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 also 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 170 older people helped us to conceptualise these games, which were co-designed through playful everyday 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.

Keywords: older people, digital games, ethnography, participatory action research, evaluation

While the attitudes of older people (60+) towards Information and Communication Technologies (ICTs) are depicted as being positive or negative, i.e. eagerly adopting ICTs 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, their 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 their play experiences reveal a much wider variety of reasons for playing digital games, e.g. taking up intellectual challenges or having fun (De Schutter, 2011; De Schutter, Brown, & Vanden Abeele, 2014; Marston, 2013; Pearce, 2008; IJsselsteijn, Nap, & Kort, 2007). Additionally, while 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) and 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 using 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 HCI, GS and Gerontechnology conferences and journals since 2000[1]. We divided these publications into two specific areas – designing digital games for older people, experiences of play – 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 include *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 their design has been to help older people to cope with 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 otherwise interested in playing digital games. The results reveal varied *motivations* for playing digital games, e.g. to connect with their children or to relax with friends. *Preferences* for playing certain types of games have also been addressed. Older people seem to prefer to play games that present intellectual challenges, and which 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, e.g. playing casual games on their PCs or being engaged in vicarious play[2] 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 design objectives of games aimed at older people (mostly focused on physical activities in either intergenerational play or rehabilitation (exer)games, e.g. *Walk2Win*, *Activator* and *Paldokangsan*) appear to be at odds with the results of playful experiences studies, wherein older people tend to show a preference towards intellectual challenges. 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 (b) are uninterested in engaging in this activity, have largely been overlooked. 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 WorthPlay[3], 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 of using 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 170 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. 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. Figure 1 presents an overview of the study. The settings where we conducted the research, recruitment and overall profile of the participants, and the data gathering and analysis process, are summarized next.

(Figure 1)

*Settings, recruitment and participants' profile*

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 operated 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 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). Participants 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, for instance, when they were bored or waiting for a friend to visit.

*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 through 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 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 at 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 laptops) of most of our first-hand observations of, and conversations with, the participants. 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: [F (Fieldworker), Setting (AG,

ECM or DUC)]. Participants granted 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* and *FarmVille* on desktop computers, *Bowling* in the Nintendo Wii, or *Rummy* with traditional playing cards (Figure 2). Participants also played non-digital games, e.g. 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 2)

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 sixty-two 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, e.g. 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.

The thematic analysis approach described previously enabled us to identify the following three key themes:

- Our participants are not interested in playing (e.g. "we are here to learn, not to play" [F1, AG]).
- Meaningful and varied casual games (e.g. "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 (e.g. "I feel so excited. I wait until all the molten lava pours out of the volcano. I feel proud of myself" [F2, AG]).

*Our participants are not interested in playing*

Most participants were initially reluctant to play digital games and to acknowledge that they already had some experience of 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, e.g. 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 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 whose main goal was to improve their ICTs 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. They played games that were (a) meaningful, e.g. "I play *Rumikub* every night online. I play it because my children showed it to me. Some nights we even play together" [F2, AG]; (b) closely connected to 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, Brown, & Vanden Abeele, 2014), and this might be due to our participants' active lifestyles and the fact that most of them were not players.

Participants had no intention of completing or achieving the final goals of the games, 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, e.g. *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,* e.g. "I seldom win when I play this game (against the computer) (…) but 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, and (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. 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, covering three themes: neighbourhood memories, a book quiz, and Spanish folk parties.

*A game about neighbourhood memories*

Members of the AG staff proposed the idea of organizing a game for the summer 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 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 and points achieved) based on the ideas provided by its creators. This first version of the game party was simulated with a group of older adults undertaking a course on ICTs. As this group was reluctant to play "games", we decided to include Google Maps, which was perceived much more positively. 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 ICTs 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 3). 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 for new questions).

(Figure 3)

Eighty-two members of the community participated in the ICT class simulation, and at the summer party. In the latter, we observed participants encouraging others to play the game, demonstrating their strong affinity to the game 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 naturally 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].

### *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 at a weekly book-reading club and had partaken 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 (Figure 4). 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 to make the most of the playful experience (e.g. learning, socializing) beyond wining or losing, in which 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 4)

*A trivia quiz about Spanish folk parties*

A key finding of the second activity was that older people could be seen as potential game creators, as well as game players. 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. Members of an ICT course played the quiz, and 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 ICT resources to find answers (Figure 5). 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 validated.

(Figure 5)

*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 mutually exclusive. The main objective of the resultant games is to engage older people in a type of play that consists of mutual and between-equals sharing and the 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 a new game, or to 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 those 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 6 shows the player's view and how a game is played. Figure 7 illustrates the editor of games and the main steps to create a game.

(Figure 6)

(Figure 7)

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 (see Table 2), wherein participants were encouraged to create and play their games using the platform. We did not specifically aim at testing the usability of the user interface of the platform, since it had been designed with the feedback and contributions of participants in the PAR activities. Thus, the evaluation focused on the games that could be either played on the platform or created through it, aspects that had not yet been evaluated (Figure 8).

(Figure 8)

Fifteen games were created and played by older people over a 6-month period (February to July 2013). The games included a mix of photos, text and videos, and were written in English, Spanish and Catalan.

*Qualitative data gathering*

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*

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 were related to common topics of interest and could be played without time limits: "Jeez! We've spent two hours playing this game, really? I can't believe it. It is so interesting! Time flies!" [F6, ECM].

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 female AG participant 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 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 further understanding 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 them, 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 how 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 use 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 them 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 goals[5]. Yet, they manifested themselves (as one may expect) within the PAR and evaluation activities.

### *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 research into 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 and ideas. 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. 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. 80 papers were excluded from the review. Exclusion criteria: 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. There is no right or wrong answer.<br>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.<br>While answering, participants can add an extra answer to closed questions if they consider all the previous ones are incorrect.<br>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 concrete questions. | The platform lets any user create his or her game/s.<br>The platform lets players 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.<br>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.<br>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. |
| 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<br>There is no specific path to play the game. Players read the list of questions and decide which one they want to answer.<br>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.<br>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) Book-reading club | 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.<br>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. Five 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 ICTs classes, this time on the platform.<br>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).<br>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 the summer party | 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.<br>Participants: 20 (6: 75+; 7: 60-75; 7: less than 60; 16 men, 4 women). We were unable to gather the previous ICTs experience of the participants because doing so was difficult in this type of public event. |
| (DUC) Dundee, geography and Scotland | Researchers created initial games, e.g. 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.<br>Participants: 16 (65-84, 7 men, 9 women). Six participants reported using computers 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.<br>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. |

Figure Captions

Figure 1: Overview of the study: main stages, activities conducted, and participants.

Figure 2: AG participants playing *Rummikub* in the gaming club.

Figure 3: AG participants and passers-by playing and contributing to the neighbourhood memories game, moderated by a researcher, with papers in her hands.

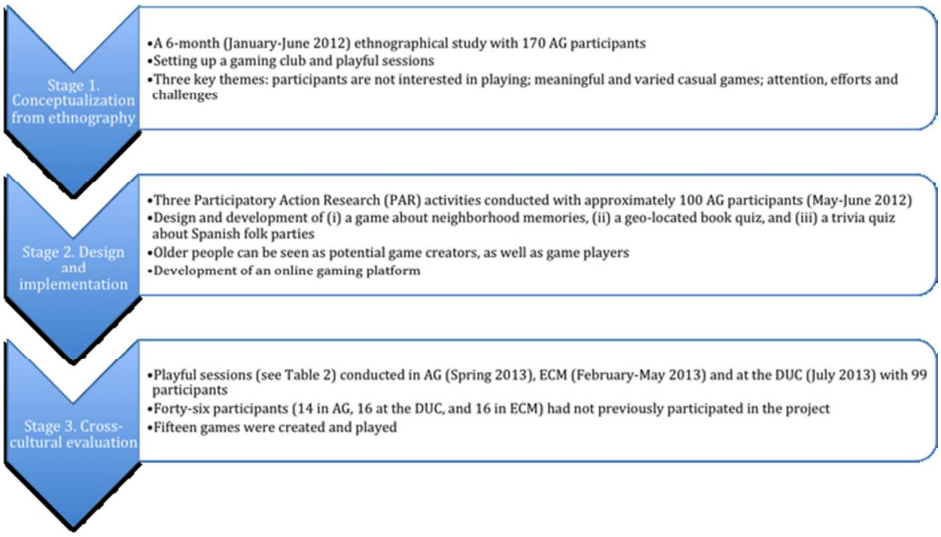
Figure 4: One of the two groups discussing a question during the geo-located book quiz using a smartphone and their notes.

Figure 5: Testing participatory creation of games: AG participants taking a picture with a tablet and e-mailing it to a friend in the folk parties and ICTs game.

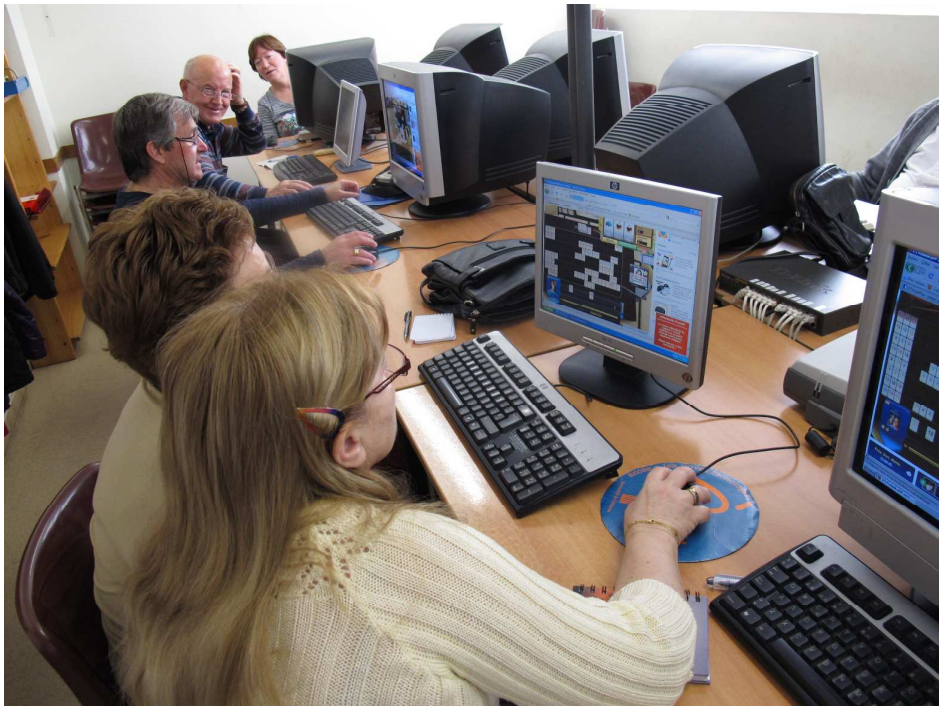
Figure 6: Four screenshots of the player's view of games: (1) the player selects a game, (2) a list of activities is shown and the player selects one, (3) the question is displayed for the player to answer, (4) the actual answer provided by the creator of the game, and a summary of the responses by other players, is shown.

Figure 7: The editor of games: (1) title of the game, (2) new activity, (3) type of activity, (4) content of the activity.

Figure 8: Evaluation in the book-reading club game: discussing answers while playing the game with a tablet PC and the original book



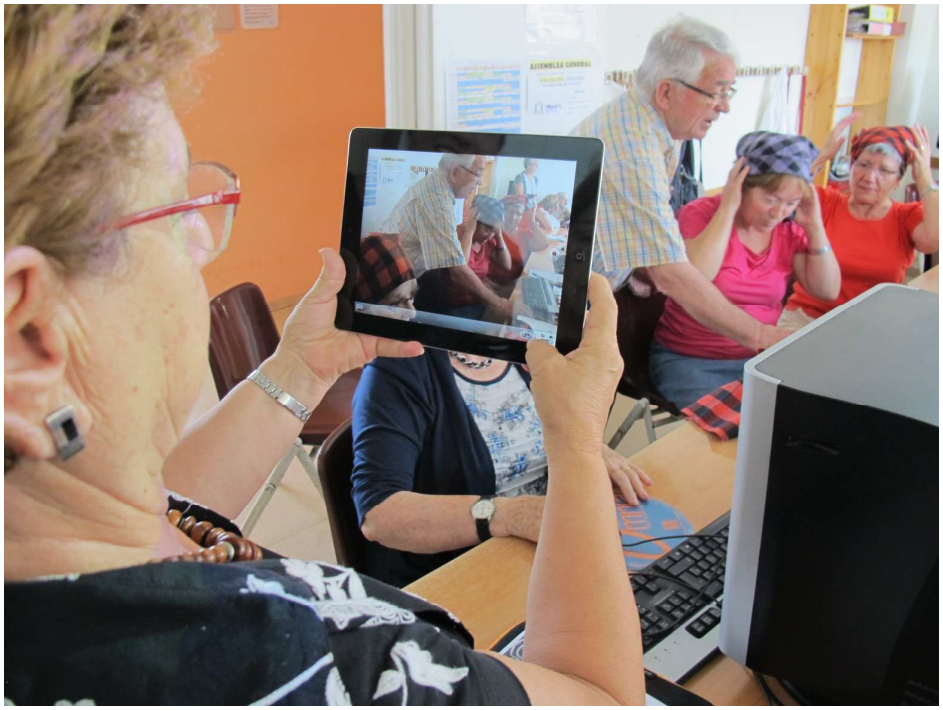

Overview of the study: main stages, activities conducted, and participants
247x141mm (72 x 72 DPI)



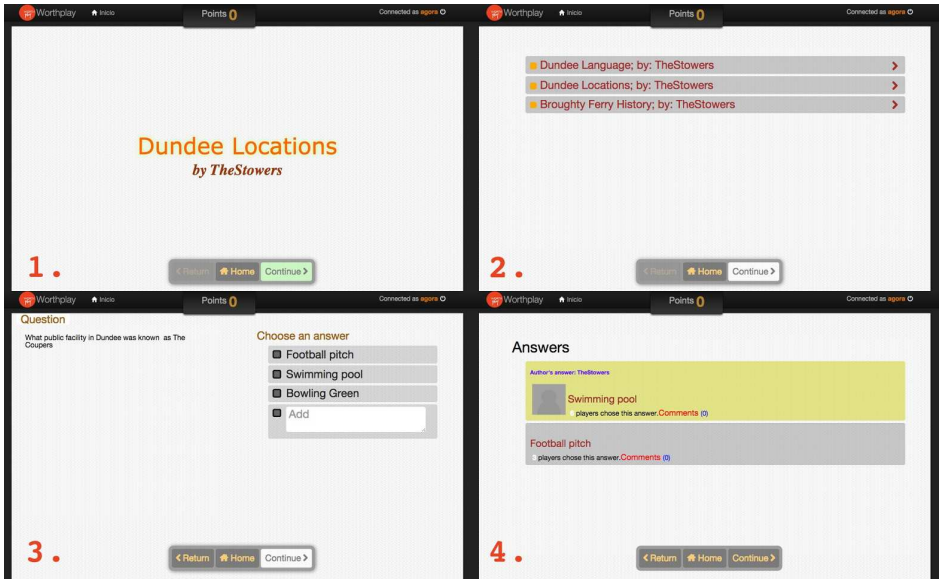
AG participants playing Rummikub in the gaming club
514x386mm (180 x 180 DPI)

AG participants and passers-by playing and contributing to the neighbourhood memories game, moderated by a researcher, with papers in her hands
514x386mm (180 x 180 DPI)

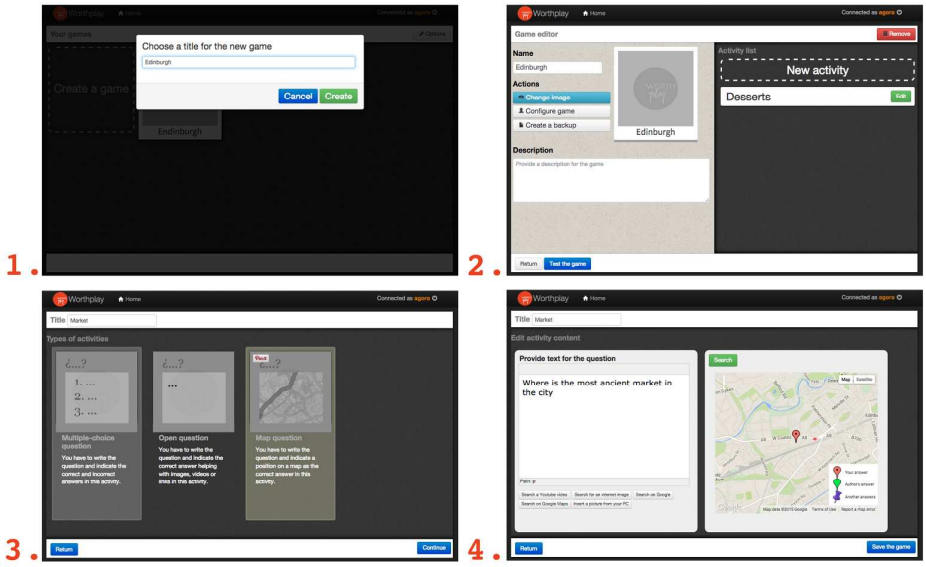

One of the two groups discussing a question during the geo-located book quiz using a smartphone and their notes
799x676mm (72 x 72 DPI)



Testing participatory creation of games: AG participants taking a picture with a tablet and e-mailing it to a friend in the folk parties and ICTs game
514x386mm (180 x 180 DPI)




Four screenshots of the player's view of games: (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 730x448mm (72 x 72 DPI)




The editor of games: (1) title of the game, (2) new activity, (3) type of activity, (4) content of the activity

Evaluation in the book-reading club game: discussing answers while playing the game with a tablet PC and the original book
1512x1134mm (72 x 72 DPI)