjoy sending and receiving MS Power Point presentations by e-mail. Many of them ask me how to do it. They want to learn to create their own presentation with cool effects in the introduction and music.*"

Sharing media is a common practice among the participants. Once they learn to use the Internet, both the least and most experienced users shared pictures and MS PowerPoint presentations by e-mail. Participants received several e-mails with media content and forwarded them to their contacts, including people that they knew but were not very close to them, such as colleagues or instructors from the centre. In addition to the mail, participants with more ICT experience also shared media in social network sites, mainly Facebook.

- A participant [PIF7] talking with the fieldworker during an initial level course: "*Can you give me your e-mail address? I will send you very beautiful things. Can you send me some pictures from Spain? I really like beautiful pictures!*" A few hours later the participant e-mailed the fieldworker an MS PowerPoint presentation with pictures and a religious message.

E.2.3 *Searching for information related to their hobbies and interests*

Apart from keeping in touch with people they cared for, participants searched for information online related to their interests and/or hobbies. It was not uncommon to see participants searching for news while waiting for a course to start. In this case, ICT were used as a strategy to enrich their off-line activities, such as DIY (Do-It-Yourself), as the following extracts illustrate:

- A participant [PAF22] talking with the fieldworker during an advanced level course: "*I often watch videos on the Internet. I especially like handcraft videos, last month I learned to do some handmade boxes by watching these videos.*"

- After one session a participant [PAF30] asked the fieldworker*: "Can you teach me how to send these images to myself by e-mail? They are so beautiful I want to save them and later on use them in my paintings."*

E.3 Main off-putting factors

In addition to having to deal with and/or overcome accessibility and access to technology issues, there were other factors that put participants off using ICT. The main issue was related to a perceived lack of privacy online, which is strongly connected with a deep distrust of the technology.

E.3.1 *They need to feel in control of the technology*

Privacy was a big concern amongst all the participants. They needed to feel in control of the technology to decide 'who can see what' online. Participants reported not feeling comfortable enough when sharing content online with people they did not know - close groups of known people were preferred (e.g. friends on Skype, Facebook or sending an e-mail to a group of people).

- Instructor [IAF4]: "*Participants often ask lots of questions about Facebook. Some want help to upload pictures. They have doubts in relation to public and private messages.*"

Thus, it was little surprising that some participants started to be very selective when adding new contacts in communications tools, such as Facebook or Skype, or, in the case of those with almost no previous experience with ICT, reporting 'being afraid' of using them.

E.3.2 Interaction is content dependent

The participants' interaction with ICT was always content dependent. Popular topics of interest amongst the participants were, for example, their favourite singers, famous TV presenters, religion or topics they felt attached to (as their family or neighbourhood). When the activities proposed in the courses were of no or little interest to the participants, they reported not seeing the reason for (learning) to use a particular type of ICT. By contrast, when the technology enabled them to work with or access content in which they were interested, they, as we have shown throughout this section, were fairly active learners and ICT users.

F. Discussion

A first and pertinent question to discuss is the extent to which the results support the claim made in this paper. We conducted our study in a social centre. Thus, how do the results carry over to telecentres? While we acknowledge the fact that having conducted our study, or part of it, in a telecentre would have enriched this paper, we consider that the results back up and illustrate in detail the need of going beyond telecentres to achieve the goal of fostering the digital inclusion of older people in Brazil. Providing older people with a technological infrastructure and places where they can go and use computers and the Internet does not necessarily mean that they make the most of the technologies or do actually use them. Warschauer (M Warschauer, 2004) made a similar claim is his oft-cited book *Technology and Social Inclusion: Rethinking the Digital Divide*. In this paper, we concur with and extend his point by focusing on older people in Brazil, which was not addressed in the book, and on stressing the need of both being aware of their basic needs when it comes to using ICT and enabling older people to meet them. Doing so rests on having a group of people who can provide support and design suitable educational activities. Moreover, when these basic needs are fulfilled, older people – at least, our participants – aspire to meet non-instrumental ones that make them feel more socially included and close to their relatives, for instance. Telecentres *per se* are therefore not sufficient to achieve this digital inclusion.

Having discussed how the results relate to the claim made in this paper, it is worthwhile to reflect on the novelty of the findings and

how they are related to previous studies. To begin with, going beyond telecentres by taking into account and supporting the evolving needs of ICT use of older people might be evident for some scholars. For instance, previous ICTD studies have argued for going beyond meeting people's basic needs (Johri & Pal, 2012). A similar claim has been made by user value studies. According to Boztepe (Boztepe, 2007), value as experience is created as a result of the interaction between what the product provides and what the users bring in terms of their goals, needs, limitations, etc. Previous studies in this field argue for understanding how values changes over time (Parasuraman, 1997), (Boztepe, 2007), (Nurkka, Kujala, & Kemppainen, 2009). Our results support these claims with field evidence, and provide a lively and detailed account of participants experiences, based on ethnography, strengthening an approach that does not predominate in ICTD research. For instance, we indentified the ways in which ICTs enriched participants' lives and showed that non-instrumental needs such as remaining or keeping in touch with relatives were always independent of participants' experience with ICT. The focus on telecentres in ICTD is still dominant, and the low participation of older people in them suggests that the claim made in this paper needs to receive further support to become more widespread. Overall, there is room for strengthening older people's digital inclusion in developing countries by drawing upon the results presented in this paper. We suggest some ways forward next.

F.1 Evolution of needs at different stages of interaction

A significant result of this study is how our participants' needs varied as their level of experience with ICT increased. To understand it, we applied a cross-sectional approach (Kim, Han, Park, & Park, 2014). Following this approach, we compared the data from users with different levels of experience, from the initial course (which were having their first contact with computers and Internet) to the advanced level course (more established ICT users). The results showed that while some of their needs were time-persistent others were more evident only in their first encounters with ICT. Participants' basic needs when it comes to interacting with ICT, such as coping with accessibility issues, were dynamic, whilst non-instrumental needs, fulfilled by using these technologies, such as interacting with relevant others, remained fairly constant

throughout the study. These results strengthen the fact that, in addition to focusing on the basic needs when promoting older people digital inclusion, it is also necessary to take into consideration their non-instrumental needs, which are related to how ICT can enrich their lives, in order to promote their appropriation of the technology.

F.2 Older people require different digital inclusion strategies than younger users

By comparing our results with previous studies with younger users of public access environments, we observed similarities in relation to participants' needs, which can be fulfilled by using ICT, and also differences in their learning process and accessibility issues. Our findings show how communication, leisure, working with multimedia content and searching for information that is related to older people's interests can enrich their lives. Those needs were similar among men and women, and concur with previous studies with younger users of public access environments (Bar et al., 2013), (Gomez, 2014).

In relation to their learning process, previous research has indicated that older users might feel intimidated to learn in the same environment than the youth (Morris, 1992) & (Roman & Colle, 2002). Our observations indicated that participants faced accessibility issues that can be more critical due age-related changes, which may require more attention on those specific issues when learning a tool. Difficulties to interact with input devices, such as keyboard and mouse, can be more significant to older people due to a limited manual dexterity. In addition to this, creating accounts, remembering passwords and performing tasks with to many steps can be more critical to older people and seems to be related to age-related changes in cognition, such as declines in fluid intelligence and memory (Czaja & Lee, 2007). These results indicate that although older people may have similar non-instrumental needs as younger ICT users, they are faced with different accessibility issues which are mostly overcame or dealt with the support of instructors.

F.3 *ICT courses contribute to older people empowerment and digital inclusion*

According to (Mark Warschauer, 2002), (Gurstein, 2003) & (Johri & Pal, 2012), in addition to providing physical access to ICT, users also need to feel capable of using them. Focusing on older people in the UK, (Dickinson, Eisma, Gregor, Syme, & Milne, 2005) suggested that the provision of training courses to overcome the lack of experience with computers and the Web is a necessary short-term approach to encouraging the participation of older people in the digital world. Concurring with previous research, the results of our study highlight several aspects that indicate that educational centres, which teach ICT to older adults, contribute to their ICT uptake and digital inclusion. Our results indicate that besides the need of having access to a computer and Internet, our participants faced other basic issues as accessibility problems and need of support. These findings take forward previous strategies for digital inclusion in Brazil supporting the claim that providing older people with ICT education is key to foster their digital inclusion.

Most of our participants were afraid of using computers. Yet, after having some initial guidance at the centre, they were more motivated to practice and also use other technologies at home. Participants reported feeling empowered by the classes and felt more confident. Other ICTD scholars highlight the importance of empowering users to help themselves (Johri & Pal, 2012), (Liang, 2010) & (Norris, 2001). The results of our research showed that educational centres can empower participants to teach others with less ICT experience. Participants of the courses, after some time, and ICT experience, felt empowered to start helping other participants.

F.4 *Using multimedia and communication to introduce older people to ICT*

According to Carmichael (Carmichael, 1999), having a positive initial experience when starting to interact with a novel technology can contribute to eliminating the common feeling amongst older people of being intimidated by it. In the same vein, researchers on user value have argued that users' previous experience with a tool influences their user experience when interacting with similar

products (Boztepe, 2007), (Kim et al., 2014). Several authors (Illich, 1973), (Sen, 1999), & (Johri & Pal, 2012) have discussed the importance of technologies that enrich people's lives besides fulfilling their basic needs in developing countries. We believe that using topics and applications which will be accepted by older people, as they are appealing and accessible, when introducing them to ICT, will motivate them to make the effort to learn those tools and have a initial positive experience using ICT.

Working with multimedia and communication tools has proved to be very appealing to our participants. Our results also showed the value of online video portals as a tool to enrich older people access to information and communication. Thus, our results indicate that applying tools related to multimedia, online video portals and communication, to introduce ICT to older people, can promote an initial positive feeling about technology, enrich their daily life and contribute to fostering the ICT uptake in Brazil. A previous study, with a younger user group in Brazil, indicated that computer-based communication and leisure activities may offer an alternative pathway to gaining digital literacy (Kolko, Racadio, Deibel, Krause, & Prempeh, 2014). Our results take further these findings, indicating that communication and leisure can be also a successful learning strategy in relation to introducing ICT to the older population, which might appear surprising in face of widespread stereotypes about older people, thereby opening the possibility for them to transfer and apply this knowledge when using other ICT.

F.5 Further challenges and opportunities

When talking about ICTD, digital inclusion and older people, the discourse tends to focus on engaging those who either are not using or have given up using ICT (e.g. (Olphert, Damodaran, & May, 2005)). While this approach is to be commended, we have tackled it from a different perspective, concentrating on those who have taken the step to learn and use them. This begs the question of what lessons learned from working with older people using ICT can or could be applied to studies and policies of digital inclusion with other groups of older adults.

Our results suggest that besides providing older people with physical access to technology, policy makers and technology

developers could also focus on other, less basic, needs of older people to use ICT. Their reasons for using these technologies, how they use them and what they get from using them (e.g. feeling more socially included and active) should be taken into consideration when proposing strategies to foster the digital inclusion of older people in developing countries. Participants' motivations to use ICT were strongly connected to feeling social included and keeping up with the times.

Also, our results suggest that policy makers could focus on strategies for providing training programs specific which are meaningful for the older citizens (i.e. related to what they want to do with the technologies, to fulfilling the needs identified in this paper) and support from peers and (younger) experts. These results take one step further, proposing solutions, to a previous survey which showed that the most significant reasons for the non-use of computers amongst older people in Brazil was a lack of interest, followed by a perceived lack of ICT literacy (CETIC.br, 2013). One strategy for these training programs is to provide computer courses in centres where older people feel comfortable to attend, such as community centres or public libraries. Another strategy is to take advantage of the telecentres' structure and promote older people's participation in them by providing training courses specific target to the older population.

We believe these aspects, which stress the importance of focusing on the 'human' element of an ICT Ecosystem, can apply to other scenarios and countries. A limitation of this research is that our user group consisted of older adults with a low socioeconomic level and interested in ICT. We did not include other groups of older people, for instance, those who do not take ICT courses, with high ICT experience or from different socioeconomic levels (such as non-literate users).

G. Conclusions and future work

In this paper, we have presented a rapid ethnographical study conducted with older Internet users in Brazil. By observing and talking with them, we identified a number of important basic needs to effectively use ICT, and non-instrumental needs which ICT could

help them to fulfil and enrich their lives. The latter have been largely overlooked in previous ICTD research. Participants' basic needs to use ICT were related to accessibility issues, access to technology and need of support, which evolved as their ICT experience increased over time. Participants' non-instrumental needs were mostly focused on keeping in touch with people they cared for, enjoying free time and taking one step further their knowledge and skills. These needs were more time-persistent - regardless of their experience with ICT. We have argued that by meeting these non-instrumental needs, ICT contributed (or can potentially do so) to improving the perceived well-being and social inclusion amongst our participants.

In light of these results, we have also discussed strategies for fostering the ICT uptake in Brazil and the relative relevance of different elements of its ICT ecosystem. We have made a case for going beyond telecentres, which, despite being a step forward towards bridging the digital divide in Brazil, are not enough if we fail to consider the importance of providing older people with educational activities that enable them to meet their basic and non-instrumental needs, and how they evolve over time. Technology developers could also take into consideration older people's accessibility issues and use of technology as inputs to design more inclusive tools.

In our future work, we aim to keep exploring the basic and non-instrumental needs of ICT use by older people in developing and developed countries, as further ICTD research is still needed if we aim to bridge the digital generation divide.

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Annex 1 – Body of collected data and analysis

The data collection process resulted in a set of fieldnotes. These notes described the activities in the centre, the observations of participants' interactions with ICT and the conversations between them and the instructors. The notes were taken in the participants' (and the first author) mother language, Portuguese. Examples of the notes and the initial coding process (line-by-line) are provided in Table 6 and 7. These fragments were translated to English and edited by the authors to keep participants' privacy. Table 6 illustrates the notes taken when the first author helped a participant at the end of an activity. Table 7 shows a fragment of a semi-structured interview with an instructor. In addition to the fieldnotes, the first author also collected part of the course workbook and took pictures of the centre's facilities and participants' notes (Figure 5).

After finishing the class activity [PAF30] calls for my help. "*Can you teach me how to send these images to myself by e-mail?*" "*I also would like to send this on, is it possible?*" She points to the desktop wallpaper landscape image. The previous images she mentioned referred to a cat and a tree that were used in a class activity. I explain to her how to do it. [PAM25] pass behind us when leaving the class and interrupts our conversation: "*I also want this image of a cat. Can you please send it to me by e-mail as well?*" [PAF30] confirms to him that she will do it and we keep adding the images to her e-mail. She gets very excited when she sees that it worked and that she already has the images in her e-mail account. She gets very happy and now wants to send many other images from the computer to her mail. She likes the images of landscapes, plants, butterflies... I ask why she wants all these images for. "*They are so beautiful I want to save them and later on use them in*	Asking assistance Difficulty to share files, interest in pictures, saving images trough mail Interest in impersonal images Interest in pictures, Sharing pictures by mail Enjoying working with computer. Feeling empowered, interest in pictures Interest in impersonal pictures Using ICT for daily

my paintings. Did you know I do some paintings? I will bring something I did in the next class to show you".	activities
When she leaves I asked the teacher if she had ever taught her to use Google images. She says yes and that she loved it.	Searching pictures online

Table 6. Fragment of field note - interaction with a participant

Fieldworker: What are the things that interest the students the most? [IAF4]: *Everything related to the Internet.*	Interest in the Internet
Fieldworker: What about online social networks? [IAF4]: *Participants often ask lots of questions about Facebook. They use it at their home and ask me many questions when they come here. I also added it to the program of the course to help them. Some want help to upload pictures. They have doubts in relation to public and private messages.*	Requiring assistance Facebook, Using Facebook at home, Interest Facebook, Sharing pictures on Facebook, Difficulties sharing pictures on Facebook, Privacy
Fieldworker: Do they publish things on Facebook? [IAF4]: *They have many doubts on this. They do not know what is public and what is private. They ask all the time who can see each thing. They are also very interested in images and photographs.*	Difficulties Facebook, Privacy, Need of control, Interest in pictures, Interest in photos
Fieldworker: Do they have digital cameras? [IAF4]: *Yes, many of them want to learn how to download the pictures of their camera to the computer. They asked for it and I prepared a special session address this issue. They really liked it and showed lots of interest.*	Using ICT at home, doubts downloading pictures, requiring assistance Interest in photographs

Fieldworker: Besides the printed material of the course they also take lots of notes during class, don't they? [IAF4]: *Some of them take notes of everything. But most of them only take notes of the things that are more important. I prepared the workbook step by step, with images of the interfaces but even then many people take extra notes during class.*	Taking notes, selectively taking notes Offering training Learning strategy
Fieldworker: What about online videos? Have they watched them before? [IAF4]: *They are very interested in this. I could not teach it to all courses yet but for some of them I taught how to use Youtube and the web of "Mais Você"* (a famous Brazilian TV program). *They liked it a lot. Many of them watch videos from home.*	Interest in videos Applying local content in training, Interest in videos. Watching videos at home
Fieldworker: And online maps? [IAF4]: *We did one activity with Google maps. They had to search for the place they live. They enjoy seen their house there.*	Using Google maps. Learning throw exploring community
Fieldworker: Yesterday one woman told me she had a fight with her son because he added a password so she could not use his computer. Is that common? [IAF4]: "*Yes, around three people have told me something similar to this already. They said their children or grandchildren added a password in the computer so they can't use it anymore. Many others also comment that they ask their children or grandchildren for help with the computer but they do not have the patience to explain to them*"	Problems sharing computer with family Difficulties having access to a computer Requiring assistance, Family not helping

Table 7. Fragment of field note - semi structured interview with teacher

The field notes were coded line-by-line (Open Coding), resulting in several preliminary categories (Axial Coding)[18]. Following we present the preliminary categories, and subcategories, that emerged from the Axial Coding:

- Factors which can potentially contribute to the ICT uptake: communication, multi-media, online video portals, context dependent.
- Factors which can potentially limit the ICT uptake: accessibility, privacy, fighting against settings issues, need of a pro-active behavior.

These preliminary categories were discussed amongst the authors until agreement was reached. In these discussions, we changed the name of some categories, deleted and grouped them into other categories. This data analysis led to the main and subcategories presented in the body of the paper.

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[18] We used the software NVivo in order to facilitate the data analysis. (http://www.qsrinternational.com/default.aspx)

3.2 Towards iTV services for older people: exploring their interactions with online video portals in different cultural backgrounds

Abstract: With a growing ageing population and the advent of interactive TV (iTV), understanding how older people use iTV services is a timely and important task. Working towards this end, this paper reports on *in situ* conversations of, and observations with, almost 400 older people, with different levels of educational attainment and experience with ICTs, while talking about and using online video portals and similar interactive systems in Spain, Brazil and Denmark. The results show more similarities than differences in their reasons for adopting online video portals and patterns of use. All our participants used these portals for keeping or remaining in touch with people they trusted. The results also show that privacy online was a common concern to all the participants. Differences in the acceptance of e-government services and the type of content that drove most of their interactions were also found. Implications for designing more accessible and meaningful iTV services are discussed.

Keywords: Ethnography, older people, cross-culture, iTV, online video portals.

A. Introduction

With a growing ageing population and the advent of interactive TV (iTV), there are reasons to argue that understanding how older people (60+) use iTV services is a timely and important task. iTV opens up numerous opportunities for communication and access to online information/services, which could (and should) be of great

benefit to older people. Communication serves key functions in ageing, such as reducing isolation, and having access to online information and services is seen by many as paramount to enable older people to remain fairly independent and (digitally) engaged in today's society. However, most of them run the risk of being unable to access and make the most of these services, due to their either lack of or little experience with ICTs, and a tendency to exclude them from technological developments (Newell, 2011). In our research, we aim to design more accessible and useful iTV-based communication and information seeking services for, and with, older people.

Working towards this goal, we address in this paper the question of how older people interact with online video portals. We started by exploring the relationship between older people and non-interactive and digital TV. Yet, those older people who participated in a number of user studies were concerned about us conducting *in situ* observations of how they watched TV at their home. Thus, we decided to explore how they interacted with online TV portals. We considered that doing so could (and should) aid in conceiving better iTV services for the older population, since online video portals are increasingly popular (Burgess & Green, 2009) and can be regarded as an implementation of iTV (Chorianopoulos & Lekakos, 2007).

In this paper, we report on *in situ* conversations and observations we conducted with older people, who were motivated to learn and use online video portals and other related technologies, such as OSN (Online Social Networks), in three countries, Spain, Brazil and Denmark. Older people are often described as a (very) heterogeneous user group, and doing user studies in different countries could (and should) help us understand how similar or different older people are in terms of their attitudes towards and interactions with online video portals. In Spain, we conducted fieldwork activities in a highly participatory adult learning community in Barcelona over a 3-year period. 201 participants were involved in the study conducted in the city of Barcelona. In Brazil, we conducted first-hand observations of and conversations with 78 participants while they went about using computers during a month in a center that runs computer classes to older people. We also conducted 13 home interviews in Brazil. In Denmark, the fieldwork was performed over a 4-month period, including 78 participants

from two different social centers, and 13 participants, who took part in home interviews.

Overall, and perhaps surprisingly, a key and common finding to the three user studies is that participants exhibited more similarities than differences in their use of online video portals, despite their different cultural backgrounds. All of them saw in online video portals an opportunity to foster socialization and communication. They also showed strong concerns about privacy. We found differences too, especially in the participants' interest in e-government services.

The remainder of the paper is organized as follows. Section 2 presents a literature review on older people, iTV and cross-cultural HCI related to the objectives of the paper. Section 3 describes our study and Section 4 presents the main results. Section 5 summarizes the results and discusses them along with the methodological approach. Section 6 closes with the main conclusions and future work perspectives.

B. Related work

B.1 Older people and iTV

Previous studies have mostly concentrated on developing prototypes for communication (e.g. (Svensson & Sokoler, 2008) and (Rice & Alm, 2008)). Svensson *et al* (Svensson & Sokoler, 2008) address the social isolation of older people and the importance of TV in their lives. They argue that TV is a central piece of furniture in older people's living room, and that watching TV is an activity they enjoy most at night. Svensson *et al* introduce the concept of "ticket-to-talk". This concept assumes that everyday activities, such as going for a walk, gardening, reading and watching TV, provide (older) people with an opportunity to start a conversation and socializing with others. They discuss the potential use of iTV as a resource for social interaction, and propose a prototype that aims to facilitate and stimulate the communication amongst older people while watching TV. They also stress the importance of identifying future services and applications that support the development of social relations among senior citizens.

Rice and Alm (Rice & Alm, 2008) carried out two studies aimed to identify older people's areas of interest for iTV applications and how they would use them. By conducting theatre and paper prototyping, the participants showed a big interest in keeping in touch with family and friends. Rice and Alm compared the use of new navigational layouts with the traditional iTV interaction, and evaluated four prototypes of communication systems for sharing multimedia contents. The results show that older people had difficulties in understanding some of the terminology and interactive concepts used in traditional design. The results also indicated a number of weaknesses in the design of more conventional layouts. Their research indicates that techniques that mimic aspects of the real world are possible new directions towards designing digital TV interfaces. Rice and Alm stress the fact that "significant work is still needed to design interfaces that can support the elderly population skills and abilities" (Rice & Alm, 2008)).

Other studies have focused on the opinions of older people about iTV. Kurniawan (Kurniawan, 2007) studied the reasons that make digital TV unappealing to them. Three older women were interviewed. The youngest one was 69-years-old. One of the issues raised by these older women was that on-demand movies are not appropriate for older people, as the movies contain inappropriate language and excessive sexual and violent scenes. The older women also indicated that the tasks were very complex (e.g. multiple screens, moving text, extra remote control). Other barriers were the cost of digital TV systems and a perceived lack of human support. Papa (Papa, Sapio, & Pelagalli, 2011) conducted focus groups to explore and analyze the user experience of older people with digital TV and, in general, with future services enabled by broadband ICTs. The results show the influence that aspects such as the technological equipment available at home, the attitude towards digital technology and lifestyles can have on older people's interaction with digital TV.

While there is growing awareness in Human-Computer Interaction (HCI) that studying interactions as they occur (i.e. in out-of-laboratory conditions) is worthwhile to design better interactive technologies (Moggridge & Atkinson, 2007), none of the studies reviewed above have studied *in situ* the interactions of older people with online TV sites.

B.2 Cross-cultural HCI with older people

With ICTs being used almost worldwide, the importance of understanding cultural similarities and differences in how people use them is important. However, very little cross-cultural HCI research has been conducted with older people. Previous studies have primarily focused on cultural variation amongst developed (European) countries ((Blat, Sayago, Morelli, & Rizzo, 2010), (Cortellessa & Scopelliti, 2008) and (Mckay, 2005)). To the best of our knowledge, a few of them have taken into account countries with different levels of development ((Schibelsky, Piccolo, Cecília, & Baranauskas, 2008), (Sa-nga-ngam & Kurniawan, 2006)), despite the importance of conducting user studies in these countries to help to improve the quality of lives of their people and the uptake of ICTs. Schibelsky (Schibelsky et al., 2008) focused on Brazil and argued that while many countries are considering questions related to personalization and bringing TV closer to the PC functionalities, in Brazil, it is important, at least, as a first step, to see TV as a mass and collective media before thinking in terms of digital TV services. Sa-nga-ngan (Sa-nga-ngam & Kurniawan, 2006) studied older people's browsing behavior in the UK, US and Thailand, finding that older people in developing countries had more difficulties in browsing than did those living in more developed ones.

C. Description of the study

C.1 Motivation and objectives

"The major open research question in iTV is when, and how much audiences want to interact with devices, content, and other people" (Chorianopoulos & Lekakos, 2007). In our study, we approached this question from an HCI perspective, and addressed it by focusing on:

(a) identifying the accessibility issues that hinder more severely the interactions of older people with online video portals;

(b) examining how they interact with and use these portals in out-of-laboratory conditions;

(c) exploring cultural differences and similarities in (a) and (b) in developed and developing countries.

C.2 Research approach

We conducted three *user studies*, involving 393 participants. They can be considered a heterogeneous user group, as it is composed of people with different levels of educational attainment, ranging from primary (children) to secondary school (i.e. before college), and previous experience with ICTs, ranging from three months to more than 10 years using these technologies. The studies were conducted in Spain, Brazil, and Denmark. Table 8 describes the data gathering methods and describes briefly the settings where the studies were conducted. We provide key aspects related to the research approach adopted in each user study next.

The study conducted in Barcelona was the core of the research[19]. We conducted a 3-year (2010-2013) ethnographical study in Àgora, an adult educational center. Over this period of time, the first author participated in 14 computer courses and 16 drop-in sessions, resulting in a total of 234 hours of fieldwork with 201 older people (aged 60 to 85; women: 113; men: 89) with different levels of experience with ICTs. They reported having been using these technologies for about three months to six years. Informal conversations revealed that the participants were born in different Spanish regions and had low levels of educational attainment (70% finished primary school). Since Àgora follows a very participative and learner-centered methodology (Aroca, 1999), the courses and drop-in sessions took into consideration the daily needs and interests of older people. Thus, most of the activities conducted in our study focused on meeting their needs, which were, amongst others, to know more about CMC (Computer-Mediated Communication) tools, such as the e-mail, and seeking information and resources online, as well as tools for editing multimedia

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[19] Since the first author is current doing her PhD research in Barcelona.

content. Questionnaires and dairies were also administered to the participants to enrich our observations and informal conversations. 8 participants (4 men, 4 women) filled in the diaries over a 1-week period. The questionnaire consisted of 24 questions. 21 (8 men, 13 women) participants filled it in.

In Brazil, the study lasted 2 months[20] and it was divided into two stages. In the first stage, we conducted, over a month, a (rapid) ethnographical study (Millen, 2000) with 78 participants (aged 60 to 80; women: 43; men: 35) in Caso do Idoso, a center where older people take computer classes and perform other social activities. Most of them reported not holding a university degree. 44 participants were enrolled in an introductory course to ICTs and 34 in the advanced level course. The latter reported having more than 1 year of experience with ICTs. During this period, the first author observed the interaction of the participants with Skype, e-mail systems and OSN. She also conducted observations of them searching for content and using multimedia editing tools. The observations resulted in c. 60 hours of fieldwork. In the second stage of the study, she conducted 13 home interviews about older people's use of TV, mobile phones, tablets PCs, computers and opinions regarding iTV services. These interviews aimed to deepen and widen the observations and informal conversations.

Similar methods were conducted in a four-month ethnographical study in two adult educational centers, Borger and FoF, both in Denmark. 78 participants (aged 60 to 91; women: 42; men: 36) participated in this study. Their level of education was similar to that of the Brazilian participants. 50 Danish participants took ICTs courses for beginners, while 28 participants were enrolled on the advanced ICT course. These participants reported having more than 3 years of experience with ICTs. During the study, the first author observed how the participants interacted with e-mail systems and Youtube, and with e-shopping and e-government platforms. The observations resulted in 29 hours of fieldwork. Home interviews (similar to those conducted in Brazil) were also carried out in Denmark with 13 participants (aged 60 to 72).

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[20] This study was done while the first author conducted a 2-month research stay in Brazil

As shown in Table 01, in the three settings, we ran similar participatory design (PD) sessions related to online video portals, wherein the participants were asked to create their own video portal interface. Although these sessions had a common structure, summarized next, the activities were adapted to the characteristics of each setting, such as language, popular TV channels and tools the participants were familiar with. Firstly, examples of video sharing sites (such as Youtube or Vimeo) and video on demand portals from local TV channels were presented to the participants. Secondly, the participants created their own prototype. They did so by re-designing several key interaction elements of these portals, such as content searching and video recommendation modules, and functions for giving feedback and writing comments. Finally, these participatory design activities were aimed at stimulating the discussion about the video portals and envisioning future interaction possibilities, and participants voiced their opinions about these two aspects.

C.3 Data gathering and analysis

Fieldnotes were taken mostly immediately after the sessions in the courses and PD activities, due to the active participation of the first author in most of them. The analysis of the fieldnotes follows the interpretation of Nigel Gilbert (Researching Social Life) (Gilbert, 2008) of Strauss and Corbin (Strauss & Corbin, 1998) Grounded Theory's methodology. The main results are presented next.

D. Results

D.1 Similar interests, concerns and interactive practices

D.1.1 Online video portals

In the participatory design session in Àgora, 79% of the participants indicated that a sharing function was indispensable in online video portals, and our observations conducted throughout the length of the study helped us understand their opinion, since they used online video portals mostly for strengthening, enriching and reestablishing contact with people they trusted. Their communication focuses on

members of their local community, especially close friends and relatives (i.e. children, grandchildren and nephews). They were concerned about trust, which concurs with the results of previous works addressing OSN and older people ((Gibson et al., 2010) and (Righi, Sayago, & Blat, 2012)), highlighting a desire of older people to share information selectively and an overall lack of interest in communicating with unknown people through OSN. This video-mediated communication adopted two styles, one-to-one and one-to-many, involving face-to-face and online conversations. E-mails and posts in OSN were the triggers of this communication. They started either online conversation, by replying the message, or enriched face-to-face ones, as sending or receiving links to video often triggered a face-to-face conversation about the content of the video or their personal experiences related to it. Àgora participants adopted different roles in this communication, ranging from receiving and watching videos to creating and sharing videos. This active behavior was especially apparent amongst those participants with more experience with ICTs.

Àgora participants looked for online videos using different strategies, which vary according to their familiarity with the video content. When searching for a specific content, the participants typed in keywords of the video in the search bar. When they were exploring the videos available on the portals, they used the categories menu. In terms of usability and accessibility, we identified several issues regarding the registration processes and sharing content. The participants with little ICT experience had difficulties filling in the forms (such as not understanding what information they had to provide, spelling and day format mistakes) when creating accounts and could not register without the support of other participants and/or the researcher. The main accessibility issues for content sharing were due to elements of the user interface that were not visible enough for them. Sharing options might become visible only when unfolding a menu or scrolling down the page, which requires an exploratory and active user behavior, which was difficult to see amongst older people with little ICT experience.

Caso do Idoso (Brazil) participants were very interested in online video portals because they were already familiar with watching videos on TV. Conducting important tasks, such as reproducing videos, was easy for all of them. Regarding searching and sharing

content, passive and active roles were identified too. Most of the Caso do Idoso participants, probably due their little experience with ICT, exhibited a more passive behavior than did participants in Spain. In Casa do Idoso, participants watched videos they received by e-mail, without directly interacting with the portals. Around 5% of them exhibited a more active participation, searching for videos of their interest, as this participant put it in a participatory design session [68, Fb15] "*I often watch videos on the Internet. I like it a lot and watch all kind of videos. I especially like handcraft videos, last month I learned to do some handmade boxes with them.*" Similar results were found in the *in situ* interviews, in which 40% of the Internet users claimed to watch videos on the web, but only 20% reported looking for them, as the following extract illustrates [70, FbII14] "*Sometimes I watch videos on YouTube. People usually send them on to me by e-mail, I don't have time to search for videos.*" Online videos triggered intergenerational (with family members) and community (between friends and colleagues) communication. This communication took place face-to-face and online, both triggered by receiving a video, especially by e-mail.

Watching films and videos was a common activity among Danish participants. Informal conversations with them revealed that they did so, for instance, when they met up in the center to watch an old movie about the city. They also reported watching a musical while being at home or videos in museum displays. Regarding online videos, most of the participants acknowledged not being used to looking for content on video sharing sites, like YouTube. Conversations with the instructors at the center, which were backed up by our observations, revealed that some participants received links to videos by e-mail and also watched videos embedded in other web pages, such as a video about fishing in a portal for buying fish online. 61% of the participants reported watching videos on the computer at home in the *in situ* interviews.

D.1.2 Multimedia content and online communication channels

Creating and editing multimedia content was a frequent activity amongst all the Àgora participants, as well as a motivation for them to learn ICTs. Courses on MS Power Point, photo edition or calendar creation were part of the ICT activities organized in Àgora.

Most of the participants were also motivated to share the multimedia contents they created, as illustrated by this participant in an Introduction to ICT course, [72, M11]: (showing the researcher 4 calendars that he created with pictures) *"These two are very similar but the size of this file is smaller, which helps me to send the calendars by e-mail to the people that usually e-mail me."*

Online communication and working with multimedia content were also of great interest to the Casa do Idoso participants. From our observations and the interviews with teachers, editing pictures was a source of motivation for them to keep learning about ICTs; namely, how to look for, edit and share online content with people they knew. Concurring with previous results gathered with participants in Àgora (Spain) (Sayago & Blat, 2010), the e-mail was the most popular Internet application amongst the least and more experienced Brazilian participants. Indeed, Facebook was the second most popular communication tool, especially among the participants with more experience with ICTs, who also used Skype for keeping in touch with family members living abroad. In the *in situ* interviews, 70% of the Internet users reported using the e-mail. Half of them reported using social network sites and Skype too.

Communication was very important amongst Danish participants, who were highly motivated to use, and, indeed, often interacted with, online applications to keep in touch with close friends and relatives. All the participants reported using the e-mail in the *in situ* interviews. Halt of them (54%) also used Skype, and 38% claimed to use OSN. Editing personal photographs on the computer was a very popular activity too. This popularity manifested itself in the activities carried out in the center, such as photo edition and creation of MS Power Point presentations, and it was confirmed in our conversations with the instructors and participants. The main reasons for editing and creating multimedia content can be divided into three categories: (a) keeping a digital record of the family to be circulated amongst the younger generations, such as grandchildren, (b) keeping memories of trips and (c) digitizing paper-based materials related to their hobbies or interests. 61% of the participants pointed out during the interviews that they edited photographs at home as well.

D.1.3 Privacy

All Spanish participants reported feeling uncomfortable with OSN when they were unsure about who could read their posts. Privacy was also an important concern amongst Brazilian participants. They needed to feel in control of the technology to decide who could see what. The comment from one participant in the in situ interviews is representative of that: [71, MbII] "*I use Facebook but not very often. When I receive something I answer, but adding things is very difficult for me and I don't do it. I don't know how it works well, so I avoid doing stupid things. I prefer to just see other people's contents. If you make your own things public…that is dangerous.*" They did not feel comfortable when sharing content online with people they did not know - close groups were preferred (e.g. friends on Skype, Facebook or sending an e-mail to a group of people).

Similar issues were identified in the two centers in Denmark. All the instructors pointed out that privacy was an important concern amongst the Danish participants. They disliked the idea of not having control over what people could get to see and know about them online. They refused point-blank to publish content in OSN. They preferred private strategies of communication. As one of the participants put it in a semi-structured interview, [70, Fd15]: "*I don't use Facebook. It's dangerous. I tell my son to never ever put a picture of me on that. People should not put their personal things there, like if you are going to travel for example.*"

D.2. Differences in the contents of the interactions and use of e-government services

The Brazilian participants' interaction was content dependent, i.e. they were more interested in searching, editing or sharing content, such as videos, which appealed to them, regardless of this content being more or less socially popular (e.g. clicks on 'I like it'). This behavior concurs with the one we found amongst Àgora participants in Spain. In particular, and as one might expect, the topic of family was of interest to all the participants (in Spain, Brazil and Denmark), as it has become evident in, for instance, their use of online video portals for keeping in touch with relatives. Yet, there were (cultural) differences. For instance, religion was a far more

popular topic amongst Brazil participants than either Spanish or Danish ones.

Interviews with participants in Denmark and instructors revealed that they were highly interested in e-government (e.g. paying taxes online and e-health), Internet banking or online shopping. In an interview, one of the instructors explained the main reason for the participants' interest in e-government: [50, MdI03] "*Nowadays, all my students want to learn about netbanking and internet, even the ones that know nothing about computers. In Denmark, in these days you can only buy flight tickets online. By 2016, the goverment aims to interact with Danish citizens via online services. Many of them are scared.*" Neither Spanish nor Brazilian participants showed such an interest in e-government, perhaps, because they are not so strongly pushed to do so or have not perceived the need of doing it yet.

E. Discussion

We summarize the findings in 5.1. Afterwards, in 5.2, we discuss the view of older people portrayed in the results. We argue that this view has a number of implications for designing online video portals (and iTV services) for a growing older population, and we discuss them in 5.3.

E.1 Summary of the results

In Section 1, we made the case for addressing the interactions of older people with online video portals, hoping that doing so would help us work towards designing more accessible and meaningful iTV services. In Section 2, we showed that there was room for understanding further the relationship between older people and iTV. We considered that adopting an ethnographical approach, such as the one described in Section 3, and conducting user studies with older people with different cultural backgrounds, could help us attain, at least, partially, this goal, and the results, presented in Section 4 and summarized next, seem to confirm it. All our participants used online video portals mostly for strengthening, enriching and reestablishing contact with people they trusted. Creating and editing multimedia content that enabled the

participants to keep and share a digital record of the family and memories of trips was also a common practice amongst all our participants, strengthening the relevance of communication. Yet, none of them feel at ease at the prospect of strangers having access to their personal contents. Differences in the content of the online videos or, in general, digital content, that appealed the participants most differed depending on their cultural background, as well as their interest in using e-government services.

E.2 A different view of older people: active and not so different as we might think

Whilst our literature review has shown that the relationship between online video portals and older people has received little research attention, we found that all our participants used online video portals mainly for keeping in touch with relatives and friends. The relevance of communication might be expected, since communication is very important in ageing. Also, other studies have highlighted the relevance of communication in the adoption and use of ICTs by older people (e.g. (Dickinson, Newell, Smith, & Hill, 2005), (Rice & Alm, 2008)). Yet, using a technology, in this case, online video portals, which have not been particularly designed to establish one-to-one or one-to-few conversations, as a means of enriching and establishing them, portrays older people as active appropriators of ICTs. This view is at odds with the typical passive role attributed to older people in previous research, especially when looking for information online without creating new digital content. This might be due to the profile of our participants and warrants further research.

We have argued that very little cross-cultural HCI research with older people has been conducted thus far. This begs the question of whether looking at cultural aspects in ICT use by older people is possible and, if so, how it takes forward current HCI research with them. As opposed to the previous studies reviewed in Section 2, which have not framed the research in situations of daily technology use over time, by adopting an ethnographical approach, i.e. conducting observations and conversations with older people with different cultural backgrounds in different communities over months and years, we have found more similarities than differences

in their relationship with online video portals. This suggests that older people might not be such a heterogeneous user group, at least when we look at their interactions with online video portals (and other ICTs, such as OSN), from an ethnographical lens.

The former claim deserves further discussion, especially if we consider the broad age range of our participants (60-91). The main difference between the youngest and oldest participants (75+) was due to the impact of normative age-related changes in functional abilities, mainly cognition and hand-eye coordination, on conducting instrumental tasks. The oldest participants struggled to use the mouse and tended to be slower than the younger ones in completing tasks. However, as far as their reasons for using online video portals, concerns about privacy and interest in communication are concerned, no differences were observed, which suggests a number of implications for designing iTV services, discussed below.

E.3 From online video portals to iTV services: some implications

Regardless of age, and their previous experience with ICTs, all our participants showed interest in, and were capable of using, online video portals. This indicates that this technology could help us reinforce the digital inclusion of older people and foster the ICT uptake in a meaningful way within this segment of the population, especially in developing countries, where older people might have more difficulties to access ICTs. By sharing content - which might be culturally either dependent, such as religion in the case of Brazil, or independent, as in the relevance of the family - older people are likely to enrich their communication with their relatives and/or close friends, and this can aid in reducing their social isolation and fostering their participation in social activities. Accessing on videos on demand that are related to their personal interests through iTV could also be an opportunity to facilitate the access of online/digital information to older people, given that most of them still might not know how to use computers, but are fairly familiar with TV.

F. Conclusions and next steps

This paper has addressed the cross-cultural interactions of a large number of older people with different levels of educational attainment and previous experience with ICTs with online video portals from an ethnographical perspective. The results have presented more similarities than differences in their motivations for using online video portals and patterns of use. The results have shown that the older adults who participated in our studies in Spain, Brazil and Denmark, use online video portals mainly for enriching and establishing communication with people they trust. Contrary to common, passive views of older people and ICTs, the results have presented them as potential digital content creators and shown they can have strong motivations for sharing content online. A number of implications for designing more accessible and meaningful iTV services for a growing (and cultural diverse) older population, and for framing older people within HCI research, have been drawn from the results. The findings also show the potential of ethnography, which has seldom adopted in the previous and related studies reviewed in this paper.

Regarding our future work perspectives, the results suggest that online video portals can contribute to reduce digital and social exclusion amongst the older population, and we consider that this warrants further research. We plan to address it by delving into the communication triggered by sharing online videos. We also aim to look into how older people create digital videos, since this can potentially take forward our understanding of HCI, as a whole, and with this user group, in particular. Finally, the cultural layer of older people's interactions seems to have a lot of potential and we plan to deepen our research by understanding what aspects or dimensions of culture impact most or least in their ICT use.

G. Acknowledgments

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Table

Country	Methods	Institution/location
Spain	Ethnography: 201 participants - User observation - Informal conversation - Semi-structured interviews - Questionnaires - Focus groups - Diaries 5 Online video portals workshops (2 hours sessions). 12 participants in each session. 10 Video creation, editing and sharing Workshops (2-hour sessions). 14 participants in each session. 2 Participatory design sessions (2-hour sessions): Online video portals. 24 participants in total.	Àgora, Barcelona - A 20-year-old association, which intends to integrate into Catalan society people who are, or might be, excluded from it, e.g. immigrants, non-educated and older people.
Brazil	Rapid ethnography: 78 participants 1. Observations *in situ* 2. Informal conversation with participants and teachers. 4 Participatory design sessions: Online video portals (1,5 hour sessions). 32 participants in total. 4 Semi-structured Interviews: Discuss first impressions with teachers: Multimedia, online videos, communication tools,	Casa do Idoso, Sao Jose dos Campos – Center promotes free activities in the areas of welfare, education, sports, recreation and culture for people over 60 years old. Founded: 2007.

	privacy, interaction issues, motivations to learn ICT, search for information, family and online maps.	
	13 *In situ* interviews: Use of ICTs, TV habits, and opinion about iTV services.	8 participants lived in Sao Jose dos Campos and 5 in Porto Alegre.

Denmark	Rapid ethnography: 78 participants
	    - *In situ* observations
	    - Informal conversation and semi-structured interview (10 participants, 4 teachers, 2 caregivers).
	
	1 Participatory design session: Online video portals (2-hour session). 12 participants in total.
	
	4 Structured Interviews: Discuss first impressions with teachers [Appendix 01]: Participants profiles, motivations to learn ICT, use of technology, popular internet applications, online videos, communication tools, iTV services.
		Mainly in:
		- Borger, Jerslev – Data room affiliated with Ældremobiliseringen (Danish Association of Senior Citizens. Organizations with a total membership of 450,000 with approximate 170 ICT centers. Founded in 1992.
		- FoF, Aalborg – Denmark's largest provider of adult liberal education, 45 local schools around the country. Founded: 1947.

	13 *In situ* interviews: Use of ICT, TV habits, and opinion about iTV services.	5 participants lived in the countryside, 3 in Aalborg and 5 in Copenhagen.

Table 8. Data gathering methods and settings

Appendix 01 – Interview script

Profile teacher:

1. For how long have you been teaching elderly?

2. Is this a volunteer activity or is your official job?
3. How old are you?
4. What is your education level?
5. In case of volunteer, what you use to do before?

Profile of the participants:

What are the participants age range?
1. Is there a age group that is more frequently? Ex.: 60-65, 65-70, etc...
2. Which education level is more frequently among the participants?
3. Are most of them retired or still work?
4. Which kind of job, intellectual or manual is more frequently between the participants?

Motivation:

1. What do you think is the main motivation for the elderly to come to the computer class?
2. Can you classify the motivation of the participants come to the class as principal motivation (1) to less relevant motivation (4).
     a. Socializing with other participants
     b. Learning computer
     c. Being occupied
     d. Feel included
     e. Other
3. What do you think is the main motivation for the elderly to learn to use computer?
4. Can you classify the motivation of the participants to learn computer as principal motivation (1) to less relevant motivation (4). (necessary X entertainment)
     a.   Learn practical things that are necessary for their life (netbanking, schedule a visit to the doctor, etc)
     b.   Communicating with family and friends
     c.   Entertainment (pictures editing, powerpoint)
     d.   Searching for information
     e.   Other _____
5. If you were asked to summarize what most of them use computers for, your answer would be:

Computer use and frequency:

1. Own computer:_____, Someone else's computer _____

(Everybody - Majority - Half of them - Minority - None - I don't know)

2. The ones that don't have one, what do you think is the main reason for that?

(Maybe because: a) the person do not see the need for a computer, b) is not able to use a computer, or c) a computer is too expensive)

3. How often the participants usually use the computer after class?

Uses computer everyday_____, Three times a week _____ Once a week _____ Few times per month _____ Few times per year _____ Never _____

4. Does most of them already use computer before coming to the class?

5. Do the children and grandchildren usually help them with the computer?

TV on Internet

1. Do they use/interest in TV through Internet?
2. Do they use/interest in YouTube?
3. Do they share/recommend videos? How? With whom?
4. Receive video recommendations from someone? How? From whom?

Social Network:

1. Have an account in: Facebook _____, Twitter _____, others _____ (Everybody - Majority - Half of them - Minority - None - I don't know)
2. The ones that has it:
3. What is their motivation to use it?
4. How often they use them?
5. What they usually comment they like or dislike in Social Network?
6. Privacy concerns? (Publish public messages or pictures, add people that they don't know very much?)

Use of technology:

Can you identify the use that the participants do of technology as:
(Very interest – some how interested – not interested)

	Beginners		Advanced		
	Interest	Use	Interest	Use	
E-mails					
Skype					With whom?
Internet services/ Internet surfing					
Net banking					
E-commerce					
Image editing					
Sharing pictures					How? With whom?
Downloading pictures from camera					
Searching for information					Where?
News					
Movies / TV program					
Maps on Web					
PowerPoint					Share presentation? How? With whom?
Word					
Excel					
Windows Movie Maker					

Mobile phone	
Calling	
SMS	
Camera	
MMS	
E-mails	
Internet	
Has used touchscreen	
Traditional phone	

About ITV:

1. Do you think the majority of them watch television often?
2. If it was possible to include some functionality from the computer in the TV do you think they would be interested in using it? (Ex.: YouTube, Skype, e-mail, chat, buying from the TV, interactive TV programs (commenting, voting), etc...)
3. What do you think they would be more interested in having on the TV? Classify in: Very interest – some how interested – not interested.
   1. Recording,
   2. Pausing,
   3. Recommending programs,
   4. Commenting programs,
   5. Like/dislike programs,
   6. See other users opinions,
   7. Skype,
   8. Chatting with a friend, buying online,
   9. Searching for videos,
   10. Asking for more information about a topic,
   11. Sharing pictures,
   12. Internet applications

Cross cultural Brazil-Spain

In Spain and also in Brazil I could observe some things that I would like to verify if it is similar here or not...

1. What are the main difficulties they have to use the computer?
2. Privacy concern? Ex.: do they: comment on web pages (Facebook, YouTube, blogs) have their own web page, publish pictures, add own picture to the profile?
3. More open to things they are familiar with?
4. Interest for downloading/saving things from internet (e.g. music, pictures, text)?
5. After learning something they get motivated to try at home?
6. Are they interested in learning to download pictures from camera and this kind of things? Do they know how to use the camera? Do they also make videos or just pictures?
7. Is there any problem in the environment that difficult the classes? Ex.: license to programs, Internet connection, air conditioner.
8. Are they interested in doing and sharing PowerPoint presentations by e-mail? (Personal, their photos or general sunset).
9. Taking notes?
10. Have you noticed any changes in the profile of the participants from when you started teaching from now?

4. DISCUSSION AND CONCLUDING COMMENTS

In this final chapter, I aim to discuss further the contributions made by this PhD dissertation to the field of HCI with older people. I also take stock of the whole dissertation in an attempt to discuss the extent to which the contributions will be relevant in five or ten years' time. Finally, I discuss a number of limitations and outline future research perspectives.

4.1 Discussing the main contributions in a broader context

A. Alternative view of ICTs use

This dissertation has presented an *alternative view of ICTs use* by older people. Contrary to the most predominant approach - focused on compensating for age-related changes in functional abilities - within HCI, the results presented in the dissertation have portrayed older people with mild-to-moderate age-related changes in functional abilities as active, creative, and social ICTs users. This alternative view reinforces and extends previous works, which proposed a change in the paradigm in HCI research with older people, moving from compensating from diminishing abilities to understanding their real-life use of ICTs (Sayago 2009), promoting empowerment through technology (Rogers & Marsden, 2013) and seeing ageing as a resource (Carroll, Convertino, Farooq, & Rosson, 2011). This dissertation contributes to this research strand by (i) detailing the digital content production (namely, videos) of older people, (ii) showing more similarities than differences in their interaction practices, and (iii) revealing their appropriation of digital videos. The novelty of these aspects has already been discussed in the body of the dissertation.

It could be argued that this alternative view of ICTs use seems to take issue with the current approach focused on coping with the downsides of ageing, as it seemingly overlooks or fails to consider the need of coping with the challenges that come with ageing in order to design ICTs for older people. As stated in Chapter 1, I consider that designing tools that help older people to deal with the

challenges that come with ageing is important, needed and to be commended. Yet, there are other factors apart from limitations / weaknesses, as I have shown (for instance, creativity), that might potentially help us to build technologies that fit in and improve older people's lives. I agree with Mosberg (Mosberg, 2014) on the fact that while there is a stage in ageing in which technologies may help to contain, supplement or replace expensive human care, there are other stages where technologies may be applied to express one's creativity, access to digital information and reinforce digital and social inclusion. As the participants told me, and my observations confirmed, they are "reasonably fit for their age", and this fact is likely to play a central role in the alternative view of ICTs use presented in this dissertation.

B. Ethnography as an evaluation method? ICTs use and well-being

This dissertation has presented a *novel use of ethnography* within HCI. Thus far, and to the best of my (our) knowledge, ethnography has primarily been used for gathering requirements (Obrist, Bernhaupt, & Tscheligi, 2008) and informing participatory / co-design activities (Andersen, 2013). This use might be accounted for the origins of ethnography in HCI. Back in the 1980s, when techniques to get insights into what people do day to day, such as surveys and focus groups, were not enough to understand computer use in everyday settings other than laboratories or offices, HCI turned to ethnography to gain these insights (Blomberg & Burrell, 2009). Another reason for using ethnography as a way of informing design activities is the strong connection between PD and the core principles of ethnography, such as holism and members' point of view (Blomberg & Karasti, 2013). Yet, the potential of these core principles of ethnography to evaluate the impact of ICTs use on the perceived well-being of older people does not seem to have received much research attention. This raises the question of whether ethnography is well suited for doing so. As this dissertation has shown, a long-term ethnographical study helped me to provide (at least, qualitative) evidence of the fact that using ICTs did have a positive impact on the perceived well-being of older people.

As discussed in Chapter 1, the experience[21] of using ICTs (i.e. where, with whom, what for…) was instrumental in helping older people to realise they were able to keep up with the times, take further their learning of these technologies, and feel more socially, and digitally included. This finding shows the efficacy of several ICTs to enrich participants' lives, thereby filling a gap in ICTs and active ageing research, in which the evaluation of the effectiveness of the technology developed is seldom conducted (Parra, Silveira, Far, & Daniel, 2014). This finding does not challenge (Dickinson & Gregor, 2006), however, who argue that computer use has no demonstrated positive impact on the well-being of older people. While the experience of using ICTs did have a positive effect on the perceived well-being of those older people who participated in my ethnographical studies, the technological intervention (in other words, using / not using a particular technology) did not seem to have a clear-cut impact on their perceived well-being. For instance, by exchanging meaningful photographs and messages with their relatives through *WhatsApp* in the courses, participants considered that their conversations with family members, and friends, were richer. They helped others to use this technology, showed photos of their grandchildren to their closest friends, and were engaged in conversations that helped them speak a 'contemporary' language. The experience of using *WhatsApp* was the most influential aspect in their perceived well-being, not the tool by itself.

At this stage, and before discussing other contributions, it might be worth reflecting on the ethnographical approach I adopted in this dissertation, which draws upon a long-term period in the field. While I do not argue that ethnographical studies conducted over short periods of time, also known as rapid or quick-and-dirty ethnography in HCI (Millen, 2000), are unable to reveal the impact of ICTs use on the well-being of older people, I consider that doing so with these ethnographical approaches is likely to be very difficult, since witnessing the real impact of ICTs use on one's perceived well-being takes (a lot of) time.

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[21] According to (Law, Roto, Hassenzahl, Vermeeren, & Kort, 2009) most of the definitions of the term "user experience" tend to see it as "dynamic, context-dependent and subjective, which stems from a broad range of potential benefits users may derive from a product" (p. 727)

C. More similarities and differences in ICTs use

This dissertation claims that *older people ICTs use is not so heterogeneous* as one might think. While it is difficult to argue against the fact that older people are a heterogeneous user group, the ethnographical research carried out in this dissertation has enabled me to find more similarities than differences in their ICTs use. Over a five-year period, I have worked with older people with different profiles and age-related changes in functional abilities. During this period, I have experienced this heterogeneity firsthand. For instance, I have known older people who had difficulties in identifying the differences among punctuations signs in the keyboard, while others could read them with no problems at all. Yet, all of them exhibited remarkably similar interaction issues and practices, as I have summarized in Chapter 1 and 3. These similarities might be more difficult to find in usability tests, as in these environments, the impact of age-related changes in functional abilities on the performance of the users is expected to stand out. However, in everyday settings, and over an extended period of time, the relationship between older people with different cultural backgrounds and these technologies is not so different as one might think. Yet, the degree to which their interaction practices differ from those exhibited by older people with more serious age-related declines in functional abilities warrants further work.

Thus far, I have discussed this contribution from a 'within' perspective. In other words, I have regarded older people as a group. 'Older people are different' (Gregor & Newell, 2001) can also be understood in terms of older people versus other user groups. In this dissertation, I have focused on older people. Thus, I find it difficult to engage in a serious discussion on how similar or different the interaction practices and issues of my participants are as compared to those of, for instance, more typical HCI users, such as university students, given that I should have carried out fieldwork activities with them too. These (or my) difficulties notwithstanding, I consider I contribute to this debate as follows. Previous studies conducted in laboratory conditions, and comparing the performance of young and older people in online information seeking tasks, have found differences (e.g. younger people are

quicker to click on links than older ones) and similarities too, especially when the task exploited crystallized intelligence (Trewin et al., 2012), which does not seem to decline as much as fluid intelligence (Czaja & Lee, 2007). In my ethnographical research, I have also found a similar finding. My participants found it (very) difficult to learn (which is related to fluid intelligence) new computer tools. Maria, in Chapter 1, is just an example. Further research can draw upon the results presented in this dissertation and other, more controlled studies, to understand how different older people's interactions with ICTs are.

D. Connection between ICTD and HCI: filling a gap and going beyond physical digital inclusion

This dissertation has (at least, partially) *filled a gap in ICTD and HCI*. As stated in Chapter 3, there is a lack of studies addressing ICTD and HCI with older people, despite an ever-growing ageing population in developing countries and the potential benefits of ICTs to improve their quality of lives. By drawing upon fieldwork activities conducted in my hometown (Brazil), along with those I conducted in Spain and Denmark, this dissertation suggests that fostering the digital inclusion of older Brazilian people should go beyond providing them with physical access to computers and the Internet. I focused on digital inclusion because of the large number of older people that has never gone online in Brazil (CETIC.br, 2013). While having a technological infrastructure is essential to use ICTs, this dissertation claims that training sessions (or, in general, educational ICT-related activities) should also be offered so that older people can perceive the usefulness of these technologies into their everyday lives and decide whether they (do not) want to use them. While this claim is not new at all (Warschauer, 2004), and the importance of training courses for older people has been stated before (Dickinson, Eisma, Gregor, Syme, & Milne, 2005), this more 'humane' view of older people's digital inclusion has mostly been overlooked in Brazil.

4.2 Five or ten years from now

Within HCI with older people, there is a growing research interest in understanding how valid the results of contemporary research will be when most of today's adult people, who have previous experience of using contemporary ICTs, grow older and find themselves surrounded by ICTs with which they will be not familiar with. Drawing upon the longitudinal aspect of the data gathered in this dissertation, I discuss this issue in this sub-section.

It is widely expected that baby boomers (those born between 1946-1964) will bring different expectations and attributes to their older years (Durick, Robertson, Brereton, Vetere, & Nansen, 2013). Indeed, there is room for assuming that previous experience of using ICTs and the increasing digitalization of services (e.g. e-government, e-banking) might result in baby boomers showing a more participative role in using ICTs and creating digital content than most of today's older people do. Thus, the alternative view of ICTs use presented in this dissertation, which portrays older people as active and creative ICT users, might be valid for the next generation of older people.

Ethnography will probably carry on playing an important role to understand ICTs use, especially because these technologies are becoming more and more ubiquitous. Periods of observation and conversation in out-of-laboratory conditions will be needed to help us get insights into how people use, for instance, wearables (e.g. smartwatches).

Technology evolves. This is a fact, and baby boomers might find themselves surrounded by ICTs with which they are not familiar. Consequently, their previous experience with (contemporary) ICTs might not be enough to help them to use these new ICTs (Hanson, 2009). Hence, most of the age-related issues, especially those related to cognition, as pointed out by (Sayago & Blat, 2011), faced by those older people who have participated in my research too, will probably be experienced by the next generation of older people, and baby boomers will not differ greatly from today's seniors as far as ageing issues are concerned.

Bearing in mind the importance of potential accessibility barriers, designing assistive technologies will still be necessary. However, this does not mean that all digital technologies for older people should be 'assistive', as this dissertation claims.

With respect to digital inclusion in developing countries, if strategies for fostering digital inclusion keep focusing on providing people with a technological infrastructure, failing to meet their non-instrumental needs when it comes to using ICTs, the grey digital divide in these countries will probably persist.

4.3 Main limitations

The user group that took part in the ethnographical studies consisted mostly of older people who were so motivated to use ICTs that enrolled in courses in clubhouses and adult educational centres. Thus, a limitation of this dissertation is that the results might not be extrapolated to other settings / profile of older people. Also, some results, such as showing an active and positive attitude towards ICTs, may be expected, given that our participants took courses on a voluntary basis and also decided to participate in my research activities. However, other results are less expected, such as their active attitude towards creating digital content and appropriation of digital videos for communication, given the predominant 'downside of ageing' message within HCI.

This dissertation has mentioned culture without providing a working definition of this term, which might be regarded as a limitation. Hofstede's dimensions of Culture (Hofstede, Hofstede, & Minkov, 2010), which are widely used in cross-cultural HCI, could have been applied to this research. I consider that Hostede's dimensions are interesting and potentially useful for speaking a fairly common language in cross-cultural HCI. I therefore plan to take them into consideration in my future research. I did not consider them before because I was not aware of them until more advanced stages of my dissertation.

One may also argue that the lack of quantitative evidence in the results is another limitation of this dissertation. A qualitative methodology was chosen because I believe it was the most accurate

strategy to understand ICTs use in real-life settings and over an extended period of time. Yet, it does not mean that quantitative data was not either gathered or analysed. Quantitative data was provided in the analysis of the home interviews and the digital videos created by the participants. This data complemented the results of the research and validated the results from my observations and conversations with the participants.

4.4 Future research perspectives

I aim to explore further the role of older people as digital content creators and their interaction with cutting edge ICTs, such as wearable computers, gesture-based interactions and 3D virtual reality. While most of today's older people might not be active users of this technologies, there are reasons to believe that the aforementioned technologies and interaction styles will be more present in the everyday life of the next generation of older people. Thus, understanding their motivations, interests and needs will be worthwhile to design more accessible, usable and meaningful technologies for the older generation. Also, I expect to explore the relationship between older people and different (and emerging) interaction styles, as doing so will (and should) potentially help me to inform the design of better, more inclusive, technologies.

As far as content creation is concerned, I aim to understand further older people's participation in digital content sharing platforms, such as wikis or crowdsourcing platforms, which are (becoming) very popular. In order to do so, I aim to combine ethnographical methods in local communities with online ethnography and data mining methods. I plan to combine qualitative and quantitative data in an attempt to develop and provide a more comprehensive account of their ICTs use, and understand further the interplay of different research methods too.

I also plan to work with older people who are not enrolled on courses on computers and the Internet in public centers. I believe that working with older people with different profiles is important to extrapolate the results of this dissertation. Working towards this end, I intend to work with older adults with high educational levels and with more severe aged-related changes in functional abilities. I

aim to do so by combining ethnography, interviews and studying older people's participation in popular online content sharing platforms.

Another area of research I expect to pursue in the future is to deepen my understanding of cultural ICTs use by older people. I plan to draw upon the cultural dimensions defined in (Hofstede et al., 2010) and other cultural studies (e.g. (Levine, 2008), (Hall, 1977), (Huntington, 1997)) to do so. These studies focused on different aspects of culture. Hofstede (Hofstede et al., 2010) identified five dimensions (Power-distance, Collectivism vs. individualism, Femininity vs. masculinity, Uncertainty avoidance and Long- vs. short-term orientation) and rated 53 countries on indices for each dimension. Levine (Levine, 2008), however, focused on the different perception of time and Hall (Hall, 1977) on the different ways of executing tasks and communication. I believe that exploring these definitions may contribute to better understand cross-cultural HCI studies with older people.

With respect to ICTD, a big concern highlighted in this dissertation is that the rate of older people that do not have access to computers and Internet in developing countries is still very high and that most HCI and ICTD scholars have not addressed this issue yet. An important future work in this area is to further explore strategies to foster older people digital inclusion in these countries. Mobile telephony is the most pervasive information and communication technology in the developing world, with an estimated penetration rate of 91.8% in 2015 (ITU, 2015), but not much is known regarding the older people's adoption of mobile phones to access the Internet in these countries. I currently started to explore the use of smartphones by older people in Spain and extending this research to a developing country is part of my future work.

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APPENDIX I. INTERNATIONAL RECOGNITION

Partial results of this dissertation have been awarded in academia and industry events. I received the "Best Paper and Presentation Award" in the Young Researchers Consortium in the International Conference on Computers Helping People with special needs in 2012. I was also a finalist in two consecutive editions of the "Google Anita Borg Memorial Scholarship", Europe, Middle East and Africa.

A. 2013. Finalist of the Google Anita Borg Memorial Scholarship.
   Google, Europe, Middle East and Africa (EMEA).
B. 2012. Finalist of the Google Anita Borg Memorial Scholarship.
   Google, Europe, Middle East and Africa (EMEA).
C. 2012. Best Paper and Presentation Award in Young Researchers Consortium.
   International Conference on Computers Helping People with special need (ICCHP).

Over the course of my dissertation, I was also awarded four grants to attend top conferences, such as ICTD and SIGACCESS, and present my research in doctoral consortiums and pre-conference symposiums.

D. 2013 - Pre-conference Symposium (OUI-ITD) and ICTD Scholarship.
   Canada's International Development Research Centre and International Conference on Information and Communication Technologies and Development (ICTD).
E. 2013 - Grace Hopper Celebration of Women in Computing Scholarship.
   Google-Global International.
   2012 - Young Researchers Consortium Scholarship. International Conference on Computers Helping People with special need (ICCHP). (Paper presented in section C)

F. 2010   -   Doctoral   Consortium   Fellowship.
    International ACM SIGACCESS Conference on Computers
    and Accessibility.

This appendix presents the papers and reports related to these
awards. Sections A, B, E and F present extended abstracts of this
dissertation. Section C presents preliminary results of the study in
Section 3.2 (Towards iTV services for older people: exploring their
interactions   with   online   video   portals   in   different   cultural
backgrounds). Section D presents preliminary results of the research
outlined in Section 3.1 (Going beyond telecentres to foster the
digital inclusion of older people in Brazil: lessons learned from a
rapid ethnographical study).

A. Finalist of the Google Anita Borg Memorial Scholarship 2013

Google, Europe, Middle East and Africa (EMEA)

PHD PROJECT: DESIGNING ACCESSIBLE INTERACTIONS FOR OLDER PEOPLE WITH ITV

INTRODUCTION

An increasing ageing population and the rising popularity of interactive TV (iTV) makes understanding older people's use of iTV a timely and important task. Whereas iTV opens up opportunities for communication and access to online information/services, older people are at risk of being unable to use them, due to their general lack of digital skills and a tendency to exclude them from software and hardware developments. In my ongoing PhD research, I am looking into designing and evaluating accessible iTV services for and with older people. I am focusing on iTV services related to communication, as it is a key aspect in ageing, and search for information, to enable older people to remain independent and engaged in society. Understanding everyday interactions is a crucial element to design better, and therefore, more accessible interactions. My PhD addresses this overall problem by breaking it into three specific aspects: (i) accessibility barriers; (ii) everyday use; and (iii) explore cultural differences.

METHODOLOGY

The methodology applied in my ongoing PhD follows the user-center design approach. I have conducted ethnographical methods to collect data about users needs, interests and difficulties while interacting with iTV (and ICT, in general). Combining to the ethnographic study my research includes several other qualitative methods as user observation, informal conversation, interviews,

questionnaires, diaries, focus groups, workshops, participatory design, usability tests and prototyping. The fieldwork activities are mainly conducted in Spain, where I have already spent almost two years. To take into account countries with different developing levels, I have been working for a short period of time with older people in Brazil and Denmark. In all the countries, my research activities were conducted by collaborating with digital inclusion centers[22]. So far, the studies included around 180 older adults. The participants can be considered as a heterogeneous 'user group'. It is composed of older adults aged 60+, with different educational levels and some previous experience with information technologies.

A challenge detected in the initial phase of this investigation is that most of the older adults (who participated in my activities) have TV at home, without iTV services. This was a big concern in relation to observing their use of iTV in real-life settings. The solution I found to this issue was to observe their use of other technologies and through it understand their interaction with iTV. Since the computer has similar features to the iTV, it was chosen to be the main device to be explored. Furthermore this research includes other devices as tablet PCs, cellphones, digital cameras and regular TV. In this scenario, several applications and services were explored such as online TV, YouTube, e-mail, Skype, Facebook, Blogs, Picasa, Spotify, Google maps, Google translator, buying online, MS-Office tools, Windows Movie Maker, Net-banking, games, etc. 1.3

RESULTS AND FUTURE WORK

The results expected from this project are in relation to older people accessibility barriers and use of iTV in real-life settings. So far the outcome regards services that are crucial for iTV and could also be applied in other technologies. The main results are in relation to the

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[22] 1 Mainly in:

Agora, Escola d`Adults de La Verneda-Sant Martí, Barcelona, Spain, (http://www.edaverneda.org/).

Casa do Idoso, Sao Jose dos Campos, Brazil, (http://www.sjc.sp.gov.br/secretarias/desenvolvimento_social/casa_do_idoso.aspx).

FoF, Aalborg, Denmark, (http://www.fof.dk/AfdelingForside.aspx?enhed=1).

Borger Datacenter (affiliated with Ældremobiliseringen), Jerslev, Denmark, (http://www.jerslev.net/view.asp?soc=158).

use of media to stimulate older adults community communication, their sharing practices, their behavior as content creators and their concerns with privacy. Other important findings are related to searching for content, second screen practices, accessibility problems and attitudes concerning several interactive services in iTV. Regarding methodological contributions, was identified several issues in relation to collecting user data in different contexts. These considerations highlight the importance of a deep investigation regarding cross-cultural studies with older people and ICT. The aim for the next stage of this project is to perform a deeper investigation concerning content creation, content consumption, sharing practices, use of tablet PCs as second screen device and technology acceptance in iTV services. In order to triangulate the data, this following stage will also focus on quantitative studies in relation to user behavior.

B. Finalist of the Google Anita Borg Memorial Scholarship 2012

Google, Europe, Middle East and Africa (EMEA).

PHD PROJECT: DESIGNING ACCESSIBLE INTERACTIONS FOR OLDER PEOPLE WITH DIGITAL TV

INTRODUCTION

The DTV (Digital Television) brings many interactions possibilities to the traditional model of watching TV. These services can and should be useful to older people, who consume a lot of TV. However, and despite an increasing ageing population, they run the risk of missing out on these opportunities if DTV is not accessible to them. To contribute to fill this gap, this study aim to design and evaluate accessible interactions of older people with DTV. We focus in services related to communication and access to online information. Namely, we aim to design and evaluate interactive DTV prototypes covering these two areas.

From this initial goal we have other three objectives: 1) To identify the most and least relevant accessibility barriers for older people to interact with current DTV interfaces; 2) To understand how older people interact with and make use of DTV in real-life settings; and 3) To explore cultural differences in accessibility barriers and use of DTV amongst older people living in developed and developing countries.

METHODS

In this study we are going to adopt a user-centered design approach, paying special attention to everyday aspects of older people's interactions with DTV (e.g.: With whom?, Where?, When?, How?). We will use basic and essential ethnographical methods (in-situ

observations and conversations for prolonged periods of time) to understand older people's needs, patterns of use and interaction barriers due to age-related changes in functional abilities and previous experience with DTV. We will also carry out participatory design sessions and design low- and high-fidelity user interface prototypes.

Our user group includes adults older than 60 years old with low education levels, and with some previous experience with information technologies. Most part of the ethnographic study will be done in Agora, Spain (http://www.edaverneda.org/). This is a 20-year-old association in Barcelona, which intends to integrate into Catalan society people who are, or might be, excluded from it, e.g. immigrants, non-educated and older people.

In order to achieve our first objective we focus on existing interfaces. We consider that a key step to design future technologies is to get a deep insight into the current ones. In relation to the second objective, we aim to fill this gap by identifying how older people interact with interactive applications for digital TV in real-life settings. By doing so, we will identify which of the existing applications are more or less useful to older people and why. We already have some previous results in both of these areas. The third objective is addressed exploring the cultural differences between Spain and two other countries, each one with a different developing level. To compare the result from Spain with a developing country a studied was conduct in Brazil. A short ethnographic study and participatory design sessions where performed in Casa do Idoso, a digital inclusion center for older people. In order to contrast these results with a developed country, we will also perform studies in Denmark. Our goal is to perform an ethnographic study and other activities in an old people center in the city of Aalborg.

EXPECTED RESULTS

The main results of this PhD can be divided into three groups: 1) identification of the interaction barriers that hinder more and less severely the everyday interactions of older people with DTV - prototypes related to communication and access to online information; 2) examination of how older people interact with and use some DTV services in real-lifesettings; and 3) exploration of

cultural differences in interaction barriers and use of DTV amongst older people living in developed and developing countries.

C. Best Paper and Presentation Award in Young Researchers Consortium ICCHP 2012

13th International Conference on Computers Helping People with special needs (ICCHP). Linz, Austria, July 11-13, 2012.

Towards understanding the interactions of older people with iTV: a qualitative study in three countries

1   Introduction

An increasing ageing population and the rising popularity of interactive TV (iTV) makes understanding older people's use of iTV a timely and important task. Whereas iTV opens up opportunities for communication and access to online information/services, older people run the risk of being unable to use them, due to their general lack of digital skills and a tendency to exclude them from software and hardware developments. In my ongoing PhD research, I am looking into designing and evaluating accessible iTV services for and with older people. I am focusing on iTV services related to communication, as it is key in ageing, and search for information, to enable older people to remain independent and engaged in society. I will describe next some previous works related to this topic. This is followed by a more detailed discussion on my research goal and questions. Afterwards, I will describe the methodology I have adopted and the results obtained so far. I have conducted ethnographical research activities in three different cultural settings. The relevance of this work to ICCHP is also briefly discussed, together with next steps and references.

2   Background: iTV and cultural aspects

Previous studies have concentrated on developing prototypes for communication ([13] and [10]). Svensson and Sokoler discuss the potential use of iTV as a resource for social interaction, and propose a prototype that stimulates communication while watching TV. Rice and Alm carried out two studies including theatre and paper prototyping to identify participants' areas of interest and how they use TV applications. They proposed and evaluated four prototypes layouts of communications systems, related to sharing multimedia contents. Other studies have performed qualitative investigations to understand the opinions of older people regarding iTV [5] and [7]. Kurniawan interviewed three older women to investigate the reasons that make digital TV unappealing to older people. Papa conducted focus groups to explore and analyze the user experience of older people with digital television and, in general, with future services available by broadband ICTs. None of studies have addressed either the accessibility barriers of iTV experienced by older people or their use of iTV in real-life settings.

• Regarding cultural differences related to people's interactions with iTV, Piccolo [8] focused on Brazil and identified differences in relation to developed countries. While many countries are considering question related to personalization and bringing TV closer to the PC functionalities, in Brazil it is important, at least in this fist stage, to consider TV as a mass and collective media. In his work, Sa-nga-ngan [12] studied older people's browsing in three different countries: UK, USA and Thailand. His results suggest that the elderly from less developed countries had more difficulties to browsing then elderly from more developed ones. These two papers have identified different issues in each country, indicating that performing further studies in this area can potentially contribute to designing more accessible iTV applications for older people, by taking into account cultural aspects in their use of iTV services.

3   System Description or Theory

Very little is known about how older people interact with iTV. However, filling this gap is crucial in enabling them to use and interact with iTV successfully. As stated in [10], significant work still should be done to design interfaces that are more usable to older adults and can support their skills and abilities. Regarding everyday use, very little is known as to how older people interact

with iTV in their daily life. According to [3]: "the major open research question in iTV is when, and how much audiences want to interact with devices, content, and other people". In relation to the cultural differences, there is also very little information relative to these two aspects.

Understanding everyday interactions is a crucial element to design better, and therefore, more accessible interactions. My PhD addresses this overall problem by breaking it into three specific aspects: (i) accessibility barriers; (ii) everyday use; and (iii) cultural differences in accessibility and use. The main results expected are :(A) identification of the accessibility barriers that hinder more severely the interactions of older people with iTV - prototypes related to communication and access to online information; (B) examination of how older people interact with and use iTV in real-life settings; and (C) exploration of cultural differences in accessibility barriers and use of iTV amongst older people living in developed and developing countries.

4   Research Questions

The main research questions we aim to answer are:

•   What are the most and least important accessibility barriers older people experience while interacting with iTV?

•   How do older people use iTV services in real-life settings?

•   What are the main cultural differences in accessibility barriers and use of iTV amongst older people living in developed and developing countries?

5   Method

The methodology applied in my ongoing PhD follows the user-center design approach. We have conducted ethnographical methods to collect data about users needs, interests and difficulties while interacting with iTV (and ICT, in general). Table 1 summarizes the methods. To explore the cultural differences, we have performed qualitative studies in three different countries, with

different developing levels, Brazil, Spain and Denmark. This investigation is mainly based in Spain, where I already spent one and a half year. I conducted a two-week rapid ethnographic study in Brazil, my home country, and a three-month investigation, adopting ethnographical methods, observations and conversations, in Denmark. We have conducted this research in centers where older people take computer classes and conduct other activities. So far, around 100 participants took part in it. Our participants can be considered as a heterogeneous 'user group'. It is composed of older adults aged 60+, with different educational levels and some previous experience with information technologies.

A challenge detected in the initial phase of the investigation is that most elderly have regular TV, not iTV. This was a big issue to observe their use of iTV in real-life settings. The solution we found is to explore their interaction with Internet applications, such as online TV, on the computer. The computer has similar features to the iTV. Besides, some of the elderly are already familiar and interested in interacting with the computer. Some previous work indicates that there is a relation between how the elderly interact with computers applications and how they would interact with iTV. According to [6] the people that use more intensive the iTV services also interact with PC and Internet at home. In [7], their results suggest that the elderly that are more open to explore the iTV channels are also the ones that already use Internet. Those are indicative that understanding how the elderly use computers is a crucial step to understand how they would interact with iTV in the future.

Country	Institution	Duration	Methods
Spain	Àgora, Barcelona - A 20-year-old association, which intends to integrate into Catalan society people who are, or might be, excluded from it, e.g. immigrants, non-educated and older people.	1 year and a half.	Ethnography, user observation, informal conversation, semi-structured interviews, questionnaires, focus groups, workshops, diaries,

			participatory design sessions, paper prototype.
Brazil	Casa do Idoso, Sao Jose dos Campos – Center promotes free activities in the areas of welfare, education, sports, recreation and culture for people over 60 years old. Founded: 2007.	2 weeks	Rapid ethnography, user observation, informal conversation, semi-structured interviews, participatory design session.
Denmark	Borger, Jerslev – Data room affiliated with Ældremobiliseringen (Danish Association of Senior Citizens. Organizations with a total membership of 450,000 with approximate 170 ICT centers. Founded in 1992. FoF, Aalborg – Denmark's largest provider of adult liberal education, 45 local schools around the country. Founded: 1947.	3 month	Rapid ethnography, user observation, informal conversations, semi-structured and structured interviews, participatory design session, usability test session.

Table 1 - Methods applied until now.

We have gathered data by taking fieldnotes of our observations and informal conversations with the participants. We have conducted semi-structured and structured interviews, questionnaires and dairies to understand better our observations and informal conversations. As prototyping is important in UCD, we have designed and evaluated prototypes of video's Webpages in participatory design activities.

6   Results

As an initial step to understanding how elderly interact with iTV, we first explored how they would interact with iTV on the computers. By conducting YouTube and WebTV workshops in Spain, we found that they are very interested in sharing videos by e-mail, and unwilling to comment videos. We observed, and participants reported, that websites such as TVE a la carta [9], TV3 a la carta [14] and BTV a la carta [1], were fairly easy to use. Despite the considerable amount of information presented on these sites, each participant searched for his or her favorite TV programs independently (i.e. without relying on us).

By conducting interviews, informal conversations, focus groups and diaries, we collected material related to how the elderly use the regular TV in their daily life. We could also explore their opinion about having new technologies on the TV. At first, they found it difficult to imagine. The computer was the device for 'doing online activities'. However, after having had some contact with online iTV through computers, participants show interest in trying new applications on the TV. They were keen to re-watch their favorite TV programs or watch those they missed. They also showed interest in creating content.

We could also collect lots of data related to the elderly's real use and interaction's issues related to different technologies. Most of the them are associated to computer application as e-mail, Facebook, Skype, Google, Gmaps, Google translator, Picasa, buying online, Spotify, Blogs, MS-Office tools, Windows Movie Maker, Net-banking, games, etc. Additionally, some of the data corresponds to their interaction with other devices as cellphones, iPads and digital cameras. The initial analysis of this data indicates concerns about privacy, the importance of the family and the need to feel included in the society. Privacy is important, independent of technology and strongly connected with 'who should see what'. Concurring with previous studies of ICT and ageing (e.g. [4], [10], [11]), the family is very important. This suggests that an 'online iTV channel with my relatives', can encourage the uptake and use of iTV by older people. In relation to digital inclusion, all our participants considered that using digital technologies was crucial in being included in current society.

7   Discussion

The data set indicates how older people interact with different technologies. We also collect some information about their use of TV and their opinion about iTV. We already got preliminary results but most of the material still has to be analyzed.   A big issue at this stage of the work is to identify the better technique to perform the data analysis.   We expect results that would contribute to understand the real use that elderly people make of iTV and related technologies, their main accessibility problems and understand the differences and similarities in different cultures. We also expect to increase our knowledge about how older people would interact with iTV in real life. Another important issue is how to apply this result in the next step of the project: Design and evaluating iTV prototypes accessible to the elderly population and according to their needs.   Those initial results also arise one more topic to investigate: which would be the better device for this interaction? The TV? The computer? Or may be something else…

8   Relevance in ICCHP Context

ICCHP is concerned about the accessibility of ICT, and this ongoing PhD addresses two important research areas: iTV and older people. The ongoing results can potentially enable a discussion on different aspects of ICT accessibility with older people, and differences and similarities in different cultural contexts. Another important aspect is the methodological approach, which places emphasis on real-life accessibility and use of ICT.

9   Next Steps

The more immediate next step of this work is to perform the data analyses. The next step in the context of data collection is to perform interviews with elderly in their own house focusing in the use of the TV and their opinion about some specific interactions from the iTV.   The results obtained should be mapped into prototypes that will latter be discussed and evaluated with the users.

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11   Student Biography

Susan Möller Ferreira was born in Brazil, country where she obtained her undergraduate degree and also her first Master degree. She graduated in 2005 in Computer Science from the Federal University of Santa Catarina (UFSC), Brazil. Thesis research line: "Study of the 802.1x Standard (Port Based Network Access Control)". Also in UFSC, Susan obtained her first master degree in Electrical Engineering in 2007. Master Thesis: "Study for the proposition of a Brazilian standard for traffic control equipment communication". With a background in network management and communication, her actual research interests are related to Human Computer Interaction and older people. Currently, she is a PhD student in the Interactive Technologies Group, Department of Information and Communication Technologies at Universitat Pompeu Fabra (UPF, Barcelona, Spain). Susan received her masters in Information, Communication and Audiovisual Media Technologies (TICMA) by UPF in 2009. Master Thesis: Thesis:" Improving usability in web navigation trough implicit metrics of (user) attention".

D. Pre-conference Symposium (OUI-ITD) and ICTD Scholarship 2013

Sixth International Conference on Information and Communications Technologies and Development (ICTD 2013), Cape Town, South Africa, December 07 - 10, 2013.

Pre-conference symposium: "Opening up the ICT ecosystem through inclusion, training and dialogue (OUI-ITD)." University of the Western Cape, Cape Town, South Africa, December 02 - 06, 2013.

Scholarship: Canada's International Development Research Centre.

Working towards the digital inclusion of older people in Brazil: lessons learned from ethnographical studies of ICTs use

This paper aims to explore the ICT use of older people in Brazil in order to contribute to fostering their digital inclusion. A rapid ethnographic study was performed with 78 participants (aged 60+) in a centre that teaches computer classes to older people in Brazil. The results highlight factors that can contribute to the uptake of ICT amongst older people ICT, such as using communication tools and working with multimedia, and others that limit it, such as difficulties using input devices and creating accounts. The results also reveal how the participants designed their own solutions to deal with most of their difficulties. Drawing on these results, strategies to foster the uptake of ICT in Brazil are suggested. The paper also discusses how specific the results and strategies are to older people in developing/developed countries.

Keywords: older people, digital inclusion, ICT use, ethnography, ICTD

1. Introduction

"A core concern that has emerged among ICTD scholars over the last few years is a disproportionate emphasis in current ICTD discourse on fulfilling basic needs of users in low-resource environments without adequate attention to user-motivated concerns addressing which would enrich their lives rather than merely provide access and satisfy of basic needs" (Johri and Pal 2012, p. 64). What are the basic or instrumental (e.g. being able to interact with the content) and non-instrumental (e.g. reasons for using or rejecting technologies) needs of older people (60+) in a developing country such as Brazil in terms of ICT use? In a growing ageing and digital population, addressing this question is important, because if we do not consider the needs and interests of older people, ICTs can reduce, rather than increase, digital inclusion.

Previous studies of digital inclusion in Brazil have suggested that telecenters can promote digital inclusion in the country. Yet, very little is known about how older Brazilian people actually use ICTs. We consider that, in addition to providing citizens with places where they can go online and technological infrastructures, understanding the situated use of ICTs is key to identify challenges and opportunities to foster and strengthen the digital inclusion of older people in current society. We approached this issue from an ethnographical perspective, because we believe the outcomes can (and should) make a substantial contribution towards understanding the instrumental (basic) and non-instrumental (e.g. motivation) needs of older people with respect to their use of ICTs.

This paper presents the lessons learned from a rapid ethnographical study (Millen, 2000), i.e. first-hand observations and conversations during a short period of time, in an educational centre in Sao Jose dos Campos, Brazil (Casa do Idoso), and discusses the results with those gathered in a an ethnographical study of ICT use with 201 older people, conducted by the same authors, in an adult educational centre in Barcelona, Spain, during 2.5 years. In both studies, older people with little to moderate ICT experience used a broad array of ICTs, ranging from MS Word to Social Network Sites (SNS), such as Facebook.

The main results show that communication, feeling in control of their privacy online and working with multimedia content can potentially increase the uptake of ICT amongst older Brazilian people. Keeping in touch with people they know, and sharing multimedia content with them, are strong motivations for learning how to use ICTs. Feeling in control of their privacy is key when using communication tools. Online video portals, such as YouTube, were of their interest, regardless of their previous experience with ICT, as our participants were familiar with TV and VCR, and performing key interactions with the video player (e.g. play and pause) was very inclusive. Their most important difficulties, i.e. basic needs of ICT use to be fulfilled in better designs of these technologies, changed as their experience with ICT increased. Participants without previous ICT experience had difficulties using the keyboard and mouse, while those with more ICT experience, had more difficulties in creating accounts and performing tasks that require a large number of steps for them, such as sharing files using Skype.

Common to both studies was to use ICT mainly for keeping in touch with important people for them, such as their children, a big interest in multimedia files and concerns about privacy. Some differences were also observed in, for instance, their favourite multimedia content. A number of implications for fostering the ICT uptake in Brazil can be drawn from the results, and we discuss them at the end of the paper. We review previous works related to this paper next.

2. Related work

2.1 Changes on the ICT ecosystem in Brazil and the situation of older people

The ecosystem of ICTs in Brazil points out that a minority of the population has access to a computer with Internet at home, despite the fact that the reach of the communication channels is experiencing significant changes. The number of households with at least one computer has increased from 10,6%, in 2000 to 38,3% in 2010, with 30,7% of households with Internet access (IBGE, 2000, 2010). Although the number of houses with a computer has

increased, this number is still very low, especially if we compared it to the number of households with TV, 95% (IBGE, 2010).

A survey on the use of ICT published in 2012 (CETIC.br, 2012) showed that 90% of the people with more than 60 years in Brazil have never accessed the Internet. Keeping up-to-date with these changes is important for them if they do not want to lag behind and be digitally disconnected. In our research, we focus on older people who are interested in using ICT, and with different levels of experience with these technologies. We aim to understand their instrumental/basic and non-instrumental needs to identify factors that could contribute or limit their uptake of ICT in Brazil.

2.2 ICT for Development: older people, and Brazil

ICTD scholars generally focus on children (Hussain, 2010), (Salinas & Sánchez, 2009) or women (Shroff & Kam, 2011). To the best of our knowledge, older people have received very little attention[23].

Previous studies of ICTD in Brazil have suggested that telecenters can promote digital inclusion in the country (Lemos & Martini, 2010) & (Reinhard & Anne Macadar, 2006). Why telecentres? In 2008, they were responsible for 79% of the Internet access amongst the Brazilian population with lower incomes (class D and E) (CETIC.br, 2008). With more access to computers and the Internet in Brasilian households, this situation has changed. In 2012, the access to Internet from telecenters amongst classes D and E dropped to 42%, and, according to Madon (Madon, 2009), 80% of the people who go to telecenters in Sao Paulo are younger than 25 years old. Thus, we decided not to focus on telecenters, despite the fact that they might have allowed us to address intergenerational aspects, which we plan to address in the future. Instead, we focused on understanding the older people ICT use by conducting ethnography in centres where they learn (and use) ICT. We decided to use this methodology, as we believe ethnographic studies can

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[23] To illustrate this fact, we conducted a desktop-based search using different combinations of the words: elderly, older people, older adults, ictd and ict4d in 2 databases - Scopus and Web of knowledge - and no results were found. A similar search using the words elderly, older people and older adults were conducted in the Journals - Information Technology for Development and International Journal of Educational Development - and again no results were found.

make a substantial contribution towards the understanding of older people use of ICT. Next we present and overview from the study in Spain followed by the description of the study in Brazil.

3. Overview of the study in Spain

We conducted a two-year and a half ethnographic study (Fetterman, 2010) in an adult educational centre in Barcelona, Agora [24]. Over this period of time, were conducted 234 hours of fieldwork with 201 older people (aged 60-85) with different levels of ICT experience (ranging from three months to more then 5 years). The core methods applied were: ethnography, user observation, informal conversation, semi-structured interviews, questionnaires, focus groups, diaries, participatory design and workshops. The main results indicated that online video portals can enrich older people communication by motivating their interaction with community members through ICT. Older people can be seen as content creators as well as consumers, since both roles have being indentified among participants, and the most and least severe accessibility issues where identified when using ICTs, such as online video portals and social networks.

4. Description of the study in Brazil

Due to time and resources limitations, we decided to conduct a rapid ethnographical study (Millen, 2000), instead of a more classical, longer-term approach. We carried out our study in an adult educational centre where older people take computer classes and perform other activities, such as arts and physiotherapy, as described further next.

4.1 Setting

Casa do Idoso, São José dos Campos [25] – is a reference center in Brazil that promotes free activities in the areas of welfare,

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[24] Agora: http://www.edaverneda.org/edaverneda/en

[25] Caso do Idoso, São José dos Campos:

http://www.sjc.sp.gov.br/secretarias/desenvolvimento_social/casa_d o_idoso.aspx

education, sports, recreation and culture for people aged 60+. These activities are offered as either regular courses, which require prior registration, or free activities throughout the day. Coordinated by the Department of Social Development of the Municipality of São José dos Campos, the first unit was founded in the city center in 2007. With the success of the first center, the project was expanded and at the moment there are three operational units in the municipality of Sao José dos Campos.

We conducted our study in the city center unit, which receives around 600 older people on a daily basis. Computer classes are regular courses at the centre, the classes last one hour and a half, and are conducted twice a week. The computer room has 15 computers and participants tend to be work individually, i.e. with one computer. During the rapid ethnographic study, eight initial level and four advanced courses took place in the centre. In conversations with members of the staff of the center, the ICT courses attracted lot of interest, and there was a waiting list of people wanting to enroll in them.

4.2 Participants

78 participants, aged 60+, took part in the study (43 women, 35 men). 44 participants were enrolled in the introduction to the ICTs course. They had less than 6 months of experience with computers. The focus of the course was on learning how to use the mouse, keyboard, and on providing older people with basic aspects of Internet use (e.g. access to websites and e-mail). 34 participants were enrolled in the advanced level course. They had more than 1 year of experience with ICT and were familiar with several Internet applications, such as, e-mail, social networks, search engines or newspapers portals. For cultural reasons, most of the participants that take part in the activities in Casa do Idoso have a low family income and low levels of educational attainment.

4 course instructors, aged between 28 and 38, also took part in our research (2 women, 2 men). Two instructors had a Computer Science degree and were the official teachers and responsible for the ICT courses. The other two did not have a degree and were teaching assistants.

4.3 Activities

During the study 60 hours of fieldwork were conducted. We observed how the participants interacted with several ICTs (such as Skype, e-mail systems, Social Network Sites, Microsoft Word and multimedia editing tools) and ran four participatory design (PD) (Spinuzzi, 2005) sessions related to online video portals with 32 older people. These PD sessions were aimed at stimulating the discussion about the video portals and its interaction possibilities. During the activities, informal conversations with the participants and the teachers of the centre were carried out.

Semi-structured interviews were also performed with 4 computer instructors. These interviews were conducted at different stages of the research, aiming to understand the context and validate the results. The interviews were performed individually, in the cafeteria or at the classroom, before or after the courses.

5. Data gathering and analysis

The topics we explored in Brazil (privacy, communication tools, working with multimedia, topics of interest, motivation to learn ICT, accessibility issues, searching for information, taking notes and maps) were chosen according to the results obtained in the study conducted in Barcelona. The study in Barcelona involved a larger number of older people (201) and was conducted over an extended period of time. Thus, being aware of the results in Barcelona we could see similarities and differences emerging in the research in Brazil. We considered that exploring the key issues of this study in Brazil was worthwhile to understand ICT use by a group of older Brazilian people. Adding to that, it allowed us to address the important question of how similar or different the results are in different socio-cultural setting, which is important if we consider that ageing is a complex process and older people are widely regarded as a very heterogeneous user group.

Fieldnotes of *in situ* observations and conversations with the participants were taken during or immediately after the sessions, depending on our participation in them. The entire body of collected data was coded line-by-line (Open Coding), which resulted in

several preliminary categories (Axial Coding). The categories were discussed amongst the authors until agreement was reached, and we use them (see below) to the present the results:

A. *Factors which can potentially contribute to the ICT uptake*: communication, multi-media, online video portals, context dependent.

B. *Factors which can potentially limit the ICT uptake:* accessibility, privacy, fighting against settings issues, need of a pro-active behaviour.

6. Results

6.1 Key factors which can contribute to the ICT uptake

The participants were highly motivated to learn to use CMC (Computer-Mediated Communication) tools and work with multimedia content. CMC tools and multimedia content can contribute to the uptake of ICT amongst older Brazilian people, as we argue next.

6.1.1 Using the computer for keeping in touch with friends and relatives

Using the computer for communication was a very popular among the participants. The most popular tool, and the one they started using first, is the e-mail. The participants started learning to use the e-mail in the initial level course, but many of them already used it, before coming to class, even with a limited knowledge about computers. After having some ICT experience, participants started to use Facebook, which is a very popular tool among them. In both, email and Facebook, sharing pictures was a very common practice. Most participants used these tools to communicate with family members and people from their community. Besides the asynchronous communication tools, the more experienced participants used computers for synchronous communication. They used Skype to talk with family members.

6.1.2 Multi - Media, a motivation to learn ICT and keep in touch with people from their community

Working with multimedia content (especially images) motivated the participants to learn ICTs. For instance, the participants used search engines for seeking images online, downloaded pictures from their camera to the computers and learned how to attach a file to an e-mail in order to share a picture. Participants were very motivated to search, edit and share content with people they know. Receiving an image, a video or a multimedia presentation by e-mail triggered their interest in learning how to work with this type of content.

- Instructor [FIA4] talking with the first author about advanced level course participants: "*They enjoy a lot to send and receive power point presentations by mail. Many of them ask me how to do it. They want to learn to create their own presentation with cool effects in the introduction and music.*"

Sharing media is a common practice among the participants. Once they learn to use the Internet, both the least and most experienced users share pictures and MS Power Point presentations by e-mail. Participants receive several e-mails with media content and forward them to their contacts, including people that they know but are not very close to them, such as colleagues or instructors from the centre. In addition to the mail, participants with more ICT experience also share media in social networks, mainly Facebook.

- A participant [FbrI7] talking with the main author during an initial level course: "*Can you give me your e-mail address? I will send you very beautiful things. Can you send me some pictures from Spain? I really like beautiful pictures!*" Few hours later the participant sent to the author by mail an MS Power Point presentation with images and a religious message.

6.1.3 Online video portals, appealing and accesible

Online video portals attracted the attention of all the participants, and performing key interactions with the video player was easy, even to the participants with less ICT experience. Regarding searching and sharing content, passive and active roles were

identified, ranging from watching videos received by e-mails to searching for videos of their interest. Online videos triggered intergenerational communication (with family members) and also community communication (between friends and colleagues).

- At the end of an advanced level class, a participant [FbrA15] wants to show the instructor a video she received by e-mail: "*Come to see it! Is a video about my grandson, is on his graduation. My daughter sent to me.*" (The video was uploaded in Youtube and she received the link by e-mail).

- A participant [FbrA22] talking with the first author during an advanced level course: "*I often watch videos on internet. I like it a lot and watch all kind of videos. I especially like handcraft videos, last month I learned to do some handmade boxes with it.*"

6.1.4 Interaction is content dependent

The participants' interaction was content dependent, i.e. they were more interested in using a tool when the topic of the content was of their interest. This could be applied to different applications and tasks, such as, typing a text, sharing an image or watching a video. Popular topics of interest were, for example, their favourite singers, famous TV presenters, religion or topics they feel attached to (as their family or neighbourhood).

6.2 Key factors limiting the uptake of ICT and solutions

The main limitations for our participants to uptake ICT were accessibility, privacy and proactive behaviour issues. Our participants developed their own solutions to overcome these problems, as discussed next.

6.2.1 Privacy concerns – need to feel in control of the technology

Privacy is a big concern amongst all the participants regarding communication tools. They need to feel in control of the technology to decide who can see what. They do not feel comfortable enough when sharing content online with people they do not know - close

groups of known people are preferred (e.g. friends on Skype, Facebook or sending an e-mail to a group of people).

- Instructor [FIA4]: "*Participants often ask lots of questions about Facebook. Some want help to upload pictures. They have doubts in relation to public and private messages.*"

Solution: Some participants started to be very selective when adding new contacts in communications tools, such as Facebook or Skype.

6.2.2 Accessibility

6.2.2.1 Using the keyboard and the mouse. The most important accessibility issues of the participants with less ICT experience are related to a low familiarity with the input devices, i.e. keyboard and mouse. The keyboard's main accessibility issues are the size of the symbols and understanding the function of some keys (such as enter, shift or tab). The punctuations' and accentuation's keys are too small and many participants could not see the difference for instance between the point and the coma. Regarding the mouse, coordination problems and lack of precision made it difficult for the participants to use the mouse when, for instance, using the Windows's Start pull down menu.

Solutions: In order to minimize these difficulties, participants take notes related to the keys and their functions. The Figure 1 shows the notes from a participant [MbrI11] regarding punctuation and accentuation keys. To improve their coordination with the mouse participants practiced and performed lot of exercises.
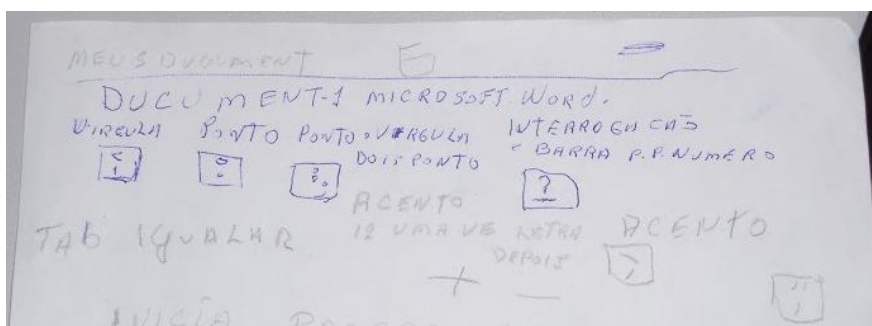
Figure 1. Participant's notes regarding punctuations and accentuation keys

6.2.2.2 Creating accounts and login. A recurrent accessibility issue observed in Brazil was setting up accounts and signing in. The participants needed support to sign up online (e.g. e-mail or Skype) and could not accomplish the task independently. Another main issue is to remember their user name and password. An extra difficulty is added to the process when the system requires a Captcha test to finalize the process. Participants did not understand why they did not write what they can barely see in the image.
- Participant [FbrA30] from advanced level course asking researcher about the Captcha when creating an account in Skype: "*What is this? I can not see anything!*"
Solution: Relying on the support of other people for registration and taking notes of their user name and password.

6.2.2.3 Simple and basic interactions X too many steps. For participants without much ICT experience, interactions that require a small number of steps, less than three, and use the main function of the application were easy to perform. For instance, once the reproductor is already opened running a video only requires one click in the play button. On the other hand, more complex tasks, with too many steps and that differ from the basic flow of the application, were difficult for users without much ICT experience users and they required support. Such as adding a new friend or receiving a file throw Skype.
Solution: Participants with little ICT experience tends to focus their interaction on the basic features of the applications and start to explore more complex tasks after acquiring some practices.

6.2.3 Proactive behavior

Participants describe several issues in their learning process ranging from interaction to access to the technology. A proactive behavior was needed to solve them.

6.2.3.1 Need support. Participants with low ICT experience reported needing support when using computers. Their first strategy was to

ask for the help from younger members of their family, which often refused, arguing that they did not have either enough time or the patience to teach.

Solution: Taking part in ICT courses for older people and ask other younger members of their community. The Figure 2 shows a participant receiving support during a class initial level course.

- Instructor [MII2] taking with main author: "*They often come to ask questions out of class. They ask about everything, e-mail, Facebook, Orkut…*"

Figure 2 - Participant receiving support during a class initial level course.

6.2.3.2 A device to work: Another challenge is to have a computer. Most participants started working with computers borrowed from younger family members or the ones available in free public spaces. Sharing computers with other family members lead to discussions – as far as they told us.

Solution: Buying their own computer. The Figure 3 shows a participant watching a video in her own notebook.

Figure 3 - Participant watching a video in her own notebook.

- A participant [FbrA17] from an advanced course talking with researcher: "*I used to use my son's computers at home. But now he putted a password on it so I can't use it any more. He says I do a mess on everything, can you believe it?*"
- Instructor [FIA4]: "*Is very common that they come to the initial level course without a computer and after some time they buy one. In the advanced level course most of the participants have a computer at home.*"

7. Discussion

The main aim of this paper was to identify challenges and opportunities to foster and strengthen the digital inclusion of older people in Brazil, addressing instrumental (basic) and non-instrumental needs from an ethnographical lens. Before discussing the results in these terms, let us interject a comment on the methodological approach.

When talking about digital inclusion and older people, the discourse tends to focus on engaging those who either are not using ICTs or have given up using these technologies (e.g. Olphert, Damodaran & May, 2005). We have approached it from a different perspective, concentrating on those who have taken the step to learn and use them. This begs the question of what lessons learned from working with older people using ICT can or could be applied to studies of digital inclusion with other groups of older adults. Our results,

based on having observed and talked to older people with different levels of ICT experience over time, indicate that using communication and multimedia to introduce them to ICTs and providing them with ICT courses to empower and give them support to deal with their main interaction issues, are strategies which can potentially foster the ICT uptake among older people who are (not) using ICTs in Brazil, as discussed next.

7.1 Challenges and opportunities to foster the uptake of ICT in Brazil amongst the older population

7.1.1 Using multimedia and communication to introduce older people to ICT

According to Carmichael, (Carmichael, 1999), having a positive initial experience when starting to interact with a novel technology can contribute to eliminating the common feeling amongst older people of being intimidated by it. Several authors (Illich, 1973), (Sen, 1999), & (Johri & Pal, 2012) discussed about the importance, in developing countries, of technologies that enrich people's lives besides filling up their basic needs. We believe that using topics and applications which will be accepted by older people, as they are appealing and accessible, when introducing them to ICT, will motivate them to make the effort to learn those tools.

Working with multimedia and communication tools has proved to be very appealing to our participants. Our results also showed the value of online video portals as a tool to enrich older people access to information and communication. Thus, our results indicate that applying tools related to multimedia, online video portals and communication, to introduce ICT to older people, can promote an initial positive feeling about technology, enrich their daily life and contribute to fostering the ICT uptake in Brazil.

7.1.2 ICT courses contributes to older people empowerment and digital inclusion

According to (Warschauer, 2002), (Gurstein, 2003) & (Johri & Pal, 2012), in addition to providing physical access to ICT, users also

need to feel capable of using them. The results of our study highlight several aspects that indicate that educational centres, which teach ICT to older adults, contribute to their ICT uptake and digital inclusion. Many participants were afraid of computers, but after having some initial guidance at the centre, they were more motivated to practice more and also use other technologies at home. Participants affirmed to feel empowered by the classes and felt more confident.

Other ICTD scholars highlight the importance of empowering users to help themselves (Liang, 2010), (Norris, 2011) & (Johri & Pal, 2012). The results of our research showed that educational centres can empower participants to teach others with less ICT experience. Participants of the courses after some time and ICT experience felt empowered to start teaching and helping other participants. For instance, in Spain, where the centre is based on the work of volunteers, most of the ICT classes are ran by older people that started coming to the centre as students and after gaining some ICT experience started to teach other participants.

We discuss next a question we consider important to deepen the conversation about digital inclusion. How different are older people in developing and developed countries in terms of ICT use? Older people are said to be a very heterogeneous user group, presenting different behavior in different settings and contexts. Our results indicate that they are not so different from the viewpoint of ICT use. The result from the studies in Brazil concurs in several aspects with the research performed with older people in Spain. Although our data is partial, and we conducted different types of ethnographies, and this impacted in different ways on the results, as discussed next, having conducted two studies combining observations with participations in ICT-related activities in Brazil and Spain enable us to provide some answers to this question.

7.2 Similarities regarding older people ICT use in Brazil and Spain

7.2.1. Rapid and traditional ethnography

Although the studies in Brazil and Spain presented differences in

relation to the duration and methodology several similarities in the older people behaviour were identified. Applying a rapid ethnography methodology in Brazil had the advantage of presenting results in a short period of time and allowing an understanding of participants interests, issues and most popular tools. On the other hand, a traditional ethnography method, as applied in Spain, could give us a more complete understanding of the scenario, allowing a more deep perception in how participants use the tools, their accessibility problems and changes in the behaviour with continues use. Thus, being aware of the results in Barcelona we could see similarities and differences emerging in the research in Brazil and address the question of how similar or different the results are in different socio-cultural settings.

7.2.2 Communication, multimedia and privacy

In both settings, using the computer for keeping in touch with community members and working with multimedia content was a motivation to practice ICT. Sharing images using different platforms, such as e-mail and social network sites, enriched their communication with family members, close friends and also other members of their community.

Participants claimed that CMC are very popular amongst younger generations. The participants considered CMC tools help them be more integrated and closer to younger members of their community, such as their children or grandchildren. Multimedia content, such as images and audio, attract their attention due to their familiarity of working with them in other formats, as their old radio or a photograph album. Sharing media files fits the expertise of novel and more experienced users, allowing simple interactions as forwarding e-mails or a more complex one, such as creating their own MS Power Point presentations. Privacy is a concern to be taken into consideration when using CMC. Having control of who sees what was an important issue to the participants. A deeper study should be performed in Brazil in order to understand if the levels of concern in both settings are equivalent or if there are differences among the countries.

7.2.3 Online video portals acceptance

Regarding online video portals, participants in Spain showed a high acceptance of the technology. Participants' intentions to use video portals are discussed next according to the UTAUT (Venkatesh, Morris, Davis, & Davis, 2003) constructors: performance expectancy, effort expectancy, social influence and facilitating conditions.

Regarding performance expectancy, participants believe online video portals enhance their access to information, entertainment and communication. In relation to effort expectancy, participants consider the system easy to use, due to their familiarity with the VCR´s controls. The social influence is often the first step that makes participants start to use the portals. Most users usually have their first contact with the portals by receiving a video recommendation by e-mail from someone they know. Regarding the facilitating conditions, since the participants in Spain were engaged in computer courses, they feel supported to use the tool and feel guidance would be available if needed. Similar behaviours were found in Brazil.

7.2.4 Interaction is content dependent

In both settings, the participants' interaction was content dependent. Although some topics, such as family, their favourite singer or a famous people from the TV, were common in both scenarios, religion was a very popular topic in activities and conversation amongst the participants in Brazil, while in Spain their home town parties were a very popular topic.

7.2.5 Creating content

Participants in Spain showed a big interest in creating content using multi-media material. Several tools are applied for that, such as Power Point, Publisher, Photoshop or Windows Movie Maker. The results in Brazil show that participants had interest in learning how to create MS Power Point presentations and enjoyed editing images using online editing platforms, although this topic has not been deeply explored with them. This opens up an opportunity to create content platforms to stimulate older people in Brazil to practicing

using ICT.

8 Conclusion and future work

This research describes the results from a user study performed in a centre that promotes ICT classes to older people in São José dos Campos, Brazil. The results showed that communication, working with multimedia content and feeling in control of their privacy online are factors which can potentially contribute to the uptake of ICT amongst older Brazilian people. Keeping in touch and sharing multimedia content with people they know are motivations for the participants to learn to use ICT. The online video portals drew their attention, regardless of (a lack of) previous experience with ICT, performing simple interactions with the video player was appealing and inclusive. These results suggest that those portals, and other multimedia and communication platforms, can enrich other people's life and act as an icebreaker to motivate older people to learn ICT. Therefore, the results suggest that those platforms can contribute to increasing the digital and social inclusion of older people in Brazil. The results also highlighted accessibility issues, privacy concerns and the need to have a proactive behaviour as factors that could difficult the ICT uptake among our participants.

Although older people is known to be a heterogeneous user group similar results were found in a longer period research with older people in Spain. Strategies to foster the ICT uptake in Brazil were also discussed. As a future work, we aim to further explore the use of online videos to foster the ICT uptake in Brazil and enrich older people communication with family and community members. We also aim to explore Brazilian older people acting as content creator presenting a more active role when interacting with ICT.

9 Acknowledgements

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Scholarship: Google-Global International.

Designing accessible interactions for older people with iTV

1.   INTRODUCTION

An increasing ageing population and the rising popularity of interactive TV (iTV) makes understanding older people's use of iTV a timely and important task. Whereas iTV opens up opportunities for communication and access to online information/services, older people are at risk of being unable to use them, due to their general lack of digital skills and a tendency to exclude them from software and hardware developments. In my ongoing PhD research, I am looking into designing and evaluating accessible iTV services for and with older people. I am focusing on iTV services related to communication, as it is a key aspect in ageing, and search for information, to enable older people to remain independent and engaged in society.

Regarding previous studies in this area, prototypes have been developed [6], [9], the potential use of iTV as a resource for social interaction has been discussed [9], and the opinions of older people towards iTV have been addressed [3], [5], [6]. None of studies have addressed either the accessibility barriers of iTV experienced by older people or their use of iTV in real-life settings. However, understanding everyday interactions is a crucial element to design better, and therefore, more accessible interactions. My PhD

addresses this overall problem by breaking it into three specific aspects: (i) accessibility barriers; (ii) everyday use; and (iii) cross-culture interactions in countries with different development levels.

The importance of understanding the differences among countries is recognized in diverse areas, including in relation to the use of ICT. However, very little research exists regarding a better understanding of the cultural variation in relation to older people use of technology. Currently, some projects have made important contributions in this field, but deeper investigations are still in need. Most of the previous studies have focused on cultural variation among developed countries [1], [2], [4] especially in Europe, excluding again, the population from the developing countries. Only a few had taken into account countries with different levels of development [7], [8]. Although most of these studies looked at older people's use of technology, none of them focus on their use of iTV. An equivalent outcome from all these projects was identifying different user behaviors in the different contexts, which means that further research is warranted.

2.   APPROACH AND UNIQUENESS

The methodology applied in this research follows the user-center design approach. I have conducted ethnographical methods to collect data about users needs, interests and difficulties while interacting with iTV (and ICT, in general). Combining to the ethnographic study my project includes several other qualitative methods as user observation, informal conversation, interviews, questionnaires, diaries, focus groups, workshops, participatory design, usability tests and prototyping.

The fieldwork activities are mainly conducted in Spain, where I have already spent almost two years. To take into account countries with different developing levels, I have been working for a short period of time with older people in Brazil and Denmark. In all the countries, my research activities were conducted by collaborating with digital inclusion centers . So far, the studies included around 180 older adults. The participants can be considered as a heterogeneous 'user group'. It is composed of older adults aged 60+, with different educational levels and some previous experience with information technologies.

A challenge detected in the initial phase of this investigation is that most of the older adults (who participated in my activities) have TV at home, without iTV services. This was a big concern in relation to observing their use of iTV in real-life settings. The solution I found to this issue was to observe their use of other technologies and through it understand their interaction with iTV. Since the computer has similar features to the iTV, it was chosen to be the main device to be explored. Furthermore this research includes other devices as tablet PCs, cellphones, digital cameras and regular TV. In this scenario, several applications and services were explored such as online TV, YouTube, e-mail, Skype, Facebook, Blogs, Picasa, Spotify, Google maps, Google translator, buying online, MS-Office tools, Windows Movie Maker, Net-banking, games, etc.

3.   RESULTS AND CONTRIBUTIONS

The results of this project have a high social impact, contributing to reduce older people digital exclusion. The outcomes are important contributions to several fields as human computer interaction, user experience, technology acceptance, communication strategies, privacy issues, searching strategies, user content creation, recommendation systems, accessibility issues, usability issues and methods to gathering user data.

So far, the outcomes show an acceptance of the technology by the participants. It provides several design recommendations regarding services that are crucial for iTV and could also be applied to other fields. Concurring with previous work [6], [9], the communication is identified as a key factor in the interaction. The results indicate the use of video portals as a tool to stimulate community communication contributing to older people social inclusion. It identifies the actors of the interaction, the communication flow, the contents and the diverse channels involved in the process.

Content searching is a key to effectively access iTV content. The results show important content searching strategies of older people. Those strategies vary according to their familiarity with the content. In relation to usability and accessibility issues, were identified several concerns regarding the registration processes, searching for

content techniques and the sharing tools. Some of those issues are crucial to enable the older people interaction with iTV and other technologies.

The outcomes also highlight the older people behavior as content creators, their concern with privacy driving their interaction and their different profiles of use, from less to more experienced users. Regarding methodological contributions, was identified several issues in relation to collecting user data in different contexts. These considerations highlight the importance of a deep investigation regarding cross-cultural studies with older people and ICT.

The aim for the next stage of this project is to perform a deeper investigation concerning content creation, content consumption, sharing practices, use of tablet PCs as second screen device and technology acceptance in iTV services. In order to triangulate the data, this following stage will also focus on quantitative studies in relation to user behavior.

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Designing accessible interactions of older people with Digital TV

ABSTRACT

The main aim of my PhD is to design and evaluate accessible interactions of older people with DTV (Digital TV) services related to communication and e-health information. DTV opens up a wide range of opportunities for older people to communicate with their social circles and access to online information. However, DTV services are not accessible to older people. I address this problem by considering three relevant and relatively unexplored areas in the field of DTV accessibility with older people: real-life accessibility barriers, everyday use of DTV and cultural differences. I will follow a user-centered design methodology with a contextual component in order to observe and talk with older people while interacting with DTV in real-life settings, and to design and evaluate prototypes with two user groups (Spain and Brazil). I seek to identify the most and least relevant accessibility barriers for older people to interact with DTV. I also expect to identify their needs and real use of DTV services, and discuss cultural differences in the two previous aspects. These results will take current DTV research with older people forward.

Keywords: Digital TV, older people, real-life accessibility.

1. INTRODUCTION

There is growing interest in improving ICT (Information and Communication Technologies) accessibility to older people. In my PhD I focus on DTV, since it is an emerging technology that opens up a wide range of opportunities for older people to access digital information and services that can (and should) improve their quality of life. The aim of my PhD is to design and evaluate accessible interactions of older people with DTV services related to communication and e-health information. I concentrate on communication because it serves critical functions in ageing [7]. I focus on e-health because older people look for information about health when they go online [1]. In the rest of the paper I describe the problem, expected results and methodologies. This is followed by what I expect contribute to DTV (and HCI) research with older people and to gain from this doctoral consortium.

2. OVERALL PROBLEM

Older people consume a lot of TV content. However, moving from analog to digital TV is a mixed blessing for them. Whereas DTV opens up opportunities for communication and access to online information/services older people run the risk of being unable to use them, due to their general lack of digital skills and the tendency to exclude older people from software and hardware developments. The populations ageing, the relevance of DTV for older people and their accessibility barriers when interacting with it create a need to make DTV more accessible to older people.

Some studies have addressed DTV accessibility for older people ([5], [9], [12]). They have mainly focused on developing novel prototypes, without exploring the real-life of DTV by older people. However, understanding everyday interactions is a crucial element to design better, and therefore, more accessible interactions. My PhD addresses this overall problem by breaking it into three specific aspects: (i) accessibility barriers; (ii) everyday use; and (iii) cultural

differences in accessibility and use. Next I explain my motives for concentrating on these areas.

3. MOTIVATION

Whereas the accessibility barriers that older people face while interacting with the web, e-mail systems and other technologies have been explored ([3], [10]), very little is known about the accessibility of DTV interfaces for them. However, this is a crucial step for older people to use and interact with DTV. As stated in [9], significant work still should be done to design interfaces that are more usable to older adults and can support their skills and abilities. Regarding everyday use, according to [2]: "the major open research question in ITV is when, and how much audiences want to interact with devices, content, and other people". Previous studies have shown that communication systems (as e-mail) are very popular among older people ([3], [11]). Some studies have also suggested that communication and social interaction through TV are important applications for them ([9], [12]). But there is no information as to how older people interact with DTV in their daily life. However, there is growing awareness in HCI that understanding how people interact with technologies in their daily life is a key step to design better (and therefore, more accessible) technologies [6].
With respect to culture, [8] points out that different aspects should be considered in relation to the design of DTV services in both developed and underdeveloped countries. Culture pervades our interactions and this might be even more important for older people, due to their life experiences. However, I am not aware of any studies of cultural differences in relation to the use and accessibility of DTV with older people.

4. SOLUTION AND METHODOLOGY

Three are the main results of my PhD:(A) identification of the accessibility barriers that hinder more severely the interactions of older people with DTV - prototypes related to communication and access to online information about health; (B) examination of how older people interact with and use DTV in real-life settings; and (C) exploration of cultural differences in accessibility barriers and use of DTV amongst older people living in developed and underdeveloped countries.

I will follow a user-centered design approach, with a strong contextual component guided by the Contextual Design methodology [4]. The general design and research stages of the study are: (i) Contextual investigation: Interview and observe users group, considering older people needs, patterns of behavior and accessibility problems; (ii) Interpretation and Data Consolidation: Identify key points and common understanding related to the previous stage. (iii) Brainstorm solutions: Propose solutions. Identify what applications could do to address the full potential; (iv) Paper prototypes interviews: Perform many times; (v) Prototype testing: Usability tests with high-fidelity prototype.

I am going through these steps by focusing on the scenario involving older Spanish people. After going through some of the stages and getting some results, I will focus on the third objective, cultural differences. In order to compare data from two different countries these stages will be perform in another scenario (Brazil). The results will be analyzed by using quantitative (experimental design) and qualitative (content analysis) techniques.

Methods that may be including in this study are: first-hand observation of users behaviors; interviews; questionnaires; focus groups; low and high fidelity prototypes; usability studies; and analysis of log files.

In relation to the user group, I aim to work with 40 older people (20 in Spain, 20 in Brazil) ranging from 65 to 80 years old. Our user groups include participants with low education levels and little experience with ICT (and DTV). All of them will have TV at home and be motivated to interact with DTV. Ethical concern forms will also be used throughout my research.

5. STAGE

At present, I have carried out a literature review and defined the methodology. I am in contact with companies that will provide me with the DTV services need to evaluate and design prototypes. I am currently creating the pool of users; designing the material for the contextual analysis and exploring the technologies to develop DTV prototypes.

6.   CONTRIBUTION ACCESSIBILITY

I aim to contribute to HCI research with older people with: (i) an understanding of accessibility barriers in everyday interactions; (ii) identification of their real needs and use; and (iii) discussion of relevant cultural differences in both accessibility barriers and use of DTV services in developed and developing countries.

7.   PARTAKING IN THE CONSORTIUM

I hope to receive feedback from experts in the area, especially in terms of the design and evaluation methodology: challenges, opportunities, methods, data gathering and analysis. This will be an excellent opportunity for improving my presentation skills and meet other PhD students working on accessibility with whom I could share my work.

8.   ACKNOWLEDGMENTS

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APPENDIX II, OTHER PUBLICATIONS

This appendix presents conference papers, posters and magazine articles in which partial results of this dissertation have been published. It also shows publications related to my participation in R&D projects while undertaking this PhD dissertation.

First I present three papers (in EuroITV, ACM womENcourage and SIGACCESS newsletter) in which partial results of my research have been published. Sections A and C present papers related to extended abstracts of this dissertation. Section B presents preliminary findings from the first stage of this research.

A. Ferreira, SM., Sayago, S. and Blat, J. (2014). Towards understanding how older people use iTV. *Poster in ACM womENcourage Europe*.

B. Ferreira, S., Sayago, S., Righi, V., Malón, G., Blat, J. (2011). Online iTV use by older people: preliminary findings of a rapid ethnographical study. *Poster in European Interactive TV Conference series –EuroITV*.

C. Ferreira, S., Sayago, S., Arroyo, E., & Blat, J. (2011). Towards designing more accessible interactions of older people with digital TV. *ACM SIGACCESS Accessibility and Computing*, (99), 24-29.

While I was undertaking this dissertation, I took part in *Life 2.0*, a EU-partially funded project aimed at designing innovative services for supporting older people's independent life by enhancing social interaction among their neighbours, and in *WorthPlay*, a two-year international project funded by Obra Social "laCaixa" and Fundación General CSIC, aimed to understand what makes digital games sufficiently appealing, playable and meaningful for older people. As a result of my activities in these two projects, wherein I conducted ethnographical research and contributed to Participatory Design and evaluation activities, I co-authored a journal paper (currently, under review), a technical report and a conference paper. Appendix II presents the abstract of these works.

D. Sayago, S., Rosales, A., Righi, V., Ferreira, S.M., Coleman, G., Blat, J. (minor revisions needed) On the Conceptualization, Design and Evaluation of Appealing, Meaningful and Playable Digital Games for Older People. *Games & Culture*

E. Rosales, A., Righi, V., Ferreira, S., Tirado, J., Sayago, S. & Blat, J. 2014. D8.1 Second report on experiences of digital game play. Proyecto Cero Worthplay (WorthPlaying Digital Games for Active and Positive Ageing). Available at: http://worthplay.upf.edu/node/181

F. Righi, V., Malón, G., Ferreira, S., Sayago, S., & Blat, J. (2011). Preliminary findings of an ethnographical research on designing accessible geolocated services with older people. In *Universal Access in Human-Computer Interaction. Users Diversity* (pp. 205-213). Springer Berlin Heidelberg.

A. Towards understanding how older people use iTV. *Poster in ACM womENcourage Europe*

Towards understanding how older people use iTV

1. Introduction

Both an increasing ageing population and the rising popularity of interactive TV (iTV) mean that understanding older people's use of iTV is a timely and important task. iTV opens up opportunities for communication and access to online information/services. Yet, older people are at risk of being unable to use them, due to their general lack of digital skills and a tendency to exclude them from software and hardware developments. In this ongoing research, we aim to design and evaluate more accessible iTV services for, and with, older people. We focus on iTV services related to communication, as it is a key aspect in ageing (Nussbaum et al., 2013), and on searching for information, hoping to enable older people to remain independent and not to lag behind in society.

Understanding everyday interactions is crucial in designing better, and therefore, more accessible interactions. This project addresses this overall problem by breaking it into three specific aspects: (i) accessibility barriers; (ii) everyday use; and (iii) cross-cultural factors.

2. Methodology

The methodology applied in this project follows the user-center design approach. We have conducted ethnographical methods to

collect data about users needs, interests and difficulties while interacting with online iTV (and ICTs, in general). Other qualitative methods, such as as user observation, informal conversation, interviews, questionnaires, diaries, focus groups, workshops, participatory design, usability tests and prototyping, have also been used to address from different perspectives the aforementioned aspects.

The fieldwork activities were mainly performed in Spain, where a two-year ethnographical study, adopting a traditional approach (Fetterman, 2010), was conducted. To take into account countries with different developing levels, and cultural diversity, a rapid ethnographical study (Millen, 2000) was conducted in Brazil and Denmark. In both settings, the activities were performed by collaborating with centers that promote ICT courses for older people[26]. So far, the studies included 201 older adults in Spain, 78 in Brazil and 103 in Denmark. The participants can be regarded as a heterogeneous 'user group', comprised of older adults aged 60+, with different educational levels and previous experience with ICTs. Figure 1 shows Spanish participants interacting with online videos.

Figure 1. Participants interacting with online videos

A challenge that arose in the initial phase of this investigation was that most of our participants did not have smart / iTVs at home. We

[26]Settings:
O1. Agora, Escola d`Adults de La Verneda-Sant Martí, Barcelona, Spain, (http://www.edaverneda.org/).
O2. Casa do Idoso, Sao Jose dos Campos, Brazil, (http://www.sjc.sp.gov.br/secretarias/desenvolvimento_social/casa_do_idoso.aspx).
O3. FoF, Aalborg, Denmark, (http://www.fof.dk/AfdelingForside.aspx?enhed=1).
O4. Borger Datacenter (affiliated with Ældremobiliseringen), Jerslev, Denmark, (http://www.jerslev.net/view.asp?soc=158).

could not observe their use of iTV in an important real-life setting. The solution we came up with was to observe their use of other technologies and from this, understand their interaction with online iTV. Since the computer has similar features to iTV, the computer was chosen to be the main device to be explored. Furthermore, this research includes other devices, i.e. tablet PCs, cellphones and digital cameras. In this scenario, several applications and services were explored, e.g. YouTube, e-mail, Skype, Facebook, Blogs, Picasa, Spotify, Google maps, buying online, MS-Office tools and Windows Movie Maker.

3. Results and future work

The results from this project deal with accessibility barriers and use of online iTV in real-life settings by older people. Thus far, the results suggest services that are crucial for iTV and that could be applied in other technologies too. The results related to the use of online iTV, points to using media to stimulate older adults' community communication, their sharing practices, their behavior as content creators and their concerns with privacy. Other important findings are related to searching for content, second screen practices, accessibility problems and attitudes concerning several interactive services in iTV. Regarding methodological contributions, several issues were identified in relation to collecting user data in different contexts. These considerations highlight the importance of a deep investigation regarding cross-cultural studies with older people and ICT.

The aim for the next stage of this project is to perform a deeper investigation concerning content creation, content consumption, sharing practices, use of tablet PCs as second screen device and technology acceptance in iTV services. In order to triangulate the data, this following stage will also focus on quantitative studies in relation to user behavior.

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B. Online iTV use by older people: preliminary findings of a rapid ethnographical study. *Poster in European Interactive TV Conference series*

Ferreira, S., Sayago, S., Righi, V., Malón, G., Blat, J. (2011). Online iTV use by older people: preliminary findings of a rapid ethnographical study. *Poster in European Interactive TV Conference series –EuroITV*.

Online iTV use by older people: preliminary findings of a rapid ethnographical study

ABSTRACT

This poster presents preliminary findings of a rapid ethnographical study of online iTV use by some 40 older people during 2 months. Whereas some research has addressed iTV accessibility for older people, online iTV has largely been overlooked. This paper presents some key issues of online iTV by ordinary older people who are motivated to technology uptake, their attitudes towards interacting with iTV on the traditional TV and a number of issues related to ICT use which can inspire the design of more enriching and inclusive online iTV services.

Categories and Subject Descriptors

H.5.2 [Information Interfaces and Presentation]: User Interfaces - User-centered design; K.4.2 [Computers and Society]: Social Issues - Assistive technologies for persons with disabilities;

General Terms

Design, Human Factors.

Keywords

iTV, older people, accessibility, ethnography

1. INTRODUCTION

The traditional model of watching TV is changing. Today, people can interact with and create TV content almost anywhere. Online iTV (interactive TV on the web) allows us to share and produce content, reinforce communication and personalize information and services. We argue in this paper that exploring online iTV with older people (60+) is worthwhile. Online iTV services can and should be useful to older people, who consume a lot of TV. However, and despite an increasing ageing population, they run the risk of missing out on these opportunities if online iTV is not accessible to them. Most of today's older people have a lack of experience with digital technologies. Furthermore, these technologies have largely been designed without taking older people into account. Thus, there is a need to further online iTV research with older people.

A number of previous studies have addressed iTV accessibility with older people ([6], [11], [15]). These have focused on developing novel and interesting software prototypes. For instance, [11] describes a system aimed at sharing multimedia content and [15] discusses a tool intended to give support to communication. Other studies have explored through interviews the reasons why iTV is unappealing to older people [6].

Whereas the interaction barriers (e.g. difficulties using the mouse, understanding computer jargon) that older people face while using other digital technologies have been explored before ([5],[13]), very little is known about those they encounter when interacting with iTV. [11] points out that significant work still should be done to design interfaces that are more usable to older people and support better their skills and abilities. Moreover, none of the studies reviewed above has addressed online iTV, despite the proliferation of it. Examples are the BBC iPlayer of the BBC in the UK [3] and TV3 A la Carta of TVC [16] in Catalonia. There is also a lack of information about how older people use (or would use) online iTV in out-of-laboratory conditions. Most of the studies reviewed above have been conducted in laboratory conditions, which concurs with the main approach adopted in HCI research with older people to date [13]. Yet, there is growing awareness in HCI that understanding interactions as they happen in everyday

environments is a crucial element to designing better, and therefore, more accessible interactions [9, 13]. An extended ethnographical study of technology use by older people revealed, for instance, that accessibility issues due to cognition limit older people's interactions with digital technologies in out-of-laboratory conditions more seriously than those due to vision [14].

This paper presents the preliminary results of a rapid ethnographical study [8] of iTV use by older people. This work is being conducted within Life 2.0 [7], a research project aimed at making the network of social interactions more visible to older people. This will be done by providing them with an accessible platform consisting of collaborative ICT that track and locate relevant members of their social networks (i.e. relatives, friends and caregivers). The Life 2.0 platform will allow older people and their social networks to communicate amongst themselves through phone calls, text messages, advanced multimedia content distribution systems (e.g. IPTV, interactive digital signage and WebTV) and video telephony/conference solutions.

The preliminary results indicate that our participants are interested in online iTV, especially in re-watching their favorite programs and watching those TV programs they missed. They are also keen to recommend TV programs to important members of their social circles. Interestingly, our participants do not have any interest in writing comments related to TV programs, despite the popularity of the comments in online iTV and, in general, Web 2.0. The results also indicate some interaction and social issues that should be considered in the design and evaluation of future iTV services, namely, privacy and social exclusion.

The remainder of the paper is organized as follows. Section 2 describes the rapid ethnographical study. Section 3 presents the initial results of this study. Section 4 discusses the results and the research approach. Section 5 describes our ongoing and future research activities.

2. RAPID ETHNOGRAPHICAL STUDY

2.1 Context: Àgora

We have conducted this study in Àgora, a 20-year-old association in Barcelona, which intends to integrate into Catalan society people who are, or might be, excluded from it, e.g. immigrants, non-educated and older people. Àgora considers that mastering digital technologies is a crucial aspect in achieving this inclusion. Thus, courses in computing, Internet access and workshops are provided. These and other activities are free of charge and participants, which is the term used by Àgora to reinforce the 'inclusion' aspect of their work, decide what technologies they want to (learn to) use. This decision is often grounded in the participants' daily needs or interests.

2.2   Participants, iTV and research methods

We have conducted 27 hours of fieldwork over a 2-month period. The fieldwork activities consisted of in-situ observations of and informal conversations with around 40 older people (aged 60-75) while using several digital technologies.

We ran 5 workshops, in which we explored technologies relevant for Life 2.0, such as and online iTV (YouTube and on-demand Spanish and Catalan TV channels), Google Maps, weblogs and Facebook. We also participated in 2 courses, which were organized by Àgora as part of their activities to foster the use of digital technologies amongst the older population and that had no specific connection with Life 2.0, in order to develop a more comprehensive understanding of older people's interactions with digital technologies. The fieldwork was conducted in the Àgora's computer room.

Our participants can be considered as a heterogeneous 'user group'. They originated from different Spanish and Catalan regions, and had different educational levels (ranging from primary to secondary school). In terms of computer skills, 27 were familiar with basic and more advanced aspects of interacting with computers, such as when to left- or right-click and look for information online. Table 1 summarizes the fieldwork activities.

Table 1 - Ongoing fieldwork

Activity	Description	Technology	Participants	Duration
Workshop on Google Maps	Hands-on introduction to	Google Maps	12 (6 men / women)	2 sessions 2-hour

	Google Map, collaborative map.			session / week
Workshop on weblogs	Hands-on introduction to blogs, creation of a blog with blogger.	Blogger	11 (5 men / 6 women)	2 sessions 2-hour session / week
Workshop TV on the Web	Hands-on introduction to TV channels video on demand Web Page and Youtube.	Internet Explorer, Mozilla Firefox	11 (6 men / 5 women)	1 session 2-hour
Workshop Facebook	Hands-on introduction to Facebook.	Facebook	9 (6 men / 3 women)	1 session 2-hour
Participatory Design Workshop	Discussion about collaborative maps and blogs.	Map paper prototype and some other images and text.	10 (5 men / women)	1 session 2-hour
Course on Gardens of the World	Download and edit pictures from the web about gardens. Create/share documents (e.g. calendar, power point).	Internet Explorer, Mozilla Firefox, MS office tools, picture-editing tools, e-mail.	9 (4 men / 5 women) 11 (6 men / 5 women) 9 (4 men / 5 women) 9 (4 men / 5 women)	4 sessions 2-hour session / week
Course on Wild life and Nature	Idem	Idem	13 (4 men / 9 women) 11 (4 men / 7 women)	2 sessions 2-hour session / week

We have recorded fieldnotes by using paper and pencil, and photographs. Our participants wrote down their notes by using notebooks and were used to other people in Àgora doing the same. Thus, laptops and video cameras were intrusive. Also, there are no laptops in the Àgora's computers room, and our participants are not used to being videoed during their everyday interactions with them.

We have analyzed the fieldnotes by using Grounded Theory [4], i.e. while gathering the data. We have conducted initial, axial and selective coding. We discuss the initial results next .

3. PREMILINARY RESULTS

We first discuss some aspects of how older people use or would use online iTV. We then deal with their attitudes towards watching online iTV on the traditional TV. We also address other aspects related to interacting with online iTV, such as privacy and social inclusion, which emerged from the analysis and we consider crucial in better understanding and designing online iTV services with older people.

3.1 Using online iTV

Whereas none of our participants had used online iTV before, all of them were eager to use it. They showed interest in sharing videos with people they did know, namely, their children, grandchildren and close friends. They are also key 'actors' in the use of e-mail by older people [14]. Our participants were also interested in the possibility of either re-watching TV programs or watching those they missed.

We observed that the participants were keen to share videos by e-mail. This is probably because all of them send and receive e-mails. However, no participant was interested in either commenting or rating videos. We found a similar result in a previous study of YouTube we conducted with another group of older people [1]. In both studies, older people reported not being interested in the opinions of other people, and their strategy for 'commenting and rating' is likely to be 'sending an e-mail' to their children, grandchildren and close friends. Part of our future work is to explore this issue in detail.

We observed, and participants reported, that websites such as TVE a la carta [10], TV3 a la carta [16] and BTV a la carta [2], were fairly easy to use. Despite the considerable amount of information presented on these sites, each participant searched for his or her favorite TV programs independently (i.e. without relying on us). They were much more dependent (i.e. relying on us) to conduct other activities, such as downloading an attachment received in an e-mail, in which we consider they deal with much less amount of information. Several factors might account for this interesting finding, which highlights the relevance of cognition in agreement with [13, 14] such as the familiarity with the task at hand or the

desktop (difficult to understand) and online iTV metaphors (similar to TV magazines). We will explore this result further in our future research.

3.2 Attitudes towards watching online on TV

As there is a growing tendency towards accessing the Internet through traditional TVs, we decided to explore the attitudes of our participants towards interacting with online iTV using their own TVs. At first, they found it difficult to imagine 'an online TV'. The computer was the device for 'doing online activities'. However, after having had some contact with online iTV through computers, all participants showed a big interest in doing the same through their TVs. As stated earlier, they were keen to re-watch their favorite TV programs or watch those they missed. It is worth noting that rather than being afraid of digital technologies, our participants wanted to explore what they could do with them.

3.3 Privacy, family and social inclusion

Our participants are worried about their privacy when they go online. Most of the participants do not use Facebook because they do not relish the idea of letting unknown people read their messages or personal information. However, they were interested in showing other participants, their children and grandchildren what they do in Àgora and share with them (e.g. e-mail) information which can be regarded as personal (e.g. a presentation with photos of their grandchildren). Privacy is important, independent of technology and strongly connected with 'who should read what'.

Concurring with previous studies of ICT and ageing (e.g. [5], [11], [13]), the family is very important in the use our participants make of online iTV services. This suggests that an 'online iTV channel with my relatives', or other forms of communication with them mediated by online iTV, can encourage the uptake and use of it by older people, as well as reducing social exclusion.

All our participants considered that using digital technologies was crucial in being included in current society. Thus, although numerous older people are not motivated to use ICT, the effort our participants make to use them should be understood as an opportunity to design better iTV services for them (and all of us).

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4. DISCUSSION

We have addressed online iTV with a heterogeneous group of older people in an attempt to improve current understanding of iTV with them and their interactions with digital technologies.

The preliminary results are rich, as they have shown expected and unexpected findings and dealt with a broad number of issues. For instance, whereas re-watching favorite TV programs can hold true for the use of online iTV by other user groups, our participants seem to have their own strategy for rating and commenting online iTV content, and this strategy is not related to writing comments or clicking on 'I like it' on the website. We have also identified their changing and positive attitudes towards iTV, and the importance of privacy, the family and social inclusion in understanding their interactions with iTV (and other technologies) and designing better ones for them.

We have adopted a research approach which has seldom been used in previous studies of iTV (and HCI in general) with older people: rapid ethnography [14]. Although the results are preliminary, our first experiences of recording in-situ observations of and conversations with the participants while using the technology in out-of-laboratory conditions suggest that the method has great potential to further our understanding of older people as iTV users. Whereas it is common to include extracts of fieldnotes in ethnographical studies, we have not included any because we feel much more research is needed to expand, confirm and reject our initial ideas.

At this stage of our research, we have not made any comparison between younger and older people's interactions with online iTV because we consider we need to understand much deeply the current gap in iTV research with older people and work with more participants in order to make valid, significant and useful comparisons.

Finally, let us also note that whereas the number of participants who took part in activities related to iTV during our fieldwork can be regarded as small, and we need to work with more participants in our future work, observing and talking with them and others while

using different digital technologies has allowed us to start to identify and understand interactions issues which are common across to technologies.

5.   NEXT STEPS

We are gathering more ethnographical data. We expect to combine informal conversations with more structured interviews and focus groups in order to deepen and widen our first-hand observations and in-situ conversations. We are also currently analyzing the diaries filled by our participants. This analysis should help us cover more activities and gather more quantitative data (e.g. frequency of use of TV). We plan to conduct much more activities (e.g. workshops) related to iTV so that we can explore further the use of several iTV services, platforms and technologies.

We will also design quantitative studies to understand the effect of observational and conversational data on the interactions of older and younger people on the prototypes we will design.

6.   ACKNOWLEDGMENTS

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C. Towards designing more accessible interactions of older people with digital TV. *ACM SIGACCESS Accessibility and Computing*

Towards designing more accessible interactions of older people with Digital TV

Abstract

This paper outlines an ongoing PhD thesis about accessibility, DTV (Digital TV) and older people. We aim to design and evaluate accessible interactions of older people with DTV services enabling communication and access to information about health and wellbeing. DTV opens up a wide range of opportunities for older people to communicate with their social circles and access online information. However, DTV services are far from being accessible to older people. We aim to fill this gap by addressing three relevant and up to now relatively unexplored areas in DTV accessibility research with older people: interaction barriers, everyday use of DTV services enabling communication and access to information about health, and cultural differences in both interaction and use. We will use key ethnographical methods to understand these aspects with two user groups of older people living in developed and developing countries (Spain and Brazil). We will also design and evaluate interactive prototypes of related DTV services by drawing upon the ethnographical data, and involving older people in the design and evaluation (participatory design) process.

Introduction

This paper outlines an ongoing PhD thesis about older people, accessibility and Digital TeleVision (DTV). This paper is an extended version of the one presented in ASSETS 2010 Doctoral Consortium[27].

The overall aim of the PhD carried out by Susan Ferreira is to design and evaluate accessible interactions of older people (65+) with DTV services enabling communication and access to information about health and wellbeing by adopting an ethnographical approach. Communication serves critical functions in ageing [Nussbaum et al., 2000]. Previous Human-Computer Interaction (HCI) research with older people has also shown that communication is a motivation for them to both take up and use Information and Communication Technologies ([Dickinson et al., 2005], [Sayago and Blat, 2009]). Seeking information about health and wellbeing is also very common amongst those older people who go online [Becker, 2004]. DTV opens up a wide range of opportunities for older people to communicate with their social circles, and access both information and services related to health and wellbeing that can (and should) improve their quality of life. Our review of previous HCI research with older people and DTV, which is outlined later, shows that this is an emerging research area. However, very little is known about how older people interact with DTV in their everyday lives - and therefore, how we can design better and more accessible (and useful) DTV services enabling communication and access to e-health for them. HCI has turned to ethnography to get a deeper insight into the everyday interactions of people with technologies. This has been motivated by the fact that understanding interactions in out-of-laboratory conditions is a key aspect to design better technologies [Moggridge, 2007]. However, very little ethnographical research has been carried out in HCI research with older people to date [Sayago and Blat, 2010]. Thus, we consider that this thesis can make several contributions (e.g. accessibility barriers, everyday use of DTV, methodology), which can potentially push forward current HCI research.

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[27] *Designing accessible interactions of older people with Digital TV*:
http://www.sigaccess.org/assets10/doctoral.html

Why a PhD on older people, accessibility and Digital TV?

Both population ageing and the increasing role of DTV in current society create a need to enhance DTV accessibility to older people. Whereas DTV opens up numerous opportunities for keeping in touch with their social circles and access to online information/services, older people run the risk of being unable to exploit DTV. This is mainly due to their general lack of experience with digital technologies, and a tendency towards excluding older people from software and hardware developments.

What is this PhD about?

A number of previous studies have addressed DTV accessibility for older people ([Rice and Alm, 2008], [Svensson and Sokoler, 2008], [Kurniawan, 2007]). They have mainly focused on developing novel and interesting prototypes. Rice and Alm proposed and evaluated four prototypes layouts of communications systems. These prototypes were related to sharing multimedia contents. Svensson and Sokoler proposed a prototype that facilitate and stimulate the elderly communication while watching TV. Kurniawan interviewed older women to investigate the reasons that make the digital TV unappealing to older people. Yet, none of them have explored the everyday interactions of older people with DTV. However, there is growing awareness in HCI that understanding everyday interactions is a crucial element to design better, and therefore, more accessible interactions [Moggridge, 2007]. This PhD addresses this overall problem by breaking it into three specific aspects: (i) interaction barriers; (ii) everyday use; and (iii) cultural differences in accessibility and use of DTV content. Next we explain the reasons why we concentrate on these areas.

Many interaction barriers, but…with DTV?

Whereas the barriers that older people face while interacting with the web, e-mail systems and other technologies have been explored ([Dickinson et al., 2005], [Sayago and Blat, 2009]), very little is known about those they experience when interacting with DTV. However, this is a crucial step for older people to use and interact

with DTV. As stated in [Rice and Alm, 2008], significant work still should be done to design interfaces that are more usable to older adults and can support their skills and abilities.

Everyday use

According to [Chorianopoulos and Lekakos, 2007]: "the major open research question in ITV is when, and how much audiences want to interact with devices, content, and other people". Previous studies have shown that communication systems (as e-mail) are very popular among older people ([Dickinson et al., 2005], [Sayago and Blat, 2010]). Some studies have also suggested that communication and social interaction through TV are important applications for them ([Rice and Alm, 2008], [Svensson and Sokoler, 2008]). However, there is a dearth of information as to how older people interact with DTV in out-of-laboratory conditions.

Culture matters, but little has been done so far in DTV

[Piccolo and Baranauskas 2008], points out that different aspects should be considered in relation to the design of DTV services in both developed and developing countries. Culture pervades our interactions and this might be even more important for older people, due to their lifelong experiences. However, we are not aware of any studies of cultural differences (and similarities) in the everyday use and accessibility of DTV with older people.

Overall PhD approach and expected results

We are going to adopt a user-centered design approach, paying special attention to everyday aspects of older people's interactions with DTV (e.g. with whom? Where? When?, How?). We will use basic and essential ethnographical methods (in-situ observations and conversations for prolonged periods of time) to understand older people's needs, patterns of use and interaction barriers due to age-related changes in functional abilities and previous experience with DTV. We will analyze this data by using qualitative data techniques in order to identify key points and common understanding related to the previous stage. We will also carry out participatory design with our two user groups in order to discuss

DTV services enabling communication and access to information about health and wellbeing, which will emerge from our analysis of the ethnographical data. We will also design low- and high-fidelity user interface prototypes. We will evaluate these prototypes in real-life settings. The concrete evaluation protocol still needs to be defined and agreed with our users. We will conduct interviews; questionnaires; focus groups and analysis of log files to gather data that help us understand the overall picture.

We expect to work with 40 older people (20 living in Spain, 20 living in Brazil), ranging from 65 to 80 years old. Our user group will include older people with low education levels, and with some previous experience with information technologies. All the participants will have DTV at home and be motivated to interact with and learn more about DTV services. Whereas the number of participants might be insufficient to draw significant conclusions from an experimental point of view, we expect to gain deeper insights into their interactions with DTV, which future research can use to make more general claims.

The main results of this PhD can be divided into three groups: (A) identification of the interaction barriers that hinder more and less severely the everyday interactions of older people with DTV - prototypes related to communication and access to online information about health; (B) examination of how older people interact with and use some DTV services in real-life settings; and (C) exploration of cultural differences in interaction barriers and use of DTV amongst older people living in developed and underdeveloped countries.

Work done so far, and future perspectives

We have carried out a literature review on HCI research with older people on DTV and defined a methodological approach for the research to be done. We are in contact with companies in order to explore the possibility of doing our PhD research with either experimental or already running commercial prototypes. We are also creating the pool of users; designing the material for the ethnographical studies and exploring the technologies to develop interactive DTV prototypes.

We have also started to work in Life 2.0, an ICT PSP project which aims to research on and develop services for *Geographical positioning services to support independent living and social interaction of elderly people*[28], and technologies such as DTV are to be explored to achieve this goal.

Acknowledgments

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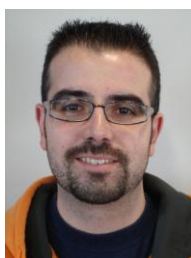
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On the Conceptualization, Design and Evaluation of Appealing, Meaningful and Playable Digital Games for Older People

Abstract

While older people tend to be regarded as actual, or potential, players of digital games within literature on Game Studies, Human-Computer Interaction and Gerontechnology, they are often considered non-avid users of digital technologies. This contradiction prompted us to conduct a literature review, which revealed (a) insufficient involvement of older people within the design of games targeted towards this group, and (b) insufficient understanding of their everyday digital gameplay. In this paper, we present the conceptualisation, design, and evaluation of digital games that active older people found to be sufficiently appealing, playable and meaningful. A 6-month ethnography of the play experiences of 178 older people helped us to conceptualise these games, which were co-designed through everyday playful activities. To facilitate the development of these games, we designed and evaluated an online game creation platform, which enabled 99 older

people with different cultural backgrounds to create, play, and contribute to games.

While the attitudes of older people (60+) towards ICTs are depicted as being positive or negative, i.e. eagerly adopting these technologies or refusing point-blank to use them (Rogers et al., 2014; Durick, Robertson, Brereton, Vetere, & Nansen, 2013; Hakkarainen, 2012), they are almost unanimously portrayed as actual or potential players of digital games in Human-Computer Interaction (HCI), Game Studies (GS) and Gerontechnology (e.g. De Schutter & Malliet, 2014; Brown, 2012; De Schutter, 2011; Nap, Kort, & IJsselsteijn, 2009; Pearce, 2008; IJsselsteijn, Nap, & Kort, 2007). By playing digital games, older people can - or are expected to - improve, for example, cognitive and motor skills, and cultivate a more active social life (e.g. Luckner et al., 2013; Harley, Fitzpatrick, Axelrod, White, & McAllister, 2010; Nap, Kort, & IJsselsteijn, 2009; Zelinski & Reyes, 2009). However, studies of the play experiences of older people reveal a much wider variety of reasons for playing digital games, ranging from taking up intellectual challenges to having fun (De Schutter, 2011; De Schutter, Brown, & Vanden Abeele, 2014; Marston, 2013; Pearce, 2008; IJsselsteijn, Nap, & Kort, 2007). Additionally, whereas it is fairly well established within HCI that involving people in design is instrumental in creating better technologies, few studies we encountered during our review involved older people in the conceptualisation and design of games, with the exception of (Rice et al 2012; Vanden Abeele & De Schutter, 2010; Marston, 2012).

These contradictions, inconsistencies and gaps, which strengthen the fact that the relationship between digital games and older people needs to be better understood and explained (Marston, 2013; De Schutter & Malliet, 2014; De Schutter, Brown, & Vanden Abeele, 2014), prompted us to address the question of what makes digital games sufficiently appealing, playable and meaningful in the everyday lives of older people with different playing interests and levels of experience with ICTs. In this paper, we report on the

conceptualisation, design and evaluation of digital games with these three features.

Related work

Digital games, which can be "played on arcade cabinets, on PC or MAC, on consoles like the PlayStation 2, the GameCube and the Xbox, on mobile devices like mobile phones or over the internet" (Kerr, 2006, p. 4), are becoming more and more popular amongst older adults (Nap et al., 2015; De Schuttter & Malliet, 2014; Marston, 2013). In order to provide a succinct, comprehensive and readable account of what is currently known about older people and digital games, we conducted a desk study of academic papers published in top HCI, GS and Gerontechnology conferences and journals since 20001. We divided these publications into the following areas, and cite those studies we consider highly representative of each one.

Digital games for older people

Over the past decade, there has been a steady production of digital games targeted at older people. Examples are DanceAlong (Keyani et al 2005), Curball (Kern, Stringer, & Schmidt, 2006), Walk2Win (Mubin, Mahmud, & Shadid, 2008), Age Invaders (Khoo, Merritt, & Cheok, 2009), Activator (Romero, Sturm, de Valk, & Kruitwagen, 2010), SilverPromenade (Gerling, Schild, & Masuch, 2010), Virtual Soccer, Human Tetris and Mosquito Invasion (Rice et al., 2011), Paldokangsan (Kim, Oh, Ahn, & Lee, 2012), Waterball (Tsai, Chang, Huang, & Chang, 2012), Cogniplay (Vasconcelos, Silva, Caseiro, Nunes, & Ferreira, 2012), iStoppFalls (Gschwind et al., 2014) and Blast from the past (Vanden Abeele & De Schutter, 2014). Central to the design of these games has been to help older people to cope with normative age-related changes in functional abilities, improve / enrich grandchildren-grandparent communication and encourage social interaction.

Experiences of play

Older people's experiences of play (i.e. motivations, practices and preferences) have received considerable research attention (e.g.

Kaufman, Sauvé, Renaud, & Duplàa, 2013; De Schutter, 2011; Nap, Kort, & IJsselsteijn, 2009; Pearce, 2008; IJsselsteijn, Nap, & Kort, 2007; Vanden Abeele & Rompaey, 2006). Much of this research is based on surveys, interviews and observational studies, and has been conducted with active older players or older people interested in digital games. The results reveal varied motivations for playing digital games, ranging from meeting people and staying connected with their children to relaxing with friends. Preferences for playing certain types of games have also been addressed. Older people seem to prefer to play games with intellectual challenges and that reflect the types of non-digital games they played in their childhood and youth. Concurring with their varied motivations, older people's practices of play are heterogeneous, ranging from playing casual games on their PCs to being engaged in vicarious play2 when observing how their grandchildren play videogames at home. The (lack of) acceptance of Nintendo Wii and Microsoft Kinect consoles in long-term care facilities and community dwelling has also been examined (Marston, Greenlay, & van Hoof, 2013; Wollersheim et al., 2010), along with the domestication of digital games in older people's everyday lives, wherein digital games are rarely put on display because playing may not be viewed as age-appropriate, while the content of digital games they play tend to be a reflection of meaningful activities for them (De Schutter, Brown, & Vanden Abeele, 2014).

Reflections

We agree with recent views claiming that "little is still known of the preferences and motivations for gaming by older adults" (Marston, 2013, p. 106) and that the current body of knowledge lacks a solid theoretical foundation to account for much of the variability observed amongst older players (De Schutter & Malliet, 2014; De Schutter, Brown, & Vanden Abeele, 2014). While a fundamental principle of HCI is to involve people in the design process in order to build easier-to-use and more meaningful ICTs, older people have not partaken in the design of most of the digital games targeted towards them as a group. Thus, there is a question as to whether the games designed so far are those that older people actually want to play in their everyday lives. The games targeted at older people are mostly focused on physical activities in either intergenerational play or rehabilitation (exer)games, (e.g. Walk2Win, Activator and

Paldokangsan), and these design objectives appear to be at odds with the results of playful experiences studies, in which older people tend to show a preference towards intellectual challenges in games. Also, while the evidence to verify improvements in cognitive abilities is often inconclusive or conflicting (Gerling & Mandryk, 2014; Rice, Ling, Ng, Hoe, & Theng, 2012; Owen et al., 2010; Zelinski & Reyes, 2009), the potential for digital games as an aid to improve the quality of life of older people by enhancing social interactions is less disputed (Nap et al., 2015; De Schutter, Brown, & Vanden Abeele, 2014; Voida & Greenberg, 2012). However, evidence supporting this claim is weak, as it is often based on evaluation studies conducted with small sample sizes and in short playful sessions. This limitation also holds true for other ICTs designed for older people, e.g. "one important limitation of most of the literature we have reviewed is that much IT is being developed but there is a minimal amount of research and testing on the efficacy of these technologies" (Parra et al., 2013, p. 421). Finally, older people who (a) do not play digital games or a(b) re uninterested in engaging in this activity, have largely been overlooked. However, if we expect older adults to benefit from playing digital games, it seems necessary to involve those who do not currently engage with gaming in order to investigate the barriers or reasons for not playing that might be lowered and addressed by new games.

Method

This study was conducted within the context of WorthPlay3, a 2-year project (2012-13) whose goal was to conceptualize, design and evaluate digital games that were sufficiently appealing, meaningful and playable in the everyday lives of older people with different levels of previous experience with ICTs. We understand the way people play digital games as a "socially constructed, dynamic and diverse cultural practice" (Kerr, 2006, p. 128). Thus, the conceptualization phase was grounded in a 6-month ethnographical study of the play experiences of 178 active and healthy older people (75% women, 25% men) with different play interests, and informed by the above literature review. We began with the premise that, in order for a digital game to be accepted by this age group, they should be involved in its design so that the game is playable, appealing and meaningful to them. The design (and

implementation) phase consisted of three Participatory Action Research (PAR) activities conducted with approximately 100 older people over a 2-month period. The evaluation was conducted in 3 European cities in order to validate / challenge the results of the ethnographical and PAR activities. Fifteen games were created and played by 99 older people with different cultural backgrounds.

Before presenting the work done in, and main results of, each phase, we provide details of (a) the settings where we conducted the research, recruitment and overall profile of the participants, and (b) the data gathering and analysis process.

Settings, recruitment and profile of the participants

We conducted our research in Àgora (AG), Espacio Caixa Madrid (ECM) and the Dundee User Centre (DUC). AG and DUC were partners on the WorthPlay project. AG is a 30-year-old highly participatory adult educational in Barcelona (Spain). The DUC is a computer clubhouse physically situated within, and run by, the School of Computing, at the University of Dundee (Scotland). The DUC has been operating since 2005. ECM is one of the centres for older people owned by the Spanish savings bank foundation, Obra Social la Caixa, one of the funding bodies of the project. ECM is located in an affluent area of Madrid and has been operating since 2001.

We considered that achieving the goal of the project rested upon recruiting a wide variety of older people with different levels of experience of ICTs and digital gameplay. To this end, we presented the project at public meetings, through ICT courses and other educational activities organized within each of the three settings. In these presentations, we outlined the main objective of the project, the type of activities that we envisaged, and how participants at each setting could be involved. We also discussed the project on an individual basis with those older adults who showed interested in the project or had heard about it.

Participant recruitment was conducted throughout the project, as those who had committed to taking part in activities at the beginning could not do so later on, due to health issues or personal commitments, while others who had not been interested in joining

the project changed their opinion when we started to conduct the planned activities. The most important recruitment inclusion/exclusion criteria were that the participants should be interested in (a) the project, regardless of their familiarity with computer games / ICTs, and (b) sharing their opinions and experiences with the fieldworkers and the research community (via scientific publications).

The age range of the participants (60-85) corresponds to the two biggest cohorts (65-75, 76-90) of the current and projected (2020-2060) older population in Europe (Eurostat, 2014). Our user group consisted of older adults with different cultural backgrounds (Spanish, Catalan, English and Scottish) and previous experience with ICTs, ranging from those who had never used computers and the Internet (approximately, 12%), or had been using them for a few months or years (80%) to those who had been using computers for more than two decades and owned smartphones (8%). Thus, our user group included older people who represented traits that most of today's more ICT literate adults will probably exhibit when they grow older. The overwhelming majority (90%) reported that they were not interested in games or played computer games (e.g. Solitaire) occasionally.

Data gathering and analysis

In keeping with long-term established practices in ethnographical research (Fetterman, 2010), we combined first-hand observations and informal conversations with participants over time (in our case, 6 months). We did so in playful sessions, during which participants played digital and non-digital games, and discussed their playing interests and practices with members of the project team. We also conducted semi-structured interviews and focus groups to deepen and widen our observations and informal conversations.

It is widely agreed that PAR consists of combining action and reflection within communities of inquiry, which "regard uncertainty, difference and conflict as opportunities for generating new knowledge through a process of experimentation and deliberation that leads to intersubjective agreement" (Reason & Bradbury, 2008, p. 253). We organized a number of PAR design activities, in which we acted as participant observers, supporting

participants to achieve their design objectives and encouraging them to reflect on why they made their decisions.

We consider that digital games must be played in out-of-laboratory conditions by players with different cultural backgrounds in order to understand, appreciate and evaluate how playable, meaningful and appealing games are. Hence, we evaluated the games designed as a result of the ethnographical and PAR activities in real-life playful sessions, which ranged from literary gatherings to ICT courses, in AG, the DUC and ECM.

Five members of the project team were involved in the aforementioned activities. We took notes (on paper and/or on PC / laptops) of most of our first-hand observations of, and conversations with, the participants. Occasionally, due to the dynamic nature of activities, which often hindered simultaneous note-taking, this process was undertaken immediately after the session was over. We adopted a thematic analysis (Braun & Clarke, 2006) approach to analyse the resultant data. All fieldnotes were read to identify common topics, and findings were discussed amongst the project team, which in turn led to the development of a corpus of "stories" from the activities. Extracts from the fieldnotes are presented followed by a code between brackets, such as [F (Fieldworker), Setting (AG, ECM or DUC)]. Participants granted us oral and written consent to include their photos and extracts of our fieldnotes in publications related to the project.

Conceptualization from ethnography

What makes digital games sufficiently appealing, meaningful and playable in the everyday lives of older people? To answer this question, we set up a gaming club, followed by a series of activities known as playful sessions, at AG. The gaming club ran once a week in two hours sessions. Participants played digital games on different gaming platforms in the computing room, some being Carcassone, FarmVille and Samorost on desktop computers, Bowling in the Nintendo Wii, or Rummy with traditional cards (Figure 1), and also played non-digital games, such a dominoes. Drawing upon our conversations and observations with the participants, we identified the games which were arguably the most appealing. Eight participants, with different levels of computer skills and playing

experience, enrolled voluntarily in the gaming club. These participants were also invited to suggest games they would like to play.

Figure 1: Gaming club.

The playful sessions were conducted as part of courses on ICTs, literacy, languages, and within a book-reading club. These sessions intended to explore playing interests and practices amongst older people who were not especially interested in ICTs and/or in digital games. One hundred and seventy participants (75% women, 25% men) were involved in these sessions. With the help of the teachers of these courses, we encouraged participants to play digital games we considered potentially useful in their educational activities, such as memory and singing games.

We conducted informal, individual conversations with 50 participants who were interested in sharing the ideas they had about digital games. We asked them whether they played digital or analogue games regularly, why they played (or did not play) games and, if they did, we then asked them to tell us what, where, when, and how they played, and who influenced their play choices.

We identified the following key themes and results through the thematic analysis approach described previously:

Our participants are not interested in playing: a semantic issue

Most participants were initially reluctant to play digital games. They were also reluctant to acknowledge in interviews that they did in fact have experience playing digital games, because "we are here to learn, not to play" [F1, AG]. They perceived playing games as an activity typical of children: "Labyrinth? I play it with my grandchildren" [F1, AG]. They also considered that negative social behaviours, such as gambling, were associated with playing games. Their life experiences – most of those involved grew up in the harsh Spanish civil war or postwar – also accounted for their reluctance to either play or acknowledge they played games. However, over the course of the study, we realized that those who had been initially reluctant to play digital games showed interest in taking part in playful activities that did not have the label "game" attached. Two representative examples are provided by a comment made by a participant who decided to take part in order to improve their ICT skills, "I did enjoy the activity, but it wasn't a game, because I don't like games" [F2, AG], and the behaviour exhibited by a participant who, at the beginning of the study, told us that she was not interested in games, as she wanted to learn useful things to do with the computer, but, after a few playful sessions, we observed how she asked the other members of the game club to send her more lives for her Farmville game in Facebook. These playful activities helped us to keep participants engaged throughout the study and many began to show more interest in playing digital games.

Meaningful and varied casual games

Coinciding with previous research (Nap, Kort, & IJsselsteijn, 2009; De Schutter, 2011), our participants were fond of casual games and digital versions of popular traditional games. In particular, they played games that were (a) meaningful to them, e.g. "I play Rumikub every night online. I play this game because my children showed it to me. Some nights we even play together" [F2, AG]; (b) closely connected with their life experiences, "I always keep the Guiñote game (a cards game typically played in his Spanish hometown) on my USB device to share the game with people from my hometown" [F2, AG], and those games that evoked memories, "Hey, here is a bowling game, let's try it! I used to play bowling with my husband when we were young" [F2, AG].

Attention, efforts and challenges

Playing digital games took up a significant amount of participants' concentration. For example, when they played crosswords, they were annoyed if they had to wait far too long for an opponent to take their turn, because they thought that their opponent was taking part in another activity, and therefore was not giving the game their full attention. This finding is in stark contrast to the idea that "digital games may be played in tandem with other activities, such as cooking, watching a television show, or while chatting online" (De Schutter & Malliet, 2014).

In general, participants had no intention of completing or achieving the final goals of the game, except when doing so involved taking specific challenges which were of interest to them. In such cases, participants often discussed what the games were about amongst themselves, took their time to decide which moves to make, and explored alternative options. Participants refused to play certain games, such as Typing Maniac, as "this is so difficult because you have to do it so fast to win" [F1, AG]. In contrast, they tended to enjoy Mahjong, because, despite the fact that "I seldom win when I play this game (against the computer) (…) when I win (…) I feel so excited. I wait until all the molten lava pours out of the volcano. I feel proud of myself" [F2, AG].

Design through Participatory Action Research

The findings of our ethnographical study helped us to understand that digital games that are appealing, meaningful and playable for our participants are predominately those that are (a) easy to personalise in order to cater for varied personal interests, (b) casual and knowledge-based games. Although our original objective was to design a single game, the results of the conceptualization phase (namely, meaningfulness, connection with life experiences and memories) prompted us to design an online platform to support our participants' varied interests, and to validate and explore further the conceptualisation results and analyse more widely their play experiences. We considered that the platform should allow older 'beginners' and 'expert' users of ICTs to create and play digital games by following a step-by-step process (e.g. intro, activities, outro). However, designing playful experiences that focus more on

play and social experiences than on achieving the objective of a game was found to be a major challenge. We decided to tap into our participants' knowledge and creativity to help us to design the platform and the games. We adopted a PAR approach, which consists of combining action and reflection within communities of inquiry (Reason & Bradbury, 2007). We conducted the following three PAR activities.

A game about neighbourhood memories

Members of the AG staff suggested the idea of organizing a game for the end-of-the-year party, a regular and important event in which AG participants present examples of what they have learned in the course(s) they have undertaken. By drawing on their knowledge of the community, the participants, and the topics that could be most appealing to those participants, members of the AG staff created the first version of the game, supported by the research team. The aim of the game was to demonstrate how the neighbourhood had changed over the course of several years, based on a series of questions and answers. The underlying concept was therefore to refresh participants' memories, and to encourage them to share their lived experiences. Members of AG staff created the first 10 questions. We designed the details of the game (e.g. rules, points achieved, types of questions and ending) based on the ideas provided by its creators. This first version of the game party was simulated with a group of older adults undertaking an ICT course. As this group was reluctant to play "games", we decided to include Google Maps, which was perceived much more positively by participants. The questions about the neighbourhood were therefore displayed on Google Maps. Those members of AG staff who had created the game acted as moderators, and wrote the scores on a blackboard. After playing the game, participants were encouraged to add new questions via Google Maps.

At a subsequent summer party, a second version of the game, including the questions created by the ICT group, was played. Google Maps was not used this time, as the party was outdoors and we did not have access to desktop/laptop computers. Instead, an adaptable prototype was used. A table with a printed map of the neighbourhood was used to foster participation, as passers-by could stop, talk to us and play (Figure 2). The paper map contained a

series of numbered dots, which corresponded to a numbered list of questions written on a board placed close to the map. Members of the community spontaneously approached the table, read the questions, and discussed possible answers amongst themselves. This enabled them to contribute to the game (and consequently to the design process) with answers and further questions, whose content reflected their varied memories. The researchers acted as moderators, providing feedback on the answers, using stickers of different colours (orange for correct answers, yellow if the participants had added a new question to the game).

Eighty-two members of the community took part in the initial creation of the game, the simulation in the ICT class and at the summer party. In the latter, we observed participants encouraging others to play the game, demonstrating that their affinity to the game was strong and that playing it was meaningful to them. During the summer party game, a young woman asked her mother, who was in her sixties, for more details related to one of the questions posed within the game. The mother subsequently told us, "You know, she's my daughter and she doesn't know much how her neighbourhood has changed. I'm very happy to share my memories with her" [F2, AG]. The neighbourhood was an important part of the participants' lives, and sharing their memories with others was, perhaps stereotypically, an activity that came natural to many of them. The game was meaningful, casual, cognitive, customizable, and supported variety, validating the concept of the game. However, multiple views of the history of the neighbourhood, created conflicts between participants and the moderators, e.g. "If what I know isn't valuable here, this game isn't for me" [F2, AG].

Figure 2: The neighbourhood memories game.

A geo-located book quiz

We designed a second PAR activity to explore the concept of the game devised in the first activity with participants not especially interested in ICTs. This second activity involved 11 older people, who met weekly in a book-reading club and had taken part in the conceptualization phase. Participants were separated into two groups, and were tasked with creating geo-localized single-choice questions about the book they were reading. This activity resulted in a geo-located book quiz, which consisted of answering questions in situ and earning points by 'competing' with other groups (See Figure 3). Smartphones and a geo-localized web-based system were used (Santos, Pérez-Sanagustín, Hernández-Leo, & Blat, 2011). This augmented activity was unanimously perceived as useful and entertaining, e.g., "We had a lot of fun in this activity, which is another way of reading a book" [F2, AG]. The activity also enabled participants to explore their personal interests and make the most of the playful experience (e.g. learning, socializing) beyond wining or losing, in which we found the participants had no interest. For instance, while taking part in the geo-located quiz, a participant said to another "who knows how well they – the competitors – are doing. It'd be nice to get more points, but we shouldn't worry about who wins" [F2, AG].

Figure 3: Book-reading club game

A trivia quiz about Spanish folk parties

A key finding of the second activity was that older people could be seen as game creators. We designed a third PAR activity to help us understand further how they create games with contemporary ICTs. In this third activity, participants of the gaming club created the contents of a trivia quiz about Spanish folk parties, which are traditional events celebrated in Spanish towns. The quiz was played by the members of an ICT course, who were divided into four groups. Each group contained a single moderator (from the gaming club) who provided the questions (one at a time) and evaluated their answers. There was a public countdown clock, and a board where moderators noted down the points earned by each group. The questions required participants to use ICTs resources to answer them; for example, they were encouraged to use a digital camera to take a picture and e-mail it to a friend (See Figure 4). Participants enjoyed this activity because it evoked folk parties they were already familiar with. They even sang songs together, although singing was not part of the game. Another source of enjoyment for participants was that this activity encouraged them to put into practice what they had learned in the course: "Finally, I understood how to use Google Maps!" [F1, AG] However, the credibility of the moderators was often questioned, and participants ignored the

countdown clock. The different features of the games and the idea of enabling older people to create them were therefore (some positively and some negatively) validated.

Figure 4: Folk parties and ICT game

The games and the platform

Central to the design of the games in this project was to support the diversity of interests we found in the conceptualization phase and validated through the PAR activities. Players can take on two roles: game creators and players, which are not necessarily mutually exclusive. The main objective of the resultant games is to engage older people in a type of play that consists of a mutual and between-equals sharing and co-creation of social knowledge. To achieve this objective, we decided that players must answer single choice questions, in a procedure similar to a trivia game. However, the games include a new type of open choice questions (single choice questions where players can add a new choice if they do not agree with any of the answers provided). The games also allow players to add new questions. In terms of rules, players are not forced to follow a specific path. Instead, they can leave games unfinished, start another game, or continue with a previously started game at any time. The resources needed to either create or play games are digital (e.g. images downloaded from Google Images) and/or non-

digital (e.g. books). Conflicts arise when a player's answer does not match with the one/s provided by the creator or other players. These conflicts are particularly challenging when the answers rely on older people's memories of an event or place, given they – at least, our participants – regard their memories as truthful. To engage the player, the games encourage competition through a rewarding system based on points, which are given according to whether the answer is popular (i.e. selected by other players), or correct/wrong. The boundaries are more conceptual than physical, since the games can be played on the move as well. Players are conceptually bound by the contribution to social knowledge. The main expected outcomes of playing the games are face-to-face / virtual socialization, social knowledge and learning.

The games were created and played using an online platform. Table 1 shows how the findings of the PAR activities were mapped onto the design of the platform. Figure 5 illustrates the resultant game platform, and the steps to take to: (1) provide a game title, (2) create a new activity, (3) select the type of activity and (4) describe the contents of the activity. Figure 6 shows the player's view and how a game is played: (1) the player selects a game, (2) a list of activities is shown and the player selects one, (3) the question is displayed for the player to answer, (4) the actual answer provided by the creator of the game, and a summary of the responses by other players, is shown.
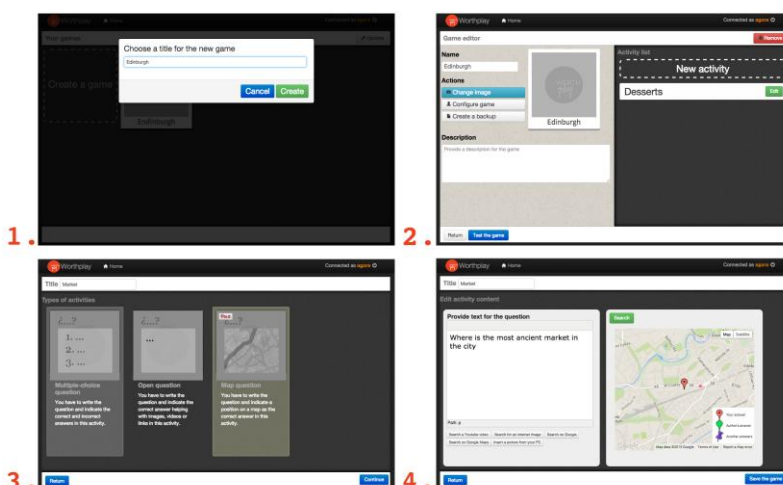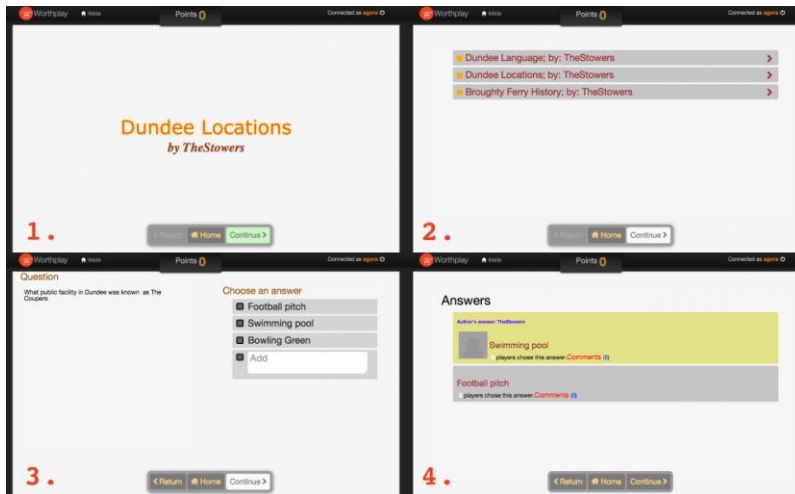

Figure 5: Editor of games

Figure 6: Player's view of a game

Cross-cultural evaluation

We conducted an evaluation of the platform in order to explore the extent to which the games designed were sufficiently appealing, playable and meaningful for older people. To this end, and in light of the heterogeneity of the older population, we involved older people in the evaluation who had not previously taken part in the project, as well as those who had already done so. Fifty-three participants (recruited in AG) had previously been involved in the ethnographical and/or PAR activities. Forty-six participants (14 in AG, 16 in the DUC and 16 in ECM) were new. The evaluation was conducted in playful sessions, which are detailed in Table 2, wherein participants were encouraged to create and play their games by using the platform. At this stage, we did not specifically aim at testing the usability of the interface, since the user interface of the platform had been designed with the feedback and contributions of participants in the PAR activities. Thus, we considered that the evaluation should concentrate on the games that could be either played on the platform or created through it, aspects that had not been evaluated yet (Figure 7).

Figure 7: Evaluation in the book-reading club game.

Fifteen games were created and played by older people over a 10-month period. The games included a mix of photos, text and videos, and were written in English, Spanish and Catalan.

Qualitative data gathering

As with the ethnographical study, we noted down our observations and conversations with the participants while they were creating and playing games. Each playful session was attended by at least two researchers involved in the project – with the exception of the ECM sessions, attended only by one. Unlike the open strategy during ethnography, the sessions were planned for evaluation purposes. However, we informed participants they could withdraw from the activities at any moment. The researchers involved gathered and analysed their notes together in order to identify key findings and supporting evidence.

Relevant findings

The key finding of this stage of the research was that social interaction played a decisive role in motivating older people to play the games for the first time, and to maintain that engagement over time, particularly as the games related to common topics of interest

and without time limits: "Jeez! We've spent two hours playing this game, really? I can't believe it. Time flies!" [F6, ECM]. For instance, we overheard a conversation between two women playing the game about neighbourhood memories, "Really? Your husband used to work in this factory (mentioned in a question of the game)? My husband did too. They probably know each other" [F2, AG].

Through our observations and discussions with participants, it seemed that learning new aspects of a desired topic or ICTs were the most relevant benefits of playing the games. During the discussion held at the end of the session in the DUC, participants suggested the main perceived value of the games was their educational nature - that is, helping people to learn new things and to "make you think" [F5, DUC]. A woman at AG stated: "Creating games was the most challenging and the most exciting part, because you have to double check information in order to create a proper game and you learn while doing so" [F4, AG]. The most intensive and positive emotional reactions were triggered by positive feedback (correct answers), "You feel really good when you realize you still know some things, despite being so old!!" [F2, AG]

Specific activities that valued personal stories, historical references and narratives about local places around the neighbourhood were also highly successful in engaging participants. These activities allowed for the construction of collective memories through the sharing of those which were more personal. It was also very important for the players to feel that their contribution was useful to achieve a common objective or a communal goal. The leader of the book-reading club stated: "Creating these games is another way of exploring literature" [F2, AG].

Overall, older people with different levels of experience with ICTs enjoyed playing and creating games. They had fun, reported they had achieved certain learning outcomes, and showed creativity. Three main aspects of the games were crucial in achieving this main result: (a) providing participants with a large variety of game topics, (b) supporting debates related to the content of the games, and (c) providing the player with an opportunity to enrich or dispute answers with their own knowledge.

In terms of the creation of games, two main roles were adopted. Leaders coordinated the activity and encouraged others to participate by designing new games from scratch and/or proposing the topics of the game. Co-authors contributed to an existing game with new or refined content. They also created a game from scratch working in a group. Creating a game was not straightforward, due to the technology itself (i.e. technical issues with the platform) and intellectual challenges. As a drawback, we noted that participants often found it difficult to come up with an interesting and motivating question to add to the game. Yet, overcoming these challenges was worthwhile, as doing so brought empowerment and social recognition benefits to them.

It is also important to note that the games created by AG participants were played and enjoyed by ECM participants: "Who created this game? Older people in Barcelona? Amazing! It is great fun! Easy to play and mentally stimulating too, well done!" [F6, ECM]. This indicates that the games AG participants created were playable by and appealing to other older people, and this, as we argue in our discussion section, aids in understanding further the relationship between older people and digital games.

Discussion and Conclusion

Prompted by the results of a literature review, we conducted a research project designed to address the question of what makes digital games sufficiently appealing, playable and meaningful in the everyday lives of older people. We did not, however, go as far as to identify what specifically makes digital games "fun" for older people, which we consider a limitation of this paper. Taking a functionalistic approach (e.g. what makes games meaningful/playable) has been criticized in a recent review of the relationship between older people and digital games is constituted within existing research: "pleasure, fun, relaxation, or finding ways of tackling existence are often wholly lacking or treated as a means to a greater and more important end" (Mosberg 2014, p. 8). The functionalistic approach we undertook is based on our ethnographical research on how active older people with mild-to-moderate age-related changes in functional abilities make use of ICTs in adult educational centres and computer clubhouses we have conducted over the past decade. Within such environments, we have

found that "important ends" for our participants are to reduce social isolation, feel digitally included, and become independent ICTs users (Sayago & Blat, 2009; Ferreira, Sayago & Blat, 2014). Fun and pleasure have not emerged as important goals5. Yet, they manifested themselves (as one may expect) within the PAR and evaluation activities.

Examining the relationship with digital games

We have explored the relationship between older people and digital games in a distinct way. Our literature review indicates that most research into this area has been based on surveys, short-term observational and interview studies. We took a longer-term approach to conceptualising digital games for older adults by gathering the experiences of play of over 100 older people, who were either interested in playing digital games or initially reluctant to do so, over a 6-month period. In previous research studies, most of the digital games designed for older people have arguably been "researcher driven", i.e. motivated by the potential benefits that playing games can bring to older adults. By contrast, we involved older people in the design of games that they wanted to play, and thus the games were much more driven by their interests, ideas and needs. We evaluated the games and the platform with older people with different cultural backgrounds and previous experience with ICTs, and involved a number of participants who had not taken part in either the conceptualization phase or PAR activities. This type of evaluation is rare in the literature reviewed. However, it has enabled us to understand and clarify the aspects that make digital games appealing, meaningful and playable for older people with different cultural backgrounds. Yet, we recognise that playing was not completely driven by an innate desire to take part in the evaluation activities, and that the (educational) settings where they were conducted limit the evaluation, both of which we consider two further limitations of this study.

The concept of digital game

We have introduced a concept of digital game that differs considerably from many games aimed at older people that are discussed in the literature. In the latter set of games, older players must achieve a particular goal by following a predefined path. The

results of our ethnographical study and PAR activities revealed, however, that playing at one's own pace, without following a predefined path or having to achieve a concrete goal, and engaging in active discussions around a topic based on one's lifelong knowledge, were key elements of positive, enjoyable and meaningful gameplay for all our participants. These results encouraged us to design casual games that consist of questions and answers. It is worth noting that the settings where we conducted our research and the profile of our participants (most of them were not players) took on a central role in the design of the final games, which are similar in concept to traditional general knowledge games, such as Trivial Pursuit. Yet, the games conceived by our participants fostered highly social interactions, focused more on the experience than on the goals of the game, were governed by flexible rules, and were strongly connected to their everyday lives and personal interests – which are elements of gameplay already reported in previous studies (e.g. De Schutter, 2011; IJsselsteijn, Nap, & Kort, 2007). These findings can potentially enrich existing recommendations for digital game design within an ageing society (Marston, 2013). Yet, whether the games designed in this project are playable, meaningful and appealing for older people other than our participants warrants further research.

We acknowledge that there is room for claiming that the games designed in the project might not be regarded as "games", given that there are multiple definitions of this term. For instance, Salen and Zimmerman (2004) present and compare eight different ones. In this paper, we have drawn upon (Fullerton and Swain, 2008), who argue that "Players, objective, procedures, rules, resources, conflict, boundaries, and outcome (…) are the essence of games", in order to provide details of relevant concepts of the final games designed in the project. Future (theoretical) studies might discuss and challenge the concept of digital game presented in this paper.

Similar experiences of play

The relationship between older people and digital games has been labelled as varied (De Schutter & Malliet, 2014; De Schutter, Brown, &Vanden Abeele, 2014; Marston 2013; Kaufman, 2013; De Schutter, 2011; Nap, Kort, & IJsselsteijn, 2009; Pearce, 2008; IJsselsteijn, Nap, & Kort, 2007; Vanden Abeele & Rompaey, 2006),

which is confirmed in the results of the conceptualization and design (e.g. different interests, varied casual games), and evaluation phases (e.g. players and roles in game creation). Yet, this heterogeneity did not prevent remarkably similar play experiences from being exhibited in our study. Whilst play has traditionally been regarded as unproductive (Callois, 1961), playing the games designed in the project produced meaningful outcomes in our participants' playful experiences, regardless of their cultural backgrounds and previous practical knowledge of ICTs. Common to these productive playful experiences were, for instance, feeling they were improving their learning of a topic or that they were more digitally included. These elements, which cut across our participants' experience of play, suggest that older people might not be such a heterogeneous group of players when their relationship with digital games is considered (and theoretically understood) by taking into account not only their life course experiences (Settersten, 2003), social and cultural context (De Schutter & Malliet, 2014), but also their current aspirations, over considerable long periods of time. However, this productive play (Pearce, 2008) is strongly related to the profile of our participants and the settings where we conducted our study, and further studies outside of our player cohort are needed to validate or challenge our findings.

Future Work

We have portrayed older people as designers, creators and co-creators of digital games. Although this view is not new – for instance, (Marston, 2012) presents older people as 21st century designers and (Gee & Hayes, 2010) reports on an international and respected designer for The Sims aged 60+ - it is still fairly uncommon within the research field. However, we found that creating digital games was a useful way of introducing older people who are not especially interested in ICTs to these technologies, and to help foster creativity and positive emotional reactions. These two aspects have thus far not been the main criteria in the design of digital games targeted at older people. However, by recruiting a diverse and cross-cultural group of participants, such themes dominated our findings. Rephrasing (Marston, 2012), what type of digital games would older people create and play, if they are given the opportunity? Seeing older people as designers, creators and co-creators of digital games also expands how they are constituted

within existing research – either as users of digital games or as a vulnerable group - (Mosberg, 2014). How will this different view deepen and widen our understanding of the relationship between older people and digital games, and shape the current discourse in future studies?

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Footnotes

[1]Academic databases: ACM Digital Library, IEEE, Google Scholar, Microsoft Academic, SAGE, Elsevier, SCOPUS. Search terms: older people / adults, seniors, digital / computer / online games. Journals: ACM Computers in Entertainment, Games & Culture, Ageing Studies, Human-Computer Interaction Studies, Interacting with Computers, Behaviour & Information Technology, Gerontechnology, Personal and Ubiquitous Computing, Universal Access in Information Society. Conferences: ACM Future Play, British HCI, CHI, DiGRA, Fun & Play, INTERACT, NordiCHI, PETRA, SouthCHI. We found and read approximately 180 publications. Yet, 80 papers were excluded from the review. Exclusion criteria were papers being primarily focused on technical aspects (e.g. cloud computing, technical accessibility), games design (e.g. heuristics, flow) and specific applications (e.g. learning) without a clear connection with older people other than

presenting a growing ageing population as a societal phenomenon with a likely impact on digital games.

[2]Experienced as a result of watching the gameplay of other people rather than by doing the activity yourself

[3]http://worthplay.upf.edu

[4] http://worthplay.upf.edu/game. The current architecture is based on SAAS client/server with serialization, which allows the platform to be expanded. The platform is based on the concept of micro-activities – types of "questions", such as closed, open and geo-located. The platform is coded using several languages, including HTML, Ajax (REST), JSON, JavaScript and PHP.

[5] Whether this is due to the settings, profile of participants, or, as suggested by (Mosberg, 2014), the cultural practices of the third age, warrants more, probably, sociological / cultural studies.

Table 1
Mapping Findings and Design Features

Findings from the PAR activities	Platform design features
One question can have multiple correct answers.	Closed questions let the player choose amongst several answers, and there is no right or wrong answer.
	In the results page, we present all the answers provided, highlighting (a) the most popular answer, (b) the answer chosen by the author of the question and (c) the answer chosen by the participant.
	While answering, participants can add an extra answer to closed questions if they consider all the previous ones are incorrect.
	In addition to closed questions, we include open questions to let the players share their memories using freestyle text.
A game can encourage participants to talk about the topic beyond the	The platform lets any user create his or

concrete questions.	her game/s.
	The platform allows players to add new questions to existing games.
AG participants are interested in sharing their knowledge in a constructive way.	Players can create new games, add new questions to existing games, provide additional answers, and leave comments.
AG participants are not interested in dealing with the rules of the game or the rewards system.	The platform has a pre-defined set of rules and a rewards system, such as points.
	Players are limited to adding new content; they cannot adapt the rules of the game.
AG participants are interested in games that support their social experiences.	The content uploaded to the platform includes the name of the player and a picture of him/her to encourage them to play (e.g. I know the person who wrote the question, let's read what he/she wrote).
Although it was complex to judge if one answer was right or wrong, a simple rewards system (via orange circles) pleased participants and motivated them to play the game.	Any contribution to a game is rewarded with points.
	Extra points can be earned by choosing author's answer in closed questions, or if your answer is the most popular one in open questions, for instance.
AG participants did not want to be forced to follow specific rules.	There is no time control. Participants are not pushed to answer questions. They can leave them unanswered and keep playing
	There is no specific path to play the game. Players read the list of questions and decide which one they want to answer.
	They can (stop) play(ing) games at any time.
The "Game" word was controversial amongst AG participants.	We do not use the word "Game" in the platform. Instead, we use playful activities, which was the word used by the participants.
Participants are interested in creating the contents of the game. However, they were not interested in setting up the rules of the game.	The platform has predefined rules to assign points, defines milestones and end point.
	Game creators only have to focus on the

	main content of the game.

Table 2

Description of Evaluation (Playful) Activities

Playful activity	Brief description
(AG) Literary gathering	Participants created and played a geo-located quiz about the life and works of Bernat Metge. Participants were reading his best novel, entitled Lo somni (1399), in the book club.
	Participants: 9 (6: 55-65; 1: 65-75; 1:75+, 1 man, 8 women). Two never used computers. One had less than 3 months of experience of using computers, while 5 had 3 years of experience, and 1 more than 10.
(AG) Neighbourhood game in two ICT courses	The neighbourhood game about history and memories of the AG neighbourhood initiated by AG staff and played in the community event was also played in two ICT classes, this time on the platform.
	Participants: 24 (15: 55-65; 7-65-75; 2: 75+; 8 men, 14 women). Sixty percent of them had less than 1 year of experience of using computers. The rest had more than 3 years of experience of using computers and the Internet.
(AG) General knowledge games	The teacher of a general knowledge course created the first version of the game the participants played. The game was about mathematics, geography and Spanish. The participants themselves created and played 3 additional games. One of the games was about geography (e.g. questions about Spanish rivers, mountains and regions). Another game was about history (e.g. questions about the Palaeolithic period), and the third one was about different topics (e.g. Barcelona and Spanish grammar).
	Participants: 14 women (1: 50; 2: 63-65; 10: 65-75; 1: 80+). Eight had never used computers. One had 3 months of experience of using computers, and 1, one year. One had been using computers 1 and 3 years, and the remaining participant did so for more than 10 years.
(AG) Neighbourhood game in a public event	The AG neighbourhood memories game mentioned before was played in a public, outdoor meeting, which was meant to celebrate the end of the academic year in AG. The game was played on tablets.
	Participants: 20 (6: 75+; 7: 60-75; 7: less than 60; 16 men, 4 women). We were unable to gather the previous ICT experience of the participants because doing so was

	difficult in this type of public event.
(DUC) Dundee, geography and Scotland	Researchers created initial games, such as a "Dundee Quiz", made up of questions on the local dialect. These games were played by participants in a first session. In subsequent sessions, participants created and played 5 games, such as "Edinburgh", with questions about the city, and the "Silver Quiz Mixture", with general knowledge questions about, such as when the First World War started.
	Participants: 16 (65-84, 7 men, 9 women). Six participants reported using a computer for 1-3 years, 7 for more than three years, and 3 for more ten years.
(ECM) Arts & Geography	Over the course of a 5-month course on ICTs, participants played games created by AG participants and also created their own games. ECM participants created three games. One of them was about famous mountains or ranges of mountains in Europe (e.g. The Pyrenees). The other two games were about the History of Greece and Art.
	Participants: 16 (60-75). Fourteen women, 2 men. They had no less than 3 years of experience of using computers and the Internet. Five of them had been using computers for more than 30 years.

E. D8.1 Second report on experiences of digital game play. Worthplay Project

WorthPlay: Human-computer games for positive ageing

D8.1 Second report on experiences of digital game play

Executive summary

This deliverable gives an account of the objectives, procedures and results of the second (and final) round of evaluation of the WorthPlay platform, which enables older people to both create and play games. Four playful activities were designed and conducted in different situations of play with around 70 older people, with basic and more advanced ICT skills, interested and not in games. The evaluation focuses on the experience of older people as a) players and b) game creators, and on c) changes in their game acceptance. The results show our participants had fun, reported learning and showed creativity while playing WorthPlay games. The results also

indicate that older people can create games through the WorthPlay platform, which presents a radically new view of older people in games research, and that creating or designing games brings empowerment and social recognition benefits. Finally, the results indicate significant changes in the acceptance of games amongst our participants before and after playing (and creating) WorthPlay games. Thus, these findings give a strong support to the concept of game put forward, designed, developed and evaluated in this project.

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Date of submission for internal peer-review	28-January-2014
Internal reviewer	Paula Forbes (Aberdeen University)
Internal review due to	30-January-2014
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Table of contents

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[29] Visiting post-doc at UC3M with an *Alliance 4 Universities* fellowship

Introduction

This deliverable provides an account of the second (and final) round of evaluation of the WorthPlay platform and games and draws mainly on two previous deliverables:

● *D3.1 – Definition of the game and its design*, wherein the concept of WorthPlay games and the platform, whereby older people (and members of their social circles) can create and play games are defined. The platform is web-based (Rosales *et al* 2013).

● *D2.3 – Evaluation Plan*, which sets out the objectives, procedures, measures and the evaluation activities to be conducted within the project.

The evaluation presented in this deliverable was designed to:

- Evaluate the **technology acceptance** of the WorthPlay platform. By platform we mean "playing WorthPlay games" and "creating WorthPlay games". Older people might not be players of computers games. Also, older people – or some of them - have been reported to be uninterested in digital technology. Thus, the first step to play digital games is to accept or adopt this type of digital technology into their every life.

- Understand the **play experience** of older people as **creators and players** of WorthPlay games. The ethnographical research on gameplay conducted in the project (Rosales-b *et al* 2013) suggested that one single game is unlikely to meet the requirements of older people – or, at least, those who took part in our research. They appear to bring lots of different experiences and interests to their play. Thus, we conceived of WorthPlay as a platform whereby older people – and members of their social circles - can create games they want to play, and play them.

- Evaluate the degree to which the WorthPlay platform meets – if this is the correct word- the **design opportunities** and the **requirements** we extracted from previous ethnographical research on older people's gameplay (Rosales-b *et al* 2013).

The evaluation was conducted in Àgora, an adult educational centre in Barcelona (Spain), and partner of the project. Around 70 people, of different age ranges and experience with ICTs, participated in the evaluation. Namely, 4 playful activities were conducted in 4 different scenarios of play: two **courses on ICT learning**, a **literary gathering**, a **course on general knowledge**, and a **community event**. Each activity consisted of a number of sessions, between 2 to 6, during which the participants played pre-created games and created their own ones. Table 1 provides an overview of the methods and activities conducted to achieve O1 and O2. O3 is achieved by meeting O1 and O2.

Table 1: Evaluation objectives, methods and scenarios of play

Objective	Methods	Scenarios of play
O1	Questionnaires (pre-test, post-test) based	Àgora literary

	on UTAUT	gathering
	Focus group	ICT classes
O2	Participant observation	Course on topics of general knowledge
		Community event (no questionnaires)

The user group, evaluation activities and methods, and data analysis are detailed further in the section that follows.

Method

This section is divided into four parts. The first presents the setting where the evaluation took place. The second deals with the recruitment of the participants and their profile. The third is about data gathering, and the fourth focuses on data analysis.

Setting: an adult educational center

The study was conducted in Àgora, an adult educational center in Barcelona that promotes social inclusion of adults through lifelong learning. The center offers free classes on several subjects, ranging from ICT to literacy, literature and foreign languages. The courses are mostly attended and managed by older people. For further information about Àgora, see http://www.edaverneda.org/edaverneda/

Recruitment, number and profile of the participants

The participants of this study were recruited in Àgora. Two coordinators of the adult educational center helped us identify the most suitable classes where we could conduct our evaluation study and recruit participants. The classes were selected in order to ensure variety in the profile of the participants. Two researchers turned up in the recommended classes to present the study to the class coordinators and ask their authorization to conduct the activities. Then, an invitation session was conducted with the participants of each class to invite them to participate in the study. We did not recruit participants for the activity that was carried out during the

public event (see Table 5). In that case, the participation was open to everyone passing by our kiosk.

67 people participated in the study (23%: <55; 27%: 55-65; 35%: 65-75; 15%: 75+). The participants who were younger than 55 were involved in the activity to respect the socially inclusive aspect – indeed, the hallmark - of Àgora, but we excluded the information they provided for the purposes of the study. Thus, the results are based on 51 participants, of which 15% (around 8) had never used computers before, while the others (43) had been using computers between 6 months to 10 years.

Data gathering

The main data gathering activities were two: a) digital technology (i.e. game) acceptance questionnaires, b) *in situ* observations and conversations in playful activities. The data gathering was conducted over a 2-month period (May - June 2013). The data gathering activities are discussed in 2.3.1 and 2.3.2.

Technology Acceptance Questionnaire

Two questionnaires were designed. They were conducted before and after the playful activities detailed in 2.3.2. By comparing the results of the pre- and post-questionnaire, we aimed at exploring any possible variations in users' game acceptance after having played WorthPlay. Thus, the questionnaires were aimed at meeting O1. To this end, both questionnaires, which form Annex I, were based on the UTAUT (Unified Theory of Acceptance and Use of Technology) (Venkatesh et al., 2003). Both questionnaires addressed the same (four) constructs of the UTAUT model, summarized below.

- **Performance expectancy,** "defined as the degree to which an individual believes that using the system will help him or her to attains gain in job performance" (Venkatesh et al., 2003, p. 447]. This construct was addressed in question 1 of both questionnaires.

- **Effort Expectancy**, "defined as the degree of ease associated with the use of the system" [Venkatesh et al., 2003. pag. 450]. This construct was addressed in question 2 of both questionnaires.

- **Social Influence,** "defined as the degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh et al., 2003, p. 451). This construct was addressed in question 3 of both questionnaires.

- **Facilitating Conditions**, "defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (Venkatesh et al., 2003, p. 453). This construct was addressed in question 7 of the pre-questionnaire and question 4 of the post-questionnaire.

In addition to addressing these technology acceptance constructs, the pre-questionnaire was also aimed at gathering baseline information of the user, such as age, years of experience of using computer, common tasks when using computer, and previous experience in playing digital games.

In terms of questionnaire design, the responses scale of every question was adapted in order to help older people understand them. This adaptation was justified by our observations in previous studies, conducted in the project, which suggested that older people tend to find it difficult to understand Likert scales.

With respect to the administration of the questionnaires, when the participants had filled them out, one researcher conducted a focus group to ask the participants to elaborate/comment on their answers. This allowed us to gain a broader understanding of their answers and helped us identify answers/situations that had not been addressed in the questionnaire, such as the importance for the participants to evaluate the overall activity in addition to the game.

Playful Activities

Unlike technology acceptance questionnaires, playful activities were designed to understand older people as players and designers of games. The playful activities are detailed in Tables 2-5. Overall, the number of sessions in which the playful stage developed varied across the different situations of play. The topic of the game, played or created, also varied. In two of the situations of play, the topic of the game was decided by the participants, while in the other two, it was selected by the researchers and agreed with the coordinator of the class/event.

Table 2: Playful Activity 1 - Literary gathering

Playful activity	Literary gathering
Situation of play and topic	The game created was a collection of questions about the life and works of *Bernat Metge*, the author of the novel "Lo somni" that a number of participants were reading in the literary gathering.
Participants	Nine participants (6: 55-65; 1: 65-75; 1:75+). 1 man, 8 women. 2 participants never used computers. 1 participant has been using computers for less than 3 months. 5 participants have been using computers for the last 3 years. 1 participant has more than 10 years of experience with ICTs.
Description of the playful activity	The playful activities was conducted in 5 sessions:

The playful activities was conducted in 5 sessions:

<u>Pre-activities</u>

S1- Invitation: Once received the authorization from the older people responsible for the literary class, two researchers (A, S) attended a class session to invite the participants to take part in the evaluation activity. 11 participants were in the invitation session, and we told them that the main objective was to organize a playful activity, which consisted of a) creating geo-located questions about a book they were reading and b) of taking a walking tour in the locations of the book, in which they would answer questions related to that book.

S2- Defining the topic & Pre-Questionnaire: In this session, the participants defined the topic of the activity (i.e. questions about the life of the Catalan author Bernat Metge) and 5 interested participants filled out the pre-questionnaire. From now on, the rest of the evaluation sessions were conducted outside the literary gathering schedule, since not all the participants (3 out of 11 showed no interest in participating in the activity, the other 3 did not want to fill in the questionnaire because they were not interested in a technology-based activity) of the literary gathering were interested in the activity.

<u>Playful activities</u>

S3 - Creating questions: 8 people participated in the activity. Each participant brought, without being asked to do so, material which s/he thought could help them to create the questions. Materials were printed documents

	from the internet and books with information about Bernat Metge. The initial idea was to split the participants in 2 groups and ask each group to create different set of questions. However, participants preferred working all together and created the questions with pen and paper, by sharing and discussing the material they brought.
	The questions created were translated into a single WorthPlay Game, created by the researchers.
	S4 - *In-situ* playing: the playing session took place in the streets of the Gotic neighborhood in Barcelona and was attended by 9 participants, split into 2 groups. To answer the questions, they had to be *in situ*, i.e. present at the location indicated by the map.
	Post-activities
	S5: -Post-questionnaire and debriefing: All the participants of the literature course took part in this session. The participants who took part in the literary tour shared their experience with the ones who did not.
Data gathering methods	2 researchers (A, S) participated in all the sessions and took notes of their observations and conversations with the participants.
	The pre- and post-questionnaires were administrated to the participants before and after the playful activities. A short focus group was conducted to ask the participants to elaborate/comment on their answers. The final debriefing session allowed the researchers to validate part of their analysis and to discuss with the participants their playful experiences.

Table 3: Playful activity 2 - Neighbourhood game

Playful activity	**Neighborhood game in two ICT classes**
Situation of play and topic	The neighborhood game was about history and memories of the neighborhood in which Àgora is located and most of the participants live. Àgora participants, in previous co-design activities conducted in the project, created the

	questions of the game. A simulated paper version of the game was also played in a previous community event. The game was now played in two ICT classes
Participants	24 participants (8: <55; 7: 55-65; 7-65-75; 2: 75+). 8 men, 14 women.
	60% of the participants had less than one year experience of using computers, while the rest had more than 3 years ICT experience.
Description of the playful activity	The evaluation was organized in the Àgora computer room. It was proposed as an ordinary activity of a course on ICT. The evaluation unfolded in two sessions:
	Pre-activity
	S1 - Invitation and Pre-Questionnaire: Two researchers (A, S) attended the class and proposed the activity to the teacher and the students. The students agreed to participate and then they were asked to fill in the pre-questionnaire. A short, informal discussion on the topics of the questionnaire was conducted to gather further data about the participants.
	Playful activities and Post-activity
	S2 - Playing the game, creating new questions, post-questionnaire: Playful and post-activities took place in a single session. Before starting to play the game, a researcher introduced the participants to the platform, by showing via a projector, the main sections of the platform and how to play the game. Then, the participants were asked to play the game we selected for them. They did so by using the computers available in the room and playing in pairs (in Àgora, participants are invited to work in pairs and share the computer). As the participants were completing the game, the researchers invited them to create a new question. They show them how to do so and provided support. When the participants had created their question, they were then asked to fill in the post-questionnaire. We wrapped up the session by conducting a 5-min debriefing session to discuss their answers to the questionnaire and their overall experience.
	The activity lasted 2 hours.
Data gathering	Three researchers (S, A, V) participated in the two sessions and took notes of their observations and

methods	conversations with participants
	The pre- and post-questionnaires were administrated to the participants before and after the playful activities. A short focus group was conducted to ask the participants to elaborate/comment on their answers.
	The final debriefing session allowed the researchers to validate part of their analysis and to discuss with the participants their playful experiences.

Table 4: Playful activity 3 - General knowledge game

Playful activity	General knowledge game
Situation of play and topic	The first game that the participants played was created by the teacher of a course on general knowledge. This game was about mathematics, geography and the Spanish language. The second game was created by the participants themselves. In fact, they created 3 games: one about geography (e.g. questions about Spanish rivers, mountains and regions), another about history (e.g. questions about the Paleolithic period), and the third one about different topics (e.g. Barcelona and Spanish grammar).
Participants	14 women (1: 50; 2: 63-65; 10: 65-75; 1: 80+).
	Around 8 women had never used computers. 1 used computers for the first time 3 months before the study. For the remaining 3, 1 had been using computers for 1 year, 1 between 1 and 3 years, and 1 more than 10 years.
Description of the playful activity	The evaluation took place within the General Knowledge Àgora courses, during its ordinary schedule. The evaluation took place in 6 sessions. Contrary to the aforementioned activities, in this class the approach was a bit different, due to the requests from the coordinator of the course. The coordinator was particularly concerned about creating an activity which was suitable for the profiles of the students. Thus, he suggested that the main strategy should be to decide the main contents of the game in advance and assign parts of it to each of the

	participants. To this end, a researcher met the coordinator to create the first game to be played by the participants.
	The following are the activities conducted with the participants.
	Pre-activities
	S1 - Invitation and pre-test questionnaire: two researchers (J, V) attended a class session to invite the participants to take part in the evaluation activity. The coordinator of the class explained to the participants the main objectives of our activity, by framing them within the context of the objectives of the course. At the end, we administrated the pre-activity questionnaire and conducted a 10-min focus group to to ask the participants to elaborate/comment on their answers.
	S2 & S3 - Preparing the game: one researcher met the class coordinator on two occasions with the aim of creating the game to be played during the class. A total of 2 games were created. One game was about Spanish geography, the other was about mathematics. The coordinator went to great lengths to create questions that were neither too simple nor too challenging and that were related to the topics of the course.
	Playful activities
	S4 - Playing the game: the participants worked in groups of three and played the two games by using Apple iPads.
	S5 - Creating new games: in this session, participants worked in groups of three with the aim of creating a game with questions related to the topics addressed during the course, as suggested by the coordinator.
	S6 - Playing the games created by their classmates: participants played the games created by their classmates during the previous session. At the end of the activity, the participants filled out the post-activity questionnaire. We wrapped up the session by conducting a 20-min debriefing session to discuss the content of the questionnaire and their overall experience.
Data gathering methods	2 researchers (J, V) participated in all the sessions and took notes of their observations and conversations with the participants.

	The pre- and post-questionnaires were administrated to the participants before and after the playful activities. A short focus group was conducted to ask the participants to elaborate/comment on their answers.
	The final debriefing session allowed the researchers to validate part of their analysis and to discuss with the participants their playful experiences.

Table 5: Playful activity 4: Neighbourhood game in public

Playful activity	Neighbourhood game in a public event
Situation of play and topic	Àgora organizes a public, outdoor meeting once a year to celebrate the end of the academic year. The event took place in an open public space where several socio-cultural activities organized by the school were taking place at the same time.
	The neighborhood game was about the history and memories of the neighborhood in which Àgora is located. The questions of the game were created by other Àgora participants in previous co-design activities conducted in the project. Also, a simulated paper version of the game was played in previous events.
Participants	20 participants (6: 75+; 7: 60-75; 7: less than 60). 16 men and 4 women.
	Given the particular context of the activity, it was difficult to ask the users about their previous ICT experience. We gathered information about their ICT experience in informal conversations and/or observing them using WorthPlay. We consider that approximately 70% of the participants had used computers before taking part in the activity.
Description of the playful activity	Unlike the previous playful activities, this one was developed in a single session and out of the context of Àgora classes. Anyone who passed by the promenade where the event was taking place could play our game. Thus, people who did not belong to Àgora participated in the activity.
	3 Apple iPads and a large paper map of the neighborhood were used to organize the activity. The paper map showed sticky numbers that represented the geographical

	reference of the game questions.
	Researchers invited participants to select a question to answer by looking at the sticky dots in the paper map or in the list of questions on the Apple iPad. Researchers also invited participants to create new questions by showing examples of questions created by other users. Researchers simulated the points system of the platform by assigning a red sticky dot each time the person answered the question correctly. This method allowed us to simulate a ranking system, given that the number of dots in the participants' shirt represented the user's points. By looking at each other participants, one could figure out their position in the ranking.
	In this kind of context, it was important to make the activity dynamic in order to speed up and facilitate the participation of users, as they could be distracted by, or want to participate in, other parallel events. To this end, participants were not asked to register. In some cases, the researchers have interacted with the system on behalf of the participants with the aim of showing him or her how to use it, or because the users reported not feeling confident enough to use the system. Most of the participants played the game in groups, and only one of them actually interacted with the application. The others participated by suggesting answers or engaging in discussions about the game content with the player who was interacting with the system.
	Although this way of designing the playful activity might have limited the data gathered for the evaluation of the interface - since not all the participants used the system on their own - it proved useful to engage participants in a dynamic context, and also allowed us to gather data about playing experiences in a completely different situation of play to those addressed in the other activities.
Data gathering methods	4 researchers (V, J, S, A) participated in the activity. 3 researchers boosted the activity by inviting people to participate in it, showing them how to play, helping them to use the platform and informally asking questions to gather information about users' previous ICT and game-playing experiences. One researcher acted as an external observer and took note of the number of participants,

	possible profiles and conversations. The high involvement of the 3 researchers coordinating the event made it impossible to take notes during the activity. Thus, at the end of the activity, all the researchers wrote extensive notes of their observations and conversations.

1.1. Data Analysis

We conducted two types of analyses: a) qualitative analysis of the fieldnotes, which relate to O2 and O3, and b) tests of significance (quantitative) of the questionnaires related to O1. For the former, we conducted paired t-tests for each construct, comparing the data gathered in the pre- and post-questionnaires. For the latter, we conducted thematic analysis (Braun, 2006), as detailed further in the subsections that follow.

Preparing the data corpus

The data corpus consists of the fieldnotes. First of all, the fieldnotes were arranged according to the evaluation activities they refer to. Thus, for each activity, one of us assembled the fieldnotes taken from each researcher participating in it. The data corpus was then sent to all the researchers in order to proceed with the analysis.

Individual coding and theme identification

Each researcher read independently the entire corpus several times until s/he became familiar with it. *Open codes* were written while reading the notes. Emerging codes were firstly grouped into the three main research goals based on whether the coded text segment referred to a situation in which the user was playing the game or creating questions. Secondly, initial *themes* and *sub-themes* were identified, by combining relationships between and amongst the codes, in an iterative process until each researcher felt confident enough with his/her coding scheme. This process led to four (one for each member of the team) different codes, theme names, and coded text segments. We discuss how we dealt with this heterogeneity next.

Convergence and consensus coding

Decision-making sessions were carried out, wherein each member of the research team discussed his or her analysis with respect to

O2. 11 hours of discussion sessions were conducted until considerable – detailed further later - consensus was reached.

The meetings started with each researcher presenting the themes emerging from his/her analysis and supporting them with quotations from his/her coding scheme. The names of the categories and themes used by the members of the team tended to be different. However, the quotations from fieldnotes and additional verbal description of each theme facilitated understanding. There was a general consensus on the themes emerging from the individual analyses, but each researcher identified different relationships among the themes, and this was the subject of further analysis.

The themes (and relationships) were organized in a thematic analysis network, which illustrated global and lower-order themes (Attride-Stirling, 2001). A network was built by assembling themes into similar and coherent groups, and by proceeding from basic to global themes. The map was built during the discussion sessions and it was used as a supportive tool in the process to reach consensus, since the map allowed the researchers to share a common understanding of the emerging themes.

Each researcher built his or her map, while themes, sub-themes and supportive codes were being discussed. Periodically, we checked that the different 'general' maps had the same themes, sub-themes and supportive quotes being discussed. This was considered proof that full consensus among the researchers was reached. Thus, a common map was built and projected on a wall to facilitate the discussion. At the end of the process, we discarded the themes to which consensus was not reached. These represented about 5% of each individual coding schema.

This process resulted in the construction of **two thematic maps** (Figures 1-2), one for each sub-item of O2.
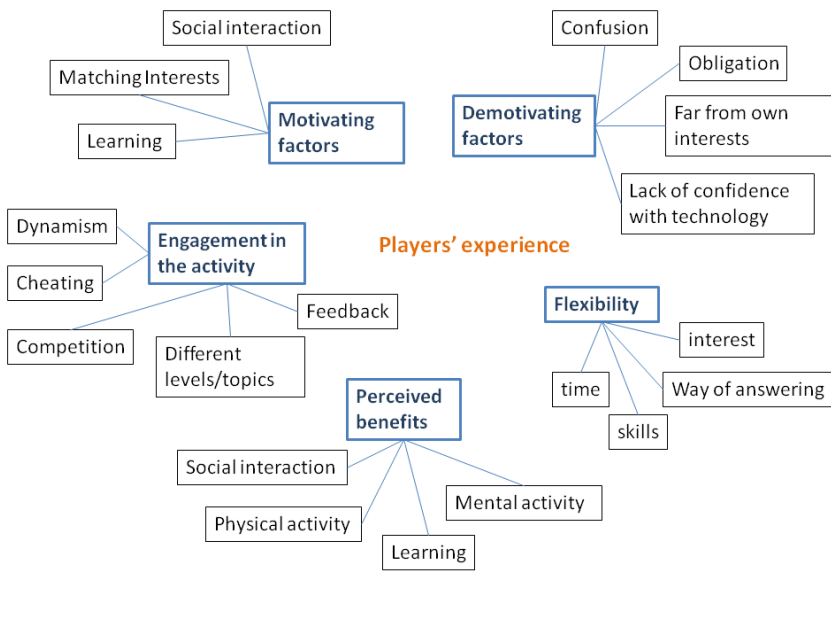
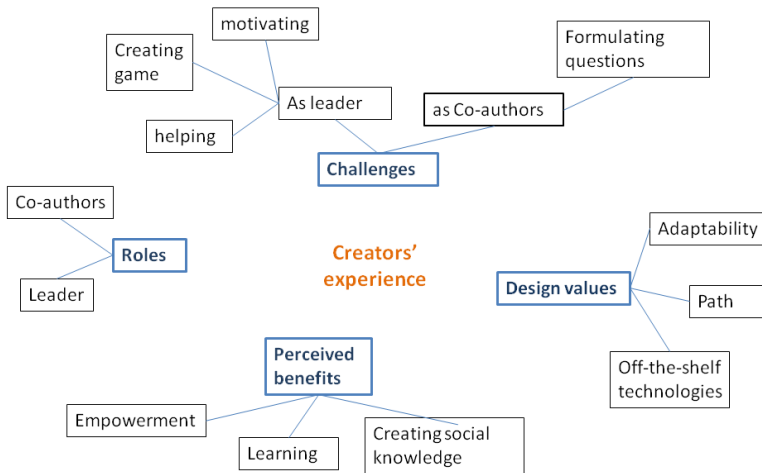Figure 1: Thematic map for O2 - older people as players

Figure 2: Thematic map for O2 - older people as game creators

We draw on these thematic maps to present the results in the section that follows.

2. Results

This section is divided into three parts. The first presents the results of seeing older people as players of WorthPlay games. The second deals with older people as game creators. The third is about game acceptance before and after playing WorthPlay games.

Extracts from our conversations with the participants are included in the results. These extracts have been translated into English by the authors of the report. The extracts are referred to using an identifier [profile of the participant / context]. The profile involves player, co-ordinator or game creator. The context refers to the activity in which the fieldnotes were taken. We have not used often-used identifiers, such as age and sex, because we did not gather the age of all the participants, due to the types of playful activities we conducted (and because we wanted to avoid any age-related prejudice).

Participants granted us written and oral consent to use photos and extracts of our observations, and conversations with them, in deliverables, reports, publications and presentations related to our research in the project.

2.1. Older people as players

We portray older people as players of games by describing their reasons for (not) playing games, actual play and benefits from gameplay.

What motivates older people to play WorthPlay games?

The main motivations for our participants to play WorthPlay games were a perceived opportunity to a) interact with other people, b) relate their personal interests to the game and c) learn further and keep using ICTs. We discuss each main motivation next.

- **Social interaction**. Working together in groups, sharing knowledge, competing or cooperating with others, discussing about historical events or keeping in touch with friends were key factors in the engagement of the participants with the WorthPlay games. This social interaction did not prevent a more individual one from happening. For instance, 4 participants of the class of general knowledge showed their motivation for playing from home, though 3 of them acknowledged that

playing alone, either at home or at any other place, would not be as fun as playing with people they know.

- **Matching interests**. Drawing on D3.1, older people bring different interests to the play, and matching them in the games is important to encourage them to play them. If the content was not appealing, they were unlikely to (try to) play. In particular, talking about their personal life experience was the most successful element for attracting players.

- **Learning and using ICTs**. Using (new) ICTs (for the participants) while playing games was another motivating factor. This was especially visible for those participants who reported being afraid of using them – i.e. those with the lowest levels of experience with ICTs. In the words of a teacher: "*It broke the fear for working with the computer… it allows you to see what can be done in the computer and that you can do it… people enjoyed the activity, had fun with the questions, with the work, with the group… it is not just avoiding fear. It can be done and I can do it!*" [Coordinator of playing/interview about the experience of general knowledge game]

Figure 3: Learning - participants writing the correct answer of a question in their notebooks. Playing session in the General Knowledge (top) and ICT (down) courses.

What does put older people off playing WorthPlay games?

- **Feeling obliged**. We observed that if playing the game was perceived as either an obligation or an activity which would divert their attention from others that were more appealing to them, the participants refused to play WorthPlay games.

- **Perceiving the game as far removed from their interests**.

- **Feeling afraid of being unable to cope with the technology**. Despite being motivated to play, the participants, especially those at initial stages of their learning of ICTs, reported being not confident enough to play the games on their own. This fear manifested itself in situations like "*not now, because I may do something wrong*" [Player, creating and playing session in the game of general knowledge].

- **Confusion**. We observed that when the participants were unsure about where to answer a question, this confusion was translated into boredom and, accordingly, less engagement with the game. Other sources of confusion were related to the playful activity, or the context of play, such as a perceived lack of social support (especially those with the lowest levels of experience with ICTs).

From being motivated to play to actually being engaged in the play

Dynamism, cheating, competition, correct/wrong answers, difficulty levels and variety of topics, were six elements associated with an active play, as discussed next.

- **Dynamism**. WorthPlay games consist, basically, of questions and answers. Dealing with similar sets of questions might be off-putting. Yet, WorthPlay games provided the participants with different formats of questions, such as open, choice and location questions, and this was highly appreciated by them. We observed that this variety contributed to keep them engaged in playing the games. Regarding the duration of the play sessions, which always followed the schedule of the classes (i.e. 2 hours per session), we observed that each participant completed the game at different times. In ICT and general knowledge classes, about 20% of the participants completed the game before the end of a session (ranging from 40 minutes earlier in ICT class and 10 minutes in general knowledge class), but about 40% of the participants did not have enough time to complete the game. This highlights that each user needs a different amount of time to complete the game and that the game should not push the player – at least, our participants - to finish it within a fixed time.

- **Cheating**. While cheating may be interpreted in a negative way – for instance, in an exam – the way of cheating of our participants and in the context of the games, portrayed older people as active and competent players. To begin with, they learned how to take advantage of an error in the platform to achieve the maximum score in the games. They answered the questions and went forward until getting the feedback from the system. If they had chosen the incorrect answer, they went backwards and changed their answer. Another way of cheating was to ask other co-players about the correct answer. Doing so, in our opinion, reinforced friendship in two ways. First, bonds between friends can be strengthened when reciprocal help occurs, as the one who provides the answer for the question, expects to obtain help from the friend in a future situation ("tit for tat"). Second, cheating can be conceived of as a risky action if it implies a punishment for the one who cheats (less points, or

social pressure -feeling guilty or shame-), so the act of cheating can be interpreted as a way of taking unnecessary risks for helping a friend, even if there can be a negative consequence. It may be important to mention that we never told the participants, and the system did not specify what kind of form of play could be regarded as cheating. This category might be biased because of our understanding of what "cheating" is, and not what it meant for the participants.

- **Competition**. The competition, which was face-to-face, and we regard as healthy, in a sense discussed later, was stimulated by two aspects, which were pervasive in all the playing sessions: a) the number of points, and b) the time needed to finish a game. Players with more points or those who finished the game before the rest of co-players gained social recognition. The winners were awarded a status of 'smart and intelligent'. This might have resulted in comparisons – smart versus stupid -, with negative social implications, but this was not the case, in our situations of play.

- **Feedback on answers**. Receiving positive feedback from the platform (i.e. correct or incorrect answer) was probably the most important aspect for keeping our participants engaged in the games. The participants smiled, laughed and shouted when their answers were correct. This feedback motivated them to keep playing, "how smart we are!" [Player, creating and playing session in the game of general knowledge]. When their answers were wrong, they were disappointed and either moved on to the next question or asked others (players and researchers) what the right answer was.

- **Difficulty levels and variety of topics**. The participants' engagement with the games was also dependent on the level of difficulty of the activities and their topics. We observed situations of play in which the participants felt playing a game was far too easy, and therefore playing it was not interesting enough for them. To prevent this from happening, one of the participants reported that "*the game allows you to set different levels of difficulty (…) you can include topics with different levels of complexity, depending on how you present the information of the activity… to give initial information and let them research more about it*" [Coordinator of playing/interview

about the experience of general knowledge game]. This design of the game enabled the participants to be interested in playing the game/s. In addition to the levels of difficulty, the variety of topic should be large enough so that participants can find a game related to their interests, since this match, as we have pointed out before, was key to motivate them to play a WorthPlay game.

Figure 4. A participant answered a question, created by another classmate, correctly, and shows her enthusiasm. Playing session in the General Knowledge course

Playing an appealing game when they feel like with the ICT skills they have

Flexibility, in terms of time, interests, answers and ICT skills, were four crucial elements of WorthPlay games in having our participants play them.

- **Time**. The fact that there was no time limit to answer a question or finish a game was rated as very positive for all our participants. As the profile of the participants was very diverse, playing a game without "rushing" was key to, for instance, encourage discussions about a topic and for them to have time to find the correct information online. Also, participants considered that playing with time constraints could put older people with little experience with ICT at a disadvantage, as well as increasing anxiety and making mistakes.

- **Interests**. As stated above, older people bring different interests to the play of games. Thus, providing them with games about different topics was key to meet this heterogeneity.

- **Answers**. In how many ways can we answer a question in an online game? We found that our participants did so by writing, pasting text from the web and copying URLs. The WorthPlay games were flexible enough in those terms, and this helped the participants to answer questions in the style that suited them most.

- **Skills**. Our participants had different levels of experience with ICTs. WorthPlay games allowed them to answer questions by writing or by conducting more advanced tasks, such as looking for a video on YouTube. By doing so, we realised that the games were suitable for different profiles, and this resulted in a better and a more inclusive engagement with the games.

What do older people get from playing digital games?

Overall, participants perceived that taking part in the playful activities helped them to stimulate social interactions, foster physical and mental activity, and take one step further their learning of ICTs and of the aspects related to the topics of the games.

- **Social interaction**. While playing the game, the players interacted with other co-players in a number of ways, ranging from asking them what the right answer was to moving around the place to talk. Playing games in a non-collocated context was not considered, as it differed from the "rules of play" of the context where the evaluation took place.

- **Physical activity**. The playful activity that consisted of an augmented literary tour was perceived as both an opportunity and excuse for "*going for a walk with friend and to have a great time with friends*" [Player, session in literary gathering paraphrasing a comment made by a participant].

- **Mental activity**. Keeping mentally fit was a top priority amongst our participants, who acknowledged that playing WorthPlay games was "*useful for exercising the memory and the mind*" [Player, session in ICT class].

- **Learning**. The participants considered that by playing WorthPlay games, they could learn new content and ICT skills. Most of the playing activities consisted of reading, discussing and searching for information using ICTs in order to answer questions, which were about academic and life topics. Thus, it is

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of little or no surprise to find that participants reported things like "*We have learnt several new things... I did not know that there was a palace here... and I have been living here for a long time ago*" and "*Between more people, it is possible to learn more. It can be more than by doing it alone. In group it is much better as it flows!*" [Player, creating and playing session in the game of general knowledge] This learning happened in an explicit or an implicit way. By explicit learning we mean the type of learning that is intentional, by choosing a topic of interest with the objective of gaining more knowledge or testing what you know about it. By implicit learning we mean learning that was not intentional, it just happened, by, for instance, playing around for a while.

Older people as game creators

As stated in the Introduction, the WorthPlay platform allows older people to create games. The structure of the game is given and fixed – the games consist of open, choice and location question. The creation then focuses on filling out a 'template' with content and deciding whether the game is sequential or random (regarding the presentation and execution of the activities questions). The exercise of creating games provides older people with experiences of game creation, which we describe in terms of roles, challenges, and perceived benefits. Before summarising these experiences, we present key design values, grounded in the research conducted in the project, of the game creation component of the platform, to help the reader better understand the results.

Key design values behind the game content creation module

- **Adaptability**. The game creation component has been designed to accommodate for different levels of experience with ICT. The system guides the user through the process of creating games. This should help basic and more advanced users to create games and questions by using the same user interface.

- **Path**. Game content creators with basic ICT skills can create questions and/or activities by following a linear path, i.e. clicking / touching on a Continue button, which is always displayed in the same part of the screen.

- **Off-the-shelf technologies**. Once game content creators have followed the basic path, if they wanted to take one step further, the component was designed to help them find new resources to enrich their questions, such as adding Google Maps, Google Images and links to videos on YouTube.

Leadership and co-creator experiences

The **leaders** in our evaluation were: a) the manager of the educational centre, b) the spokesperson of a literary gathering and c) the teacher in charge of a general knowledge group. These leaders identified the usefulness of the platform in their context and defined the objective of the game within their groups. They motivated the participants to get involved in the game and created the initial contents. Their role was very important to encourage the other participants to play the game and become co-authors. **Co-creators** are those people who added new content to an existing game (as it was the case in the ICT class and the public event), or create a new game from scratch (as it happened in the general knowledge class and literary gathering).

Figure 5. Challenging experiences: due to leadership, ICT skills and creating questions. Creating session at the General Knowledge course.

A leader plays a key role in initially supporting the older people to play games. Thus, a leader finds himself or herself with a number of challenges, ranging from motivating the group s/he leads, by discussing for example the usefulness of the game, and creating the

first version of the game to helping others to play it and become authors of new games.

In addition to the challenges faced by the leader, older people with little experience with ICT found it difficult to interact with the platform, despite the design values described above. Even so, they reported finding the experience very satisfying, as creating questions called for using ICTs and led them to create something useful for others. For example, one of the participants smiled and seemed to be very proud of the result as she was visualizing the questions she just created: "*look, what a beautiful thing I have made*" [Creator, creating and playing session in the game of general knowledge].

Coming up with motivating questions, and writing them in an attractive and precise way, was not an easy task. The big challenge was how to turn knowledge about a topic into a question. Our participants were not, with the exception of teachers, used to formulating questions. Most participants wrote down the questions first in an external resource, such as notebooks, or digital documents, and then wrote it again – or copied it – onto the platform. Taking up the challenge of writing 'good' questions provided them with social and learning rewards, "*We learned a lot by creating questions, because you've to research to be sure of what you are saying, you cannot give false information*" [Player, creating and playing session in the game of general knowledge].

Main beneficial experiences

- **Empowerment**. The participants valued the empowerment (authority and freedom) they felt after creating freely a game, or part of it, that was potentially useful for people they knew, "*they regarded the contents of the game as their contents*" [Coordinator of playing/interview about the experience of general knowledge game].

- **Creating social knowledge**. The participants valued positively the opportunity to contribute to a game with their own knowledge. This way of creating games resulted in social content, which was not graded in any formal way (it is worth repeating that the context was an adult school) and that allowed the players and creators to feel attached to WorthPlay games, "*I really liked the way it does not score you. I think that is*

something good, because people do not like to be graded. The knowledge from everybody can be better appreciated this way" [Coordinator of playing/interview about the experience of general knowledge game].

Figure 6. The participants of the Literary Gathering course are discussing the answer of a question. *In-situ* playing session.

2.2. Digital game acceptance: before and after playing WorthPlay games

As stated in the Introduction, evaluating the game acceptance was deemed key to explore whether there was a change in the attitudes of the participants towards games before and after having played and created WorthPlay games. To this end, post-test questionnaires were administrated to the participants at the end of the last session, once they had used the WorthPlay platform as both players and creators. 39 participants answered the pre-test questionnaires. 43 filled out the post-test questionnaire. We did not consider the questionnaires that had not both been filled out by the same participants. In total, 33 questionnaires were considered in the analysis.

Descriptive statistics are provided below (Table 6). We conducted a paired or dependent, two-tailed t-test, but the data did not meet the assumption of normality. By conducting a Kolmogorov-Smirnov test with SPSS, the differences between pre- and post- scores of the **performance expectancy**, $D(25) = 0.29$, $p < .05$, **effort expectancy**, $D(25) = 0.36$, $p < .05$, **social influence**, $D(25) = 0.40$,

$p < .05$, and **facilitating conditions**, $D(25) = 0.42$, $p < .05$, we found that normality could not be assumed for these constructs.

Table 6: Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
PE	33	1	3	2.12	.696	.485
postPE	32	1	3	2.56	.669	.448
EE	30	1	3	2.40	.675	.455
postEE	33	1	4	2.94	.659	.434
SI	30	1	2	1.50	.509	.259
postSI	32	1	2	1.91	.296	.088
FC	31	1	2	1.42	.502	.252
postFC	32	1	2	1.66	.483	.233
Valid N (listwise)	25					

We therefore conducted its non-parametric equivalent, the Wilcoxon signed-rank test. We conducted one test for each construct. The results show that:

G. The score of the performance expectancy construct on WorthPlay (Mdn = 3) was bigger than that related to general digital games (*Mdn* = 2), $z = -2.98$, $p < .05$, $r = -.37$, which means that the participants regarded the activity as a **useful** exercise to do in their daily lives.
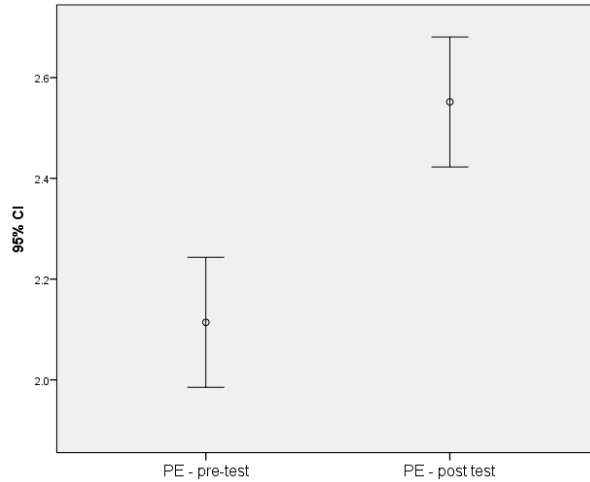
Figure 3: Error Bar Chat - Performance Expectancy

H. The score of the effort expectancy construct on WorthPlay (Mdn = 3) than that related to general digital games (Mdn = 2.5), z = -2.87, p < .05, r = -.37, which means that the participants regarded the activity as difficult[30].
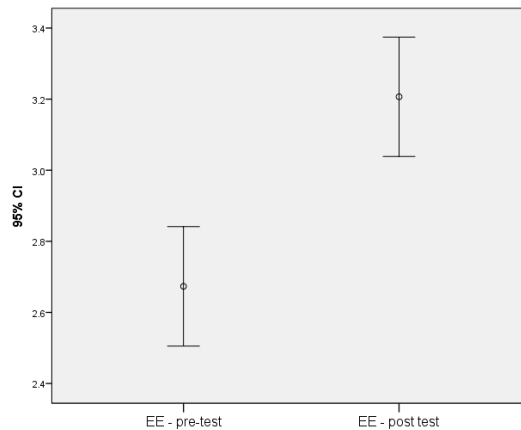

Figure 4: Error Bar Chart - Effort Expectancy

I. The score of the social influence construct on WorthPlay games (Mdn = 2) was bigger than that related to general digital games (Mdn = 1.5), z = -3.32, p < .05, r = -.42, which means that the participants regarded games they played

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[30] From our observations, creating was more difficult than playing WorthPlay games.

during the activities as **worth playing if** these are **recommended** by members of their social circles.
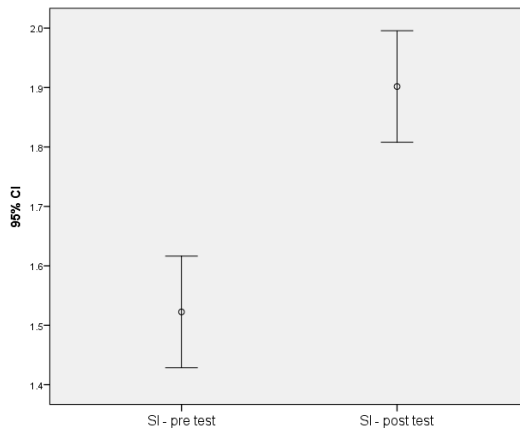

Figure 5: Error Bar Chart - Social Influence

J. The score of the facilitating conditions construct on WorthPlay game (Mdn = 2) was greater than that related to general digital games (Mdn = 1), z = -2.83, p < .05, r = -.5, which means that the participants felt that they **had the necessary abilities** to play and create WorthPlay games.
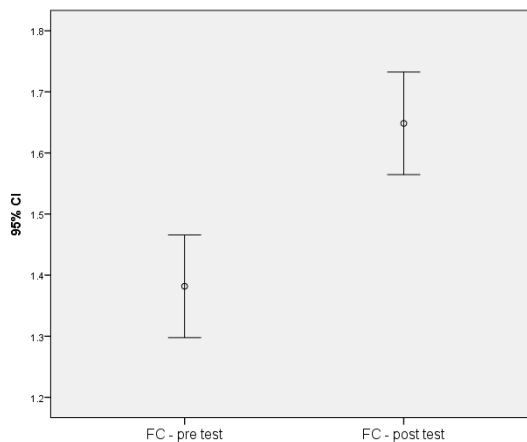

Figure 6: Error Bar Chart - Facilitating Conditions

Discussion

The discussion about how the findings take forward and integrate with previous and related works will take place in the papers on

which we are currently working. In this deliverable, we want to discuss on the aspects evaluated and how we did so, and on a specific and important aspect of the evaluation methodology, triangulation.

On the aspects evaluated

The first, and probably most important question to discuss is how a digital game can be evaluated. Games, or most of them, are not productivity tools. Thus, while most functional ICT tools, like an e-mail system, are designed to help the user conduct instrumental tasks - and lots of evaluation methods have been used to evaluate task performance - games are more experiential, i.e. non-instrumental interactions (killing time, learning and taking our minds off problems are some examples), and their evaluation should take this fact into account. How did we decide to go about evaluating WorthPlay?

Firstly, we considered that the evaluation should take place in a number of different real, or potentially real, situations of play, as running a laboratory evaluation did not make sense in the project. Secondly, by drawing upon the results of the ethnographical research conducted in the project, we considered that the evaluation should be designed to help us understand older people as both players and creators of games, and to explore the degree to which the final design fulfilled the requirements we extracted from this research. To this end, a number of playful activities, which represented different situations or contexts of play – some more outdoors, others more indoors, with older people with different ICT skills, interested and uninterested in games, and in creating them - were designed. Thirdly, taking into account the main target of WorthPlay, looking into changes in (technology) game acceptance before and after playing the game was a worthwhile exercise.

We did not evaluate the SAGE component of the WorthPlay games because the number of participants was not enough to reach statistical significance, which is important in evaluations in the field of intelligent user models.

On the evaluation methodology

In order to evaluate the aforementioned aspects, we designed and conducted an evaluation with a strong participant observation (DeWalt & DeWalt, 2012) approach. This approach is visible in the

playful activities, wherein the researchers took an active part in designing activities, recruiting participants and engaging in the play. We considered that this immersion in the playful activities was paramount in order to develop a close-up view of the experiences of play and of creation of games. To do so, we had to adapt each evaluation activity to the particular situation of play in which they took place. This resulted in having a non-uniform set of evaluation activities, which can be seen as a limitation of the methodology. Yet, the results show that it was important to fit the evaluation into the context, as play is always situated, and doing so helped us evaluate WorthPlay in several situations of play.

The results are unlikely to be general to other settings and groups of older people. Yet, this limitation is unhelpful, since participant observation aims to produce general results within the group and setting where the study is conducted. Another potential limitation is that this first-hand involvement may bias the analysis of the results, since the research is strongly immersed in the field. To address this potential limitation, we conducted a number of different triangulations. Triangulation, in general, is important in evaluation. Amongst other reasons, different researchers can see the same event or behavior from different perspectives. Triangulation is especially important in evaluating play experiences, given that playing games is a rich and complex activity: it can take place in different situations, with different people, and there might be different reasons for engaging in it, and so on. By drawing on the five-type classification of triangulation provided by (Guion, 2002), we show in Table 6 how triangulation was applied in our study and how this approach benefits our results and contributed to "uncover deeper meaning of the data" (Patton, 2002).

Table 7: Triangulation

Type of triangulation	How we addressed it	Potential benefits

Data triangulation *"involves using different sources of information in order to increase the validity of a study"*	By recruiting people from different classes and an open event, we were able to have people of different ages, interests and experiences with technologies, involved in the evaluation.	The results reflect the diversity of interests, expectations, and interaction difficulties of people with different profiles.
Methodological triangulation *"involves the use of multiple qualitative and/or quantitative methods to study the program*	We conducted participant observations as the main method in all the activities. Questionnaires based on UTAUT were conducted in some of the activities to evaluate the game acceptance. Informal and short focus groups, based on the questionnaires, were conducted at the end of the sessions to delve into the answers provided.	By complementing the questionnaires with informal discussions, we found out that people were rating the overall activity instead of the game. This suggests that the context of playing was important in the overall game experience. We also found out that some questions were too abstract for them and that it was difficult for them too to answer with a single answer item. Further discussions were needed to get a full answer to the questions.

Investigator triangulation *"involves using several different investigators in the analysis process"*	4 researchers were involved in both the data gathering and the analysis phases: at least 2 researchers participated in each session taking field notes of their observations and conversations with participants. All the researchers were involved in the analysis process	In the data gathering phase, having more than one researcher involved allowed us to observe first-hand one or a few groups of participants for the entire duration of the game. In the analysis process, doing and commenting on the coding by different researchers allowed us to discard, or delve into, categories that were (not) shared by, or were (not) clear to the team of researchers.
Environmental triangulation *"involves the use of different locations, settings, and other key factors related to the environment in which the study took place, such as the time, day, or season"*	We developed the evaluation in 4 different situations of play, with participants with different profiles, objectives, and topics. Although we adopted a similar structure for all the evaluation activities, we had to adapt the procedures according to the particular context of each class. This resulted in having, for example, different number of sessions and different goals in each class/event.	Different settings led to differences in the results (e.g. the game was more successful in some situation than in others). This suggested that context of play is an important and influential factor that characterizes the play experience. This would not have been possible if the study had taken place in the same situation of play.

Finally, it is worth noting that we needed to simplify and adapt the questions of the UTUAT model in order to help our participants to fill out the questionnaires. Questions such as "do you feel you are able to…" were abstract and also, sometimes, insulting. This

suggests that using technology acceptance questionnaires with older people should be approached with caution, and that the questions we therefore used in our study are not identical to those defined in the models.

Conclusions and future work

This deliverable has reported on the second (and final) round of evaluation of the WorthPlay platform, which enables older people to both create and play games. Four playful activities were designed and conducted in different situations of play with around 70 older people, with basic and more advanced ICT skills, interested and not interested in games. The evaluation has focused on three aspects: the experience of older people as players and creators/designers of games, and game acceptance.

Before turning to the conclusions of each of these aspects, it is worth noting that, overall, the results have shown that the design opportunities and requirements, which we extracted from our ethnographical research at the outset of the project, enabled us to design a game concept, and a platform, which have been positively received amongst our participants. There is room for improvement, of course, as, for instance, 3.1.2 exemplifies. Yet, we consider that the overall experiences of older people as game players and designers of games, and the changes in game acceptance, are strong indicators of the potential of WorthPlay games to understand, improve and strengthen the relationship between older people and digital games.

Older people as game players

Social interaction (especially trough communication) seems to be the key aspect of the experience of playing the game. It played a decisive role for motivating older people to play the game for the first time and for keeping high levels of engagement over time as well. Playing with no time limits and providing them with time to discuss about possible answers fostered social interactions. The most intensive and positive emotional reactions were triggered by positive feedback (correct answers).

Learning was perceived unambiguously as the most relevant benefit of playing the game: learning new aspects of a desired topic or learning further ICT skills (especially by a trial and error process of social learning). Learning also seems to be strongly attached to the

principle of solidarity, because the most experienced participants helped the less or unexperienced ones.

Specific activities that valued personal stories, historical references and narratives about local places around the neighborhood were highly successful in engaging participants, as it allowed for the construction of collective memories and sharing their own ones. It was also very important for the players to feel that their contribution was useful to achieve a common objective or a communal goal.

Older people with different levels of experience with ICT enjoyed playing the game. They had fun, reported learning, and showed creativity. Three main aspects of WorthPlay were crucial in achieving this main result:

- Providing a large variety of game topics

- Supporting debates related to the content of the games

- Providing the player with the opportunity to enrich answers with *their* (additional) content.

Older people as game creators/designers

Older people can create games through the WorthPlay platform. Two main roles take place in the creation of games, leaders and co-creator. Leaders coordinate the activity and encourage others to participate in it, often by designing new games from scratch and/or proposing the topics of the game. Co-authors contribute to an existing game with new or refined content or create a game from scratch working in a group. Creating a game is not straightforward, due to technological and intellectual challenges. Yet, overcoming these challenges is worthwhile, as doing so brings empowerment and social recognition benefits. Also, the games our participants created are playable by and appealing to other older people. This presents a radically new view of older people in digital game research, which raises a number of questions for future research, some of which are summarized in 5.4.

Game acceptance

Overall, the results show significant changes in the four constructs evaluated. From this, one may be tempted to claim that playing and creating WorthPlay games had a positive impact on the attitudes towards accepting games amongst our participants. Indeed, this

quantitative finding is supported and enriched by the qualitative ones. However, the impact of WorthPlay on the participants' attitudes should be addressed with caution, since it is highly likely that they did not rate playing the games per se, but also the activity where playing and creating games took place, as the post-questionnaire formulated the questions in terms of 'the activity'. Anyhow, we consider that both considerations carry much weight on the results, which show the relevance of WorthPlay games, and of designing playful activities, to change (for the better) the attitudes of older people towards games, and this strengthens the methodological approach adopted in the evaluation.

Future research perspectives

We consider that five topics warrant future research: (1) the experience of playing alone and/or in non-collocated contexts (between people who do not know each other); (2) the transference of ICT skills gained by playing a game to other ICTs; (3) the role of cheating as a trigger of social interactions; (4) different ways of promoting competition and cooperation, by, for instance, using OSN (Online Social Networks), and (5) the interplay of creativity in ageing and games. We plan to work on them in the near future.

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Annex I

Pre-activity questionnaire

Pon una X al lado de la respuesta que consideras adecuada

1) Creo que jugar juegos de ordenador:

__ No es útil para mi vida

__ Puede ser útil para mi vida

   __ Es útil para mi vida

2) Creo que Jugar juegos en el ordenador es:

__ Muy Fácil

__ Fácil

__ Difícil

__ Muy difícil

3) He empezado (o empezaría) a jugar juegos en el ordenador porque alguien me lo ha recomendado:

__ Si

__No

4) He usado el ordenador desde hace:

__Nunca

__Menos de 3 meses

__Menos de 1 año

__Entre 1 y 3 años

__Más de 3 años

__Más de 10 años

Si has usado alguna vez un ordenador, continua con las siguientes preguntas:

5) Tres cosas que hago habitualmente en el ordenador son:

1   _____

2   _____

3   _____

6) He jugado alguna vez juegos en el ordenador

__ Si

__ No

6.1) Con qué frecuencia juegas en el ordenador?

__ Muy Poco

__ A veces

__ Mucho

7. Pienso que mis conocimientos de ordenador son suficientes para jugar en el ordenador

___ Si

___ No

Post-activity questionnaire

Pon una X al lado de la respuesta que consideras adecuada

1. La actividad que hice hoy (*Performance expectancy*):

__ No es útil para mi vida

__ Puede ser útil para mi vida

__ Es útil para mi vida

2. La actividad que hice hoy fue (*Effort Expectancy*):

__ Muy Fácil

__ Fácil

__ Dificil

__ Muy dificil

3. Me interesaría jugar otro de estos juegos, si la gente que conozco lo jugara (*Social Influence*).

___ Si

___ No

4. Pienso que mis conocimientos de ordenador han sido suficientes para hacer esta actividad (*Facilitating conditions*):

___ Si

___ No

F. Preliminary findings of an ethnographical research on designing accessible geolocated services with older people. In *Universal Access in Human-Computer Interaction*

Preliminary findings of an ethnographical research on designing accessible geolocated services with older people

Older people run the risk of being socially excluded due to the numerous barriers they need to overcome when interacting with Information and Communication Technologies (ICT) to perform an ever-increasing number of daily activities. This paper presents preliminary findings of a rapid ethnographical study, conducted with around 90 older people during 1 month, aimed to explore the potential of geo-located ICT services to foster social inclusion and support independent living. This paper discusses potential scenarios of use of technologies that have largely been overlooked in HCI research with older people, such as Google Maps; key aspects of how they (want to) use these technologies and relevant interaction barriers that limit their interactions with them.

Introduction

An increasing ageing population and the need to use Information and Communication Technologies (ICT) to avoid social exclusion have reinforced Human-Computer Interaction (HCI) research with

older people. This paper discusses ongoing work conducted in Life 2.0 (Life 2.0), a research project aimed at making the network of social interactions more visible to older people (60+) by providing them with an accessible platform consisting of collaborative ICT that track and locate relevant members of their social networks (i.e. relatives, friends and caregivers). According to our review of previous work in the area (Section 2), these technologies have received scant attention in previous HCI research with older people, despite their likely potential to support social inclusion and independent living.

The Life 2.0 platform will allow older people and their social networks to communicate amongst themselves through phone calls, text messages, advanced multimedia content distribution systems (e.g. IPTV, interactive digital signage and webTV) and video telephony/conference solutions. The platform will also provide older people with a number of services supporting independent living and social inclusion. Some services will enable relatives and caregivers to monitor their position either at home and on the move, while others will allow older people to cook, shop and drive for others (e.g. giving their neighbors a lift to the local train station), and to interact with personalized information of the local area.

With the aim of informing the design and development of an accessible and useful platform, Life 2.0 is conducting ethnographical research in four EU countries (Finland, Denmark, Italy and Spain). We have argued before that ethnography has seldom been used in HCI research with older people, but the findings of a classical ethnographical study we conducted (Sayago and Blat, 2010) revealed that ethnography improves our understanding of older people as ICT users. In this paper, we report on the preliminary findings of ongoing research carried out in Spain (namely, Barcelona).

During a month, we have been conducting a rapid ethnographical study (Millen 2000) with around 90 participants (aged 60-80) in an adult association that fosters social inclusion through the use of ICT. By recording and analyzing fieldnotes of our in-situ observations of, informal and formal conversations with, the participants while using different ICT, we have identified potential scenarios to increase social inclusion and support independent

living through geo-located and other ICT fostering communication. We have also revealed a number of interaction barriers and key aspects of how older people (want to) use these technologies.

The rest of the paper is organized as follows. We first review previous work related to the objectives of the paper, including previous projects on ICT and ageing, the coverage of technologies addressed and the research approach adopted. We describe next our ongoing ethnographical study and present preliminary results. Finally, we discuss the findings and describe future activities.

Related Work

Life 2.0 and previous research projects on ICT and ageing

Whilst most of the Life 2.0 technologies already exist and many projects have previously focused on ICT and ageing, such as those funded under the European Ambient Assisted Living (AAL) program (AALIANCE) and by the UK New Dynamics of Ageing, what distinguishes Life 2.0 is the integration of available ICT into an online platform that will (i) offer accessible services to older people and their social circles based on geo-positioning ICT and (ii) allow all of them to create, and interact with, digital content in different settings (e.g. at home, in the adult association).

Most of previous AAL projects have considered older people as passive users of services provided by someone else. The information flow in the technologies developed can be regarded as unidirectional and being codified to be used at home. In Life 2.0, we consider older people both users and prosumers (Martin et al 2009). Also, building on our previous experiences (Sayago and Blat 2010), we consider that social inclusion through ICT should be achieved by promoting activities that older people can conduct out of their homes.

This view of inclusion lies also behind the philosophy of the UK projects SUS-IT (SUS-IT) and SiDE (SiDE). SUS-IT is addressing the question of sustaining ICT use with changing (i) age-related capabilities decline, (ii) interaction contexts and (iii) ICT. Amongst

other research being conducted in SiDE, prototypes of accessible indoor navigation tools for older people and people with disabilities are being developed (Montague 2010), together with research on cognitive modeling for older adults[31]. Neither the potential of geo-positioning for increasing social inclusion nor the accessibility / use of these technologies by older people have been addressed in these projects.

Life 2.0 and previous HCI research with older people

Some technologies addressed in Life 2.0, such as Digital TV (Rice and Alm, 2008) and social networking sites (Burmeister 2010, Gibson et al 2010), have received attention in HCI research with older people. Much less research has been done related to Google Maps, online collaborative document editing (Google Documents) and weblogs (Blogs)[32]. However, they are becoming pervasive (e.g. websites with embedded Google Maps in them).

Methodologically, a relatively recent HCI trend has turned to ethnography to understand the important interactions of users with ICT in out-of-laboratory conditions. However, very little of this research has been conducted with older people (Sayago and Blat 2010). In that paper, we adopted a classical ethnographical approach, which requires at least between 6 months to 1 year of fieldwork (Fetterman 2010), and showed that socialization, independence (not relying on anyone else) and inclusion are key aspects of e-mailing everyday use, and that interaction barriers due to age-related changes in cognition limit much more severely their interactions in out-of-laboratory conditions than those related to vision or difficulties using the mouse.

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[31] http://www.computing.dundee.ac.uk/staff/dsloan/projects.htm
[32] A survey we conducted of four leading HCI journals (Interacting with Computers, first issue-2011; International Journal of Human-Computer Studies, first issue- 2011; Universal Access to the Information Society, first issue-2011; ACM Transactions of Human-Computer Interaction, first issue-2011; ACM Transactions of Accessible Computing) and CHI ACM Proceedings using keywords such as "older people", "geography", "google maps/earth", "blogs", revealed that no studies have been published to date addressing these technologies.

In this paper, we have adopted a rapid ethnographical approach due to time constraints in R&D projects and our goal of understanding better ethnography, and explored other technologies. As stated in (Millen 2000), the three most important ideas of rapid ethnography are: 1) narrow the focus of the field research before entering it; 2) use multiple interactive observation techniques, and 3) use collaborative and computerized iterative methods to analyze data combining techniques. Next we describe our ethnographical study.

Description of the ethnographical study

Context: Àgora

We have conducted this study in Àgora, a 20-year-old association33 in Barcelona. Àgora aims to integrate into Catalan society immigrants, non-educated and older people, who are, or run the risk of being excluded from it. This is done through informal learning in free courses (e.g. languages, mathematics and literature) with over 1000 people (using Àgora's terminology, participants) taking part in them monthly. Àgora, and its participants, consider that mastering ICT is an essential inclusive element, so courses in computing, Internet access and workshops are also provided. Participants decide what ICT they want to (learn to) use according to their needs and interests. Courses and workshops are also geared towards supporting daily life activities.

Rapid ethnography: participants, technologies, methods

We have conducted 32 hours of fieldwork over a 1-month period. The fieldwork activities consisted of in-situ observations of and conversations with around 90 older people (aged 60-75) while using several technologies, ranging from Google Maps to weblogs, in two workshops we run for the project and five courses already organized by Àgora with no connection with Life 2.0. The fieldwork was conducted in the Àgora's computer room. Approximately 50 participants were familiar with basic and more advanced tasks, such

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[33] Within Escola d'Adults La Verneda – St. Martí (an adult centre), http://www.edaverneda.org

as when to left- or right-click and look for information online. Table 1 summarizes the fieldwork activities.

Activity	Description	Technologies	Participants	Implementation
Workshop on Google Maps	Hands-on introduction to Google Maps and collaborative creation of an annotated map	Google Maps	12 (6 men / women)	2-hour session
Workshop on weblogs	Hands-on introduction to blogs and creation of a blog with Blogger[34]	Blogger	11 (5 men / 6 women)	2-hour session
Course on Gardens of the World	Downloading and editing picture aout gardens of the world from the web and creating documents (e.g. calendars) with them	Internet Explorer, Mozilla Firefox, MS Office tools, picture editing tools	9 (4 men / 5 women) 11 (6 men / 5 women) 9 (4 men / 9 women)	3 sessions. 1 session per week. Each session lasting 2 hours
Course of Wild life and Nature	Idem about wild life and nature	Idem	12 (4 men / 9 women)	2 sessions. 1 session per week. Each session lasting 2 hours
Course on advanced aspects of ICT	Topics of computer management, online communication and document sharing	File and windows management, Internet Explorer, Mozilla Firefox, MS Office tools, webmails (Yahoo!, Hotmal, Gmail), Google Docs, Blogger	17 (7 men / 10 women)	4 sessions. 1 session per week. Each session lasting 2 hours
Course on Women and ICT	Downloading pictures from the web, creating MS Word documents, calendars and cards	Internet Explorer, Mozill Firefox, MS Office tools	16 women	2 sessions. 1 session per week. Each session lasting 2 hours
Course on Introduction to ICT	Introduction to computers, file and windows management	Desktop tools	13 (6 men / 7 women)	4 sessions. 1 session per week. Each session lasting 2 hours

Table 1: Ongoing fieldwork

We have also conducted two focus groups (1 hour, 6 women, 2 men) to elicit everyday life stories[35], and one participatory design workshop (1 hour, 5 women, 5 men[36]) to suggest ideas for the design of Life 2.0 scenarios. As discussed later, part of our ongoing

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[34]"*Un blog para compartir*", Blog created by the participants, http://blogsantmarti.blogspot.com/

[35] This method is often used by Àgora in other research projects in which they work.

[36] 3 of them (2 men, 1 woman) also participated in the focus group.

activities is to analyze diaries written by the participants about the activities they have conducted over a 2-week period and the involvement of relatives, friends, and ICT in them.

We have also carried out a semi-structured interview with the director of the social services of the local area in her office as our first activity with caregivers. We expect to talk with some key relative of the participants (their children and grandchildren) in the next few months.

We have recorded fieldnotes by using inclusive technologies: paper and pencil, and photographs. All our participants took paper-based notes in the courses and workshops. However, laptops and video cameras were intrusive; there are no laptops in the Àgora's computers room and participants are not used to being videoed during their everyday interactions with them.

We wrote most of the fieldnotes at the end of the sessions. The active involvement of the participants in the activities suggested, such as creating a collaborative map of their neighborhood, hindered note-taking while interacting with the participants. Whereas this finding might challenge the 'veracity' of the fieldnotes, it also indicates the engagement of the participants in the research, however.

Different members of the research team were involved in different fieldwork activities. Their fieldnotes were shared as online documents with the rest of the team. We have been analyzing the fieldnotes by using Grounded Theory (Charmez and Mitchell 2007), i.e. while gathering the data. We have conducted initial open, axial and selective coding. We have discussed the different results during the course of the research and describe them in an integrated way below.

First analyzed results

Potential scenarios of use: technologies, social actors and inclusion

A map of my life. Reminiscence is common in communication in ageing. Whereas this might lead to negative stereotypes (e.g. older people talk too much about their 'stories'), we can turn it into an inclusion opportunity. For instance, annotating a digital map with places which had been important in their past by using technologies familiar to relevant members of their social circles, such as grandchildren, can help us achieve the goal of improving social inclusion. Whilst this scenario exploits an idea that is not new, i.e. life or oral stories and historical memory of older people (Klemmer et al 2003), using digital maps is a novel approach to the best of our knowledge.

What I like and dislike about my local area. Older people pinpoint areas where walking could be dangerous or identify and comment about worth visiting places. This could be socially shared through several channels (e.g. a website, DTV), which can generate further comments and thus, enhancing the role of older people in the community by sharing their valuable knowledge.

What is going on in my town? Older people play a less active role, they open their web browser or switch their (D)TV on and 'read' a map containing information created by relevant members of their social circles. For instance, Àgora recommends reading books and partaking in activities organised by the association; caregivers and social relatives remind older people of walking at least 1 hour in the park. Older people can also track the places visited by close friends and read their comments (e.g. you have to see this: the water leak in the street has not been fixed yet!). This scenario can promote socialization by encouraging older people to 'go out'.

Some requirements common to the scenarios

All our participants aspire to be in control of the technology because of privacy concerns. They are reluctant to be located through geo-positioning ICT when they want to be 'invisible'. However, tracking partners with Alzheimer is considered useful.

Specific times for being 'visible and 'invisible' are also important with respect to their communication with relatives and close friends: our participants want time for themselves. All participants were also unwilling to reveal what they considered private data (e.g. contact details) to unknown people by using blogs. This finding concurs with our previous study of e-mailing and other studies of social networking sites (Gibson et al 2010).

There is a rich flow of the role older people play in their interactions with ICT. Sometimes, as we have indicated in the scenarios, older people are active and wish to create content; on other occasions, they just want to interact with content created by others without contributing to it.

The appearance of the content that they create on maps and blogs (or e-mails and calendars) is much less important to them than how easy it is to actually create the content, since their most important aspiration is to be able to interact with the technology independently. However, when they are able to do so, they are interested in the aesthetics of their content, which concurs with our study of real-life e-mailing, but adding the evolution when competence is acquired.

As we also found in our previous study, the interactions are social (reduce isolation, informal (e.g. making jokes while using Google Maps), and non-utilitarian (e.g. none of our participants want to use ICT for productivity purposes).

Figure 1: Participants interacting with Google Maps

Interaction barriers and opportunities for strengthening social inclusion

We argued before (Sayago and Blat 2010) that cognitive-related interaction barriers limit more severely the interactions of older people with ICT than other types of barriers. We have also pointed out that note-taking is their strategy for overcoming them. We have found very similar results in this study, despite having been working with different participants and technologies. Next we show some examples.

Whereas Google Maps allows us to edit the comments and areas of interest created by other users, Blogger does not enable us to modify posts written by others. This 'lack of consistency' resulted in all our participants making mistakes and asking us questions about what could be edited and what could not in these technologies. We observed that all our participants relied on their previous experience with 'one' technology in order to (learn to) interact with another. By contrast, no participant had difficulties publishing a new post in Blogger. Overall, participants reported that Blogger was 'very similar to MS Word', with which they were familiar. We observed that all participants took notes during the sessions, independently of their experience with ICT.

When working with Google Maps, we started with the Map view, which we considered the simplest and less cognitive demanding geographical representation. However, we observed that participants switched to the Satellite view. This seems to indicate that the latter view, which is less abstract, provides older people with information that helps them interact with digital maps more effectively (e.g. finding streets and defining routes), and is less demanding cognitively. We also observed a general preference for Google Earth, which offers context with a real representation of geographical information. We will explore further this finding in our future work, as we discuss later.

Whereas participants did not add any entry or comments to the blog after the session in which they created it[37], information

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[37] 6 participants accessed the Google document created in the course on Advanced Aspects of ICT (Table 1) up to five times in the following four days

conversations with them revealed that they had actually accessed the blog in the following two days after the class. However, they reported not remembering how to add or edit an entry. Moreover, they asked us to repeat the workshop in order to memorize the steps and be able to 'write things' in the blog. This result seems to stress once again the relevance of cognition and note-taking.

Discussion and future work

We have focused on geo-positioning and other pervasive ICT because we consider that these technologies can (and should) help us foster social inclusion and support independent living amongst the older population.

The preliminary results have revealed a number of research challenges and opportunities to achieve these goals. As for the challenges, it is worth mentioning some requirements and interaction barriers, which seem to confirm results of our previous research. Regarding opportunities, the engagement of older people in the research, the scenarios and different representations of geographical information can potentially stimulate further research.

We have not included the voices of the participants we have gathered so far in this paper because we need to conduct more ethnography in order to ascertain how valid our first observations and conversations are. Whereas part of the interaction barriers and elements of ICT use can be somewhat quick to understand by building upon a previous and extended ethnographical study, and we feel confident about the relative validity of the findings, new results which have emerged from this ongoing research and devising scenarios with new technologies which have not been explored before, and with which (older) people are not familiar, requires much more ethnographical data and analysis, we believe, and we feel less confident about these initial findings.

We are currently analyzing diaries written by the participants in an attempt to get a more holistic view of their everyday lives. We are

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after the session. 3 participants created new documents and shared them with the participants

also gathering more data related to in-situ observations of and conversations with the participants, and we plan to conduct interviews or questionnaires with their grandchildren and children, who are very relevant members of their social circles, as well as of caregivers. We are going to address the important question of how to communicate effectively ethnographical data to user interface designers and developers, who are working in Life 2.0. We also expect to analyze cultural differences and similarities in the accessibility, use and potential of geo-positioning ICT for supporting social inclusion and independent living as the project is run in Italy, Denmark and Finland. All these activities, which are related to ethnographical research, should help us provide much deeper insights into the challenges and opportunities of geo-positioning ICT to foster social inclusion and independent living amongst the older population.

Acknowledgments

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