Senior gamers: Preferences, motivations and needs

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Digital games hold the potential to enhance seniors' leisure time and social connectedness, and provide a mental and even physical workout. However, most digital games that are currently on the market are targeted at the younger audience and contain content that generally does not resonate well with seniors. Senior gamers do exist, yet little is known about them. It is unclear what motivates them to engage in digital gaming, what type of games they play, what problems they face with game interfaces, and what their perceptions and attitudes are towards digital gaming. By gathering an in-depth understanding about senior gamers, future digital games could be designed in such a way that they are usable, engaging and fun to the senior population. By means of two focus groups and four contextual inquiries, rich, qualitative insight was gained about senior gamers. Results indicate that digital game play offers many benefits to seniors, and in the paper a number of potential strategies are discussed to increase the positive return from digital game play and to appeal a wider senior audience.

Keywords: digital gaming, seniors, gamers, perceptions, cost-benefits

In 2050, almost a third of the population of the United States of America (USA), and more than a third of the European population will be aged over 60 years[1]. For the first time in history, by 2045, the number of seniors aged 60+ years in the world will likely even exceed the number of children aged less than 15 years[2]. At the age of 60, most seniors are close to retirement, or have retired from work, a time most people have to re-think how to give meaning to the day and enjoyably pass time. This also holds true for the partners of the retired workers. Digital game play has the potential to support seniors in creating meaning and enjoying leisure time together or alone, and to train and uphold cognitive and motor abilities. With a few notable exceptions (for instance, Nintendo's 'BrainTraining'), most digital games that are on the market are targeted at a younger audience and contain content that is unlikely to resonate well with seniors. Nevertheless, senior gamers are on the rise. In the USA the population of gamers over 50 years of age increased from 9% in 1999[3] to 26% in 2008[4]. However, seniors are still an underrepresented group compared to the 49% of 18-49 years olds who play digital games[4].

In order to gain an improved understanding of the media consumption patterns across various demographic groups, the BBC[5] commissioned a study showing that gamers in the age group of 51-65 years of age prefer puzzle, board and quiz games. These gamers thought there were too many racing, shooting and fighting games on the market, which perhaps reflects their dislikes about violent and rapidly paced digital games. However, to this date, no substantial data-sets are available about the digital gaming preferences of people who are 65+ years of age. There is

some understanding about the way preferences are construed, and that preferences are likely to be influenced by the appraisal of the perceived costs and benefits.

Bouwhuis[6] stressed that the use of new technologies is subject to a cost-benefit analysis. For example, if the investment of seniors to play a digital game (for instance, complex controls that need to be learned) is higher than the return (for instance, enjoyment) then the utility of digital game play will remain zero. The same holds true for a highly accessible digital game system that provides little benefits, for example low return by uninteresting and unsatisfactory game content. IJsselsteijn, Nap, de Kort, and Poels[7] argued that in such a cost-benefit analysis, the role of benefits is more pronounced for the senior population. As suggested by IJsselsteijn et al.[7] most seniors need to perceive substantial benefits in digital game play before they are willing to invest their valuable time and energy in what could potentially be a rich and rewarding experience. In fact, a perceived lack of benefits from new technologies such as digital gaming, irrespective of perceived costs, is reason enough for seniors to reject a new technology[8]. For a new technology to be accepted and liked, it should also fit into the daily lifestyle and personal environment of the user[6], or as stated by Beyer and Holtzblatt[9], it should fit into the fabric of every-day life.

The benefits of digital game play have been studied extensively with young adults[10,11,12]. Sherry, Greenberg, Lucas and Lachlan[11] found six dominant dimensions of video game use that included 'arousal', 'challenge', 'competition', 'diversion', 'fantasy', and 'social interaction'. The most prominent of the motivations for game use were social in nature. In addition, diversion and arousal were also important predictors of time spent playing digital games[11]. It is possible that there is an overlap between the motivations of seniors to play digital games and those of young adults. However, senior specific lifetime experiences, world knowledge, age-related changes in perception, cognition, and motor control[13] are likely to have an influence on specific gaming preferences, motivations, and needs. For example, seniors might enjoy digital games that contain content and in-game rules related to the card and board games they played when they were young (for instance, the games Tarbish, Ludo) and derive little enjoyment from digital games that require learning complex and fast motor skills (for instance, Soulcalibur, Tekken).

Research that focuses on the possible barriers (i.e., costs) that seniors face in digital game play is also still in its infancy. For technology in general, it has been found that age-related changes have an influence on how well existing technologies can be used, as well as how new technologies are learned to be used[14,15,16]. Age-related changes and experience with technologies will likely influence successful and enjoyable game play[7].

Although the percentage of senior gamers is steadily increasing, relatively little is known about them. It is unclear what type of games seniors play, what motivates them to engage in digital gaming, what their gaming needs are, what problems they face with digital gaming interfaces, and what their perceptions are about digital gaming. By gathering an in-depth understanding about senior gamers, future digital games could be designed in such a way that they are usable, engaging and fun to the senior population. To our knowledge, two studies[17,18] addressed the gaming motivations and attitudes of seniors in general, however, not of senior gamers. Most of the participants in these studies were non-gamers, who were either faced with gaming for the first time[17], or were non-gamers who participated in the design of new game concepts[18]. The study of Aison, Davis, Milner and Targum[17] demonstrated that video games have a strong appeal to senior non-gamers, and the main motivation for selecting games in a game play session during the study was based on their prior knowledge or familiarity with the game content (for instance, sports games, card games).

The main message of the study by De Schutter and Vanden Abeele[18] is that gameplay for seniors should not only focus on the activity itself, but also on connecting people, personal growth, and contributing to society.

This paper presents two exploratory studies each employing a different qualitative method, i.e., focus groups and contextual inquiries, in order to investigate the motivations and needs of seniors in playing digital games. In contrast to previous work in this area, the qualitative investigations included seniors who could be considered active gamers, allowing them to reflect on their own current senior gaming situation, and their perceptions of strong and weak points of currently available games. Such knowledge can provide content and design requirements for future digital games, as well as for gaming interfaces, systems and controls. In the focus groups and contextual inquiries, the emphasis was on the perceived benefits of digital game play (for instance, social interaction), preferred game content, and the barriers seniors face. In the contextual enquiries, additional contextualised and observation-based data was gathered about the ongoing gaming experience, rituals, and social and game-play environment. With this knowledge, we can maximise the utility of digital game play for seniors, thereby potentially creating a more fulfilling digital experience, and appealing to a wider senior audience than is currently the case.

Study 1: Focus group explorations
Methodology
Using a focus group is a discussion technique where participants in an interactive small-group setting are encouraged to discuss amongst themselves about a particular topic. A moderator is present to provide thematic guidance and to pose probing questions on issues that need further exploration. Focus group studies are generally carried out in quite an informal atmosphere with great emphasis on group talk and interaction. Two focus group studies were performed with avid and casual senior gamers

to elicit Perceptions, Opinions, Beliefs, and Attitudes or POBAs[19] about digital gaming, and to gather their motivations and needs for playing digital games.

Participants
Ten Dutch senior gamers participated in the focus groups; one which consisted mainly out of avid gamers (FG1) and one which consisted mainly out of casual gamers (FG2). Although it is difficult to make a clear distinction between avid and casual gamers, avid gamers can roughly be described as people who play digital games on a regular basis as a main leisure activity, whereas casual gamers play digital games infrequently as a break between main activities. In FG1 and FG2 there were both 4 females and 1 male (FG1: mean age=67.8, SD=3.6, FG2: mean age=70.0, SD=4.7). The participants were recruited from an advertisement at the Dutch SeniorWeb page and at a senior summer course that was given in the Mozes and Aaron church in Amsterdam (The Netherlands). In the advertisement it was stated that the topic of the focus groups was about digital gaming, to recruit seniors who have an interest in the subject matter. Moreover, criteria for participation were being 65 years of age or older and playing digital games at least a couple of times a year. All participants were paid €10,- as a compensation for their time in the study. Of the avid gamers (FG1), four participants played digital games every day, three of whom played digital games between one and three hours, and one between 30 minutes and one hour. One of the avid gamers showed a keen interest in digital gaming, however, he did not play digital games on a regular basis. Of the casual gamers (FG2), two played every day, one of whom played between 30 minutes and one hour, and one played less than 30 minutes. Two of the participants in FG2 played every week between 30 minutes and one hour, and one hardly ever played games. All participants were pensioners. Three of the participants in FG1 and two in FG2 lived together with their partner. Nine of the participants were frequent Internet users. Most

participants had a higher education than High School, except one in FG1.

Location and Equipment
Both focus group studies were held at the Uselab of the Human-Technology Interaction group at the Eindhoven University of Technology (The Netherlands). The Uselab is a comfortable and informal room similar to a living room, outfitted with unobtrusive, state-of-the-art audio and video equipment.

All instructions and questions were read from printed cards. Audio was recorded by two pointing-microphones, and video was recorded by three ceiling mounted camera's. Both audio and video recordings were recorded digitally on a Personal Computer (PC). Audio that was relevant to the topic of discussion was transcribed and categorized afterwards.

Topics of Discussion - Questions
In focus group research, it is important that participants do not have the possibility to prepare arguments and opinions beforehand. Because of this, participants were only informed about the main topic of interest (seniors and digital gaming) before the actual focus group took place. The focus on the motivations of seniors for playing digital games and their digital gaming needs was set during the group discussion by the moderator. Besides informal group talk and sharing experiences with gaming, the participants were provided with five topics to guide the discussion.

The first topic of discussion was about the games the participants play or would ideally like to be playing. Little is known about the type of digital games seniors play or (would) prefer to play. If the participants mention certain digital games they would like to play, it is interesting to gather knowledge about reasons for not already playing these games (for instance, costs, availability, and system requirements). In the second topic of discussion, seniors were asked about their motivations for playing these games. Do the partici-

pants play games for fun, educational value, to increase skills, train cognitive abilities, pass time, increase self-esteem, etc.? The third topic of discussion was about violence in digital games. From the study of Aison et al.[17] and from discussions with members of the Dutch SeniorWeb organization (personal communication, March 5, 2008), it became apparent that most seniors seem to have strong negative perceptions about aggression and violence in digital games. It is unclear what types of games are classified by seniors as violent, and what aspects of a game would contribute to this classification. Strategy games like Age of Empires or puzzle adventure games like Sherlock Holmes contain violent content, but could be interesting and pleasurable for seniors, due to the historic setting, slow pace and familiar content. The fourth topic of discussion involved an exploration of the perceptions, opinions, beliefs and attitudes of seniors regarding social interaction in digital games. The study of Sherry et al.[11] showed that for young adults, the most prominent of the motivations for game use were social in nature. For seniors to overcome loneliness and meet other people, multiplayer gaming (via Internet, Intranet or shared play) with friends, family, and/or fellow residents of senior homes, can be of great value to their social life. However, from a preliminary exploration study on a Belgian senior gaming forum in 2008[20] it appeared that most seniors play digital games (for instance, Zylom games[21]) that provide little means for social interaction with other players or multiplayer options. In the fifth topic of discussion, gaming interface constraints were considered. During the years, gaming interfaces have changed from simple two-button input devices and simple option menus (start, save, load) to multi-button input devices and numerous menus, options and settings. Because, in general, seniors are less experienced than young adults with current technologies like the computer and the Internet, it is likely that seniors will face difficulties when operating these complex game interfaces.

Procedure

The participants were welcomed with coffee, tea and cookies. Information was given about the focus group procedure, which was followed by an introduction round. After this, participants were asked to read and sign an informed consent form. The informed consent stated what was being studied, ensured anonymous analysis, announced that video, audio, and image recordings were going to be made, and made clear to the participants that they could withdraw their consent and cooperation at any given point in time during or after the session. After signing the informed consent, participants were asked to briefly report what their experiences were with playing digital games (for instance, whether they played digital games on the console or PC, for how long they had been playing and why they started playing digital games). This was followed by a discussion on the five key topics described above. After the discussion, the moderator summarized the main points that had been covered, and the participants were asked if they agreed on the summary. After this, participants were asked if they had anything to add or share that was on their mind, followed by a questionnaire to gather demographic characteristics. Finally, they were thanked, debriefed by means of an information sheet and paid for participation. The total focus group session took about one hour and 30 minutes (*Figure 1*).

Figure 1. Overview picture of focus group 2 (FG2)

Results

Results for the focus groups are presented per discussion topic. The focus groups were held in Dutch. The quotes have been translated into English for the purpose of this paper. To prevent distortion of the original messages, the quotes have not been modified to create full sentences. Clarifications are presented above the quotes and between brackets within the quotes.

Question 1: *What type of digital games do you play, and if everything were possible, what would you like to play?*
Four of the avid senior gamers in FG1 and four of the casual senior gamers in FG2 played the same type of casual games. Casual games can be characterized by their simple in-game rules and can be played satisfactorily within a short time-span. The main focus in the design of a casual game is on game-play instead of extended story-lines and graphical quality. Examples of popular casual games are: Patience/Solitaire, Mine Sweeper, and Bejeweled.

Eight of the ten participants played digital card games like 'Solitaire', and four played digital math games like Sudoku. Two of the participants in FG1 played golf on the computer, and two played digital board games (for instance, Rumicub). One of the participants in FG1 additionally played simulation games like Civilization, online Flash games (for instance, Samorost), and embodied games on the Nintendo Wii.

Most participants reported that they would like to play games they played in the past (for instance, text based adventures), which are not directly available or cannot be played on modern machines.

"...Railroad Tycoon would be very nice, in Dutch, and not that fast. In the past, you could nicely watch it (the game), in a slow pace, but now everything goes so incredibly fast. The graphics were not that nice, but it (the games) really captivated me. And that is what I miss these days." (P2-FG1, Female (F), 66 years old (66))

"I think it would be nice if there was a game like a puzzle (jigsaw). You set it aside and carry on playing two days later..." (P3-FG1,F,70)

Some participants reported that they were satisfied with the games that are available today.

"There is a lot of choice in (digital) games. I think (at SeniorWeb) you can choose out of at least 50 games, of which you keep a couple (on your computer) and keep playing them." (P5-FG1,F,65)

Question 2: *What are your motivations for playing digital games?*
Most participants reported that they played digital games for relaxation, fun, and to pass time.

"I play a lot, simply because I find it (digital gaming) relaxing." (P5-FG1,F,65)

"When I am very busy with things, then there will come a moment when I think; now I will need a break. After the break I can carry on quite well. How do you stop (being busy with things)? Take a cup of coffee, or watch something at TV, or play some FreeCell. Most often, at those moments I will do that game (FreeCell). A postponement of or a reward for (the work you have done)" (P4-FG2,F,69)

The challenge to progress and beat high scores were also reported as motivations for playing digital games.

"With double patience, you play against the machine. He (the computer) wins many times, and that is an incentive." (P3-FG1,F,70)

In addition, one of the participants liked to pretend she was someone else in a game and really enjoyed creating a virtual character, based upon either of her sisters, and then create virtual co-players, who could relate to her sisters' sexual or ideological preference.

"I own the Mahjong game…I do not have any family here (to play digital games with), so then I play with three virtual people, who

you can give names (in the game). I used the name of my sister, who is a feminist. So then I think; let's use three women (as virtual co-players). I also have a younger sister, and she is, well, she likes that (flirting with guys). So then I use three nice men (as virtual co-players)…and that is how I am busy with that thing."* (P2-FG2,F,77)

Question 3: *What do you think about violence in digital games?*
All participants reported that they were intensely against violence in digital games and the subject brought up memories of the Second World War.

"A game is played deliberately; in which there should not be a past (World War II) close by in it. That is too much of a burden." (P3-FG1,F,70)

"Horrible of course...It (war) is not a game." (P4-FG1,F,65)

Most participants were especially worried about the effect of violence in digital games on their grandchildren.

"I think it (violence in digital games) is horrible that it exists. I also think this when you watch it on television, whenever there are those horrible violent movies on it at moments that children watch. I think it is the same with those violent games. I cannot imagine that a child, after watching such a movie, is able to sleep well. They will dream about it…especially small children." (P3-FG2,F,67)

"I would not advise my grandchildren such a (violent) game, also not in such movies... Especially now, when the Second World War is in the news. I do not get it why violence should be a part of it (gaming)." (P1-FG1,M,73)

Some participants carefully put violence in digital gaming into perspective. For example, one participant reported that although she did not feel comfortable with violence in

gaming, a sort of battle is inevitable in most digital games (for instance, even the amiable plumbers 'Mario' and 'Luigi' in the Nintendo game 'Mario Bros' have to defeat enemies).

"I do not feel comfortable with it. If there is brute violence in a game, I will not buy it. However, you cannot escape the fact that a game with some tension in it contains a fight of some sort." (P2-FG1,F,66)

In addition, one participant reported that some violence in digital gaming could serve as a relief.

"You should be able to get rid of some aggression; I think that that will give some comfort. But those murders, and those urges, and seeing it too much…well that scares me." (P1-FG2,M,72)

Question 4: *What is your opinion about playing digital games with others*?
Most participants reported that they did not feel any need to play digital games with others. Nobody felt like playing games over the Internet, especially when playing with an unknown person. A number of participants had rather negative opinions about multiplayer gaming, especially related to perceived obligations towards other player(s).

"That is not my cup of tea, because then I am committed to sit there (behind the PC) at certain times." (P5-FG1,F,65)

"I do not think it is practical and not that easy because my grandchildren live abroad. Time differences etc., I do not know, no I do not think so. I also think that I will think then like…then I have to (play a game), while I am not in the mood." (P4-FG2,F,69)

However, one of the participants reported that she really liked playing digital games with others in the same room, and some of the other participants did like the idea.

"I like it (playing digital games with others). When my husband was still alive, we had a golf game, PGA golf…we played that with the four of us, with two couples, taking turns, and that was exciting!"* (P2- FG1,F,66)

Question 5: *Have you experienced problems with the computer or console?*
Most participants initially reported that they did not experience any problems with the computer or console. However, eventually, the participants in FG1 reported problems about changing game settings.

"…problems with the settings…especially graphical and sound settings. It should be perfectly geared to your system; else you will face a lot of problems." (P2-FG1,F,66)

One participant complained about the size of the playing cards in the game 'Solitaire' and that there is no option to enlarge them. In addition, he mentioned the time limit that is present in most games as a burden and the others agreed that this is a common obstacle in digital game play.

"Small playing cards and that you cannot always enlarge them, and that you are bound to a certain time limit." (P1-FG1,M,73)

Some of the participants reported that they faced problems with understanding the manual.

"It would be pleasant if there was a more simple manual." (P2-FG1,F,66) *"In Dutch."* (P5-FG1,F,65) *"One A4 sheet should be enough to start something up."* (P2-FG1,F,66)

STUDY 2: CONTEXTUAL INQUIRIES AT HOME
Methodology
The main goal of the contextual inquiries was to gain additional insight into the context in which seniors play digital games and the ongoing senior gaming experience. Contextual inquiry consists of both interviewing and observing users in their natural environment. To gather explorative data in a wide range of contexts, seniors who use different gaming platforms (PC, handheld, and console) were asked for participation. Four contextual inquiries were planned at the homes/

apartments of senior gamers using different gaming platforms (for instance, PC, console, and handheld).

Participants
Four Dutch seniors participated in the contextual inquiries. The participants were recruited from an advertisement at the Dutch SeniorWeb page, at the SeniorWeb ambassador days, and via friends and relatives. Criteria for participation were being 65 years of age or older and playing digital games at least a couple of times a year. Participants were sent an invitation by e-mail or called by phone. The contextual inquiries took place at the participants' homes. All participants were paid €15 as a compensation for their time in the study.
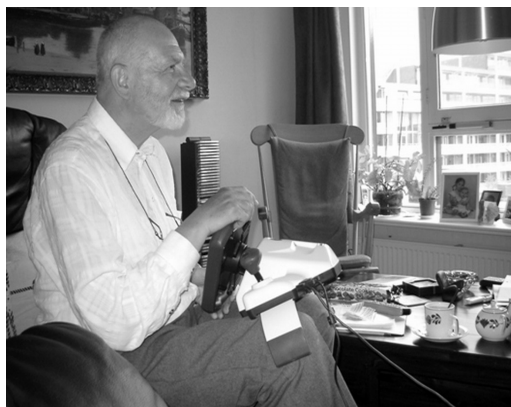
'George' is a 71-year-old male who lives alone in a senior apartment. He had his own photo shop, and was a rally driver for 10 years in the 1970s. He wanted to be a pilot or captain. He started playing games in the beginning of the 1980s. He bought an ATOM clone Personal Computer (PC), and played Flight Simulator, chess and Pacman. He owns an XBOX 1 with wheel (*Figure 2*) and pedals, large wide screen CRT TV, a PC (Windows XP) with a 22-inch widescreen TFT, and a Laptop with VISTA installed. His favourite games are Flight Simulator, DTM Racer, and various card games. He plays digital games every day, between 30 minutes and three hours. He plays in the after-

Figure 2. George playing DTM racer on the XBOX

noon, evening and at night in the living and study room.

'Elizabeth' is a 76-year-old female, housewife, who has been living together with her husband for 30 years in a terrace house. She worked at a hospital as an administrative assistant and travelled all over the world with her husband. She loves knitting and painting. She started playing games in the beginning of the 1980s at work. She played 'Dracula' with her colleagues, and enjoyed the competitive element. She owns a PC (Windows XP) with a 17-inch TFT-monitor and a Laptop that has not been used yet. She has a subscription for one year to Zylom (www.zylom. com), an online casual games portal. Her favourite games are Around the World in 80 Days, Heroes of Hellas, and Catan (digital card game). She plays games every day between 16.00 - 18.00 hours, and after dinner until 20.00 hours, for one to three hours, in a study/guest room on the first floor.

'Jane' is a 70-year-old female, housewife, who lives alone in a freestanding house. She visits friends, likes to do crossword puzzles, loves humour, follows a computer course, and is trying to give meaning to her life. She started playing games about a year ago. She received a Nintendo DS as a present from her son. She owns a PC and the Nintendo DS. Her favourite game is a game collection, Touchmaster, on the Nintendo DS. She plays games in the afternoon, in the evening during commercial breaks at TV, and on Sunday morning, for 30 minutes to one hour. She plays digital games in the sun room/kitchen and on the couch in the living.

'Albert' is a 64-year-old male, pensioner, who has been living together with his wife for at least 30 years in a terrace house. He worked on Electron Microscopes at a large company. He tried to give meaning to his life after retirement. He paints, likes to do crossword- and math puzzles, and he teaches computer courses. He started playing games in the beginning of the 1980s. He built his own clone PC and back then, Flight Simula-

tor was used to test the IBM compatibility of clones. He played text based adventures and Larry. He owns a PC with a 17-inch TFT-monitor and a Joystick. His favourite game is Microsoft Flight Simulator 2004. He plays digital games a couple of times a week, in the evening when his wife is taking a shower, for 30 minutes to one hour. He plays games on the first floor in a small study room.

Equipment
In the contextual inquiries, audio was recorded by a digital voice recorder, and video was recorded by a camcorder. Audio was transcribed and categorized afterwards.

Procedure
The researcher was welcomed with coffee and cookies. After an informal talk, the researcher and participant went to the room in which the participant played digital games. Information was given about the contextual inquiry procedure. After this, the participants were given an informed consent form on which they could give permission for audio, video, and image recordings. A questionnaire was given to gather the participants' characteristics. After this, an introduction question was given by the researcher and the participants were asked to report briefly what their experiences were with playing digital games. This was followed by a semi-structured traditional interview with the same five key questions that were also discussed during the focus group studies. In addition, participants were also asked to describe how a digital game is played (from starting the system to shutting down the system). After this, the researcher's role switched from an interviewer to an apprentice mode, and the participant became the master. The participant was asked to start up the system, select a game, play a game, shut down a game, and to shut down the system. Additional tasks were included if these were performed regularly by the participant (for instance, switching games, changing user settings). Finally, they were thanked, debriefed by means of an information sheet and paid for participation. The contextual inquiry took about two hours.

Results
The results of the contextual inquiries will be described in two sections. First, similar to our presentation of the focus group results, the interview results will be presented following the discussion guideline. Secondly, the contextual and behavioural observations will be presented in a thematic fashion. The results for the first question about what games the seniors played are included at the participants' section. Again, the quotes have not been modified to create full sentences. Clarifications are presented above the quotes and within the quotes between brackets.

Question 1: *What are your motivations for playing digital games?*
Similar to the focus groups, most participants reported that they played digital games for relaxation, fun, to pass time, and for the challenge.

"Brain training, yes, very clear, and of course for fun…I would say hitting two birds (training and fun) with one stone..." (Elizabeth)

"I like doing it (playing the game 'Flight Simulator'). It is similar to solving a cryptogram. At a certain moment in time, you solved 90% of the cryptogram, and then it takes a couple of hours to solve the final 10%, and that gives a certain amount of satisfaction. That is similar to Flight Simulator. Having a good flight for once, planning the route, and a decent landing" (Albert)

One of the participants reported that childhood dreams might be the motivation for playing the Flight Simulator game.

"Because I like it (playing the game 'Flight Simulator') and flying might be something of the past, because you might have wanted to be a pilot..." (George)

One participant reported that she played games to relieve the sadness and loneliness she experienced after her husband passed away.

"Pastime, actually to give meaning to the day, because I, well... When I feel sad or lonely, I will grab that..." (Jane)

Question 2: *What do you think about violence in digital games?*
Again, most participants reported that they were against violence in digital games.

"All wrong. Today's violence originates to a large extent from playing fighting games..." (Elizabeth)

"I do not want to think about it (violent games). I think it is horrible. It (digital games) should just be friendly. There is already so much misery in the world..." (Jane)

"Very negative. I am against violence." (George)

The latter participant did report that he liked to outsmart the police in a racing game (A2 Racer by Davilex):

"In a game I like to outsmart the police, but there should not be any deaths, not to run over people..." (George)

Question 3: *What is your opinion about playing digital games with others?*
As reported during the focus groups, most participants reported that they did not feel any need to play digital games with others. One of the participants was afraid to become lonelier by multiplayer gaming.

"I feel no need for that. I think it falls in the same category as chatting (on the computer). It is totally different from meeting people in real life. Else you will still be lonely, and that is not what we are looking for..." (Elizabeth)

One of the participants reported that he played digital games with his grandchildren, however, he did not like losing to a grandchild.

"I am afraid that I am not good enough. I have played on the XBOX with my grand-

children. They have a lot of fun when they beat granddad..."* (George)

Question 5: *Have you experienced problems with the computer or console?*
All participants were skilled gamers and initially reported that they did not experience any problems with the computer or console. One of the participants reported that the overall and in-game speed of one of the digital games she played was too fast.

"It is all clear (the computer and digital games). Well, except for (the game) 'Around the world in 80 days'. I am at Level 77, and it is so hard to pass (to level 78). I am pulled back every time..." (Elizabeth)

Moreover, one of the participants reported that she did not understand in-game rules.

"Yes, I have (experienced problems with digital games). I play a game, but do not understand it. I win points, but totally do not understand how..." (Jane)

Many interesting findings of a contextual inquiry cannot be transcribed, simply because they are behavioural observations, or reports that are context dependent. In the upcoming paragraph, the most noticeable and relevant findings are presented.

Game preferences and motivations to play
All participants enjoyed playing casual games like Patience or Bejeweled (*Figure 3*). These games were the main gaming activity for the female participants, while for the male participants, casual games were played as an activity between main activities or when they had to wait for a certain task to finish (for instance, virus scanner, Windows update). The male participants preferred real-life graphics and scenarios in a game, while the female participants preferred colourful cartoon-like graphics. None of the participants played multiplayer games, but the underlying reasons differed (see above). One of the participants really enjoyed playing turn-based with her (grand)
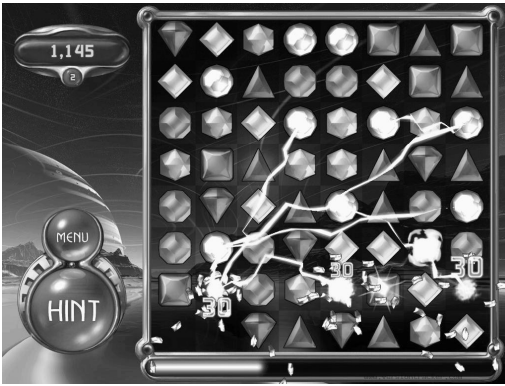
Figure 3. Screen capture of Bejeweled®2 by Pop-Cap games

children, but hardly ever did because there was not enough opportunity or time for it. In contrast, one of the participants disliked playing multiplayer or turn-based play with his grandchildren, because his grandchildren derived pleasure from his failure. Two of the participants mentioned that they played digital games to train their brain and reflexes.

All participants enjoyed explaining to the researcher how the games were played. When the participants started a game, they were rushed and rapidly clicked away the game developers' advertisements and introduction movies. All participants became immediately immersed in the game and forgot about the researcher's presence. When the researcher asked a question about certain in-game behaviour, some of the participants became mildly irritated and ignored the question or raised their voice. Participants became frustrated when they were not able to accomplish what was intended (for instance, "isn't this mean!"), and some even suggested that the researcher's presence caused their failure. However, almost immediately, their frustration turned into courage and hope, they excused for their behaviour and retried the level. An important motivation for the seniors to play digital games was to increase in-game skills, beating high scores, and advancing to the next level.

Digital gaming as an escape from reality
Two of the seniors that participated in the contextual inquiry lost their partner, and one of the participants' partners suffered from a medium stage of dementia. These participants mentioned that digital gaming helped them to forget about the sorrow. It is interesting to note that the participant, whose husband had dementia, stopped talking about the sorrow when the game started, and started smiling and really enjoyed playing. During game play, she started talking about all the places she has been with her husband, which was likely triggered by the game setting (Egypt). After game play, she immediately returned talking about her husband and the shared activities that were not possible any more. The participants who still lived together with their partner played in a computer room and cared about their privacy, while the participants who lived alone played wherever they pleased and felt most comfortable.

Usability problems
Various usability problems with the system and in-game interfaces were observed. For example, the power and restart button on the XBOX 1 system are difficult to distinguish, which resulted in frequent power-offs while the user's intention was a restart. Although one of the senior participants was quite able to operate the small Nintendo DS interface, she did have sore eyes and experienced dizziness after she played for a while. Most usability problems were experienced with the in-game interfaces. In a racing game for the XBOX, and in many console games, the user is provided with the option to choose between 'yes' and 'no' (for instance, to answer the question: "Do you want to quit?"). Both the 'yes' and 'no' option is coloured, for instance, blue and green. The selected option is coloured blue, but with only two options it is far from clear which option is selected. One of the participants frequently chose an option that differed from his goal, which eventually resulted in frustration and a loss of situation awareness (for instance, "Where am I?'). Both participants who started up Flight Simulator for the first time, which takes about three minutes, immediately closed the game after it was loaded.

They both clicked on the top-right cross to close the game. The participants might have thought that a Windows program was still running and wanted to close it to play the game decently. It is interesting to note that, although the participants were quite experienced in the games they played, they had little knowledge about in-game rules. Game play seemed to be based on heuristics and sometimes even superstition, while the game provided information (for instance, by means of progress bars) that explained in-game rules.

Game difficulty
The difficulty to finish a game, or to make progress in a game, was a problem that all participants faced. One of the participants had played a particular game for almost half a year and was not able to pass the final levels simply because the in-game speed was too high at the end. Another participant, who was a rally driver in the 1970s, really wanted to drive the old racing cars from the 1950s and 1960s in DTM racer. To unlock these cars he had to finish certain levels within a predefined time limit, which was too difficult for him.

Care, maintenance & privacy issues
All participants operated the systems with care and were careful about viruses and spyware. Two of the participants always shut down all power, router and power board inclusive, after they played a game. They did this to protect the system for a lightning strike. The participant who owned a Nintendo DS really treated the system with care. She touched it all the time, or just held it in her hands, like a piece of jewellery. Two of the participants were extremely careful about viruses and spyware. They run a full system scan every day and disliked to provide personal information (for instance, name and location) to a service or game developer. One of the participants had never played a game she owned, because she had to provide personal information for registration before she could play the game. Most of the participants were suspicious about

everything on the Internet, and used 'they', 'sellers', and 'companies' as a synonym for the Internet.

Positive side effects of gaming
The enjoyment and fun the participants experienced from digital gaming were not always directly linked to the game play itself. In the Flight Simulator game, one of the participants enjoyed showing well-known local places to the researcher by flying over them. The same participant met a woman at an aquarelle course, whose husband was a flight leader at a Dutch airport, and because he told her that he enjoyed playing Flight Simulator, he was invited twice at the control tower at the airport. Eventually this resulted in an invitation to fly gliders, which he flew four times and hopes to fly many more. According to him, this was all due to Flight Simulator. Another participant, who also played Flight Simulator, was proud to report that he flew over and around Dutch waters while carefully inspecting the in-game real-time weather, to plan actual sailing trips. As mentioned, two of the participants reported that they played digital games to train their brain and reflexes. One of these participants promoted and defended the educational value of the digital game she played to children and teachers. She enjoyed the idea that children could learn geography and history by the fun and pleasure of digital game play.

GENERAL DISCUSSION
The focus group studies and contextual inquiries presented in this paper provide a rich and in-depth understanding of seniors who actually play digital games. New and special insights were learned of actual senior gamers about the type of games they play, their motivations to engage in digital gaming, their gaming needs, their perceptions and attitudes towards digital gaming, and about the problems they face with digital game interfaces.

The seniors who participated in the studies played a small variety of game genres, and kept playing a small number (two or three) of

the same digital games for months or even years. All seniors preferred casual games like Patience. Casual games were the main gaming activity for most of the female seniors, while for most of the male seniors the casual games were played as an activity between main activities. In general, the female participants preferred cartoon-like graphics, while the males preferred realistic graphics.

All senior gamers mentioned that they play digital games for fun and relaxation (i.e., enjoyment), which was also found as most prominent player experiences in young adults[10]. From the contextual inquiries it appeared that an underlying intrinsic motivation is to escape from reality (i.e., escapism), either to escape from the sorrow of a deceased loved-one or to escape the household and have some private time. Some of the participants reported that the challenge or suspense to finish a game, to beat high scores, and to improve one's skills are important motivators to play digital games. Meeting these challenges resulted in enjoyment, pride and satisfaction, while not meeting these challenges resulted in frustration and irritation (i.e., negative affect[10]). However, such negative affects were short-lived, and almost immediately motivated the seniors that participated in the contextual inquiries to retry and carry on with the digital game they were playing. Another motivation, which was expressed by some of the senior gamers, was to stay in touch with society and give meaning to the day, which has not been expressed as a motivational factor by young adults[11]. Brain training and training reflexes was also mentioned, although these motivations were more of an appropriate excuse for playing digital games than a primary motivation. One of the senior gamers reported that he played digital games that were linked to his childhood dreams and one played digital games to bring up memories of the past.

All these motivations can also be expressed in senior gaming needs. For example, digital games could provide senior gamers with

means to keep track of their progress. Future research could explore if seniors would prefer the possibility to share their advances with their family and friends. Game developers could also consider to provide seniors with digital game genres that contain (positive) historic settings of their lives (for instance, the coronation of the queen), or digital games in which they can place memories of the past. Digital game scenarios that make it possible to fulfil childhood dreams might also be appealing to senior gamers, for example a game scenario about becoming a pilot or successful race car driver. It is interesting to note that the senior gamers enjoyed explaining to the researcher how a digital game is played. A motivational factor for seniors to play digital games could be to teach others, instead of being trained by the game. Teaching others (for instance, young adults) how a game is played could also increase social connectedness and interaction. In future digital game design, it might be appealing to seniors to provide them with an in-game option to teach, for example to kids, how the game is played.

Similar to the findings of Aison et al.[17], all seniors that participated in the focus groups and contextual inquiries showed strong emotional reactions and reported negative perceptions about violence in digital games. The subject triggered memories of the Second World War and the participants were especially worried about the effects of violence in digital games on their grandchildren. Some participants did differentiate between forms of violence in digital gaming. A small degree of violence like cartoon violence and violations of the law were accepted forms, whereas games that contain brute and explicit violence like murders were unacceptable. Most digital games that are on the market and displayed in digital game stores involve violence of some degree. For example, a study by Smith, Pieper, and Choueiti, in 2004[22], showed that 70% of the video game jacket covers of 74 top-selling console games depicted visually one or more instances of violence (for instance, credible

violent threats, violent behavioural acts, and harmful consequences of unseen violence). Yet, there are numerous non-violent games available that will likely resonate well with seniors but are not advertised as such. To reduce the costs of an endless search for senior friendly games, seniors could be provided with a clearly marked non-violent game section in a shopping store.

De Schutter and Vanden Abeele[18] stated that game play for senior citizens should, among others, incorporate aspects that allow for connecting people. Games should emphasize connectedness, for example via multiplayer options and extra forums[18]. The findings of De Schutter and Vanden Abeele[18] are in some contrast with the finding from the studies reported here. The seniors that participated in our studies preferred single player games. The participants did not want to be tied to specific times when others would be available, or would expect them to be available, to play. Moreover, they clearly separated socializing with friends and family in real life from digital gaming. It is possible that the underlying reason for senior gamers' negative perceptions about multiplayer gaming is due to fear of failure. Fear of failure appeared to be an experience that prevails among the seniors who participated in the contextual inquiries. These participants excused themselves for their gaming performance while the observer was present, and even became frustrated because, according to them, the researchers' presence deteriorated their in-game performance. In principle, multiplayer gaming or shared play is tied to certain times, and multiplayer gaming incorporates a competition element that reveals the gamers' skills. Both factors likely contribute to negative perceptions about multiplayer gaming. It should be mentioned that some of the senior gamers did like the idea of playing digital games with family or friends in the same room. Because of fear of failure and senior mobility issues it might be interesting in future research to examine the extent to which seniors enjoy multiplayer games that provide shared presence (for

instance, by means of an Eye-Toy or similar device) with little focus on competition (for instance, cooperative play mode). (An Eye-Toy is a digital camera that recognizes gestures of players as such that they can interact with the digital game world. The device can be connected to Sony's PlayStation 2 video game console.)

To overcome barriers that seniors could face to engage in digital game play, game interfaces should incorporate usability and accessibility guidelines, for example the guidelines that can be found in Morrell[15]. Many senior gamers that participated in the studies faced problems with high overall game speed and/or the game speed at the end levels. In-game adjustable time or digital games that adapt to the players' abilities might be needed to support seniors who face difficulties with time restricted games. Some participants faced problems with legibility, for example, manipulating or perceiving small playing cards. A highly accessible option to adjust the overall and in-game screen size will certainly help seniors with age-related visual declines[23]. Most seniors that participated in the studies experienced problems with understanding content that is presented in the English language, which was also found in a study with Dutch seniors operating a digital information retrieval system[24]. English is used as the primary language in most digital games that are on the market, and other languages than English are not always available. Seniors without an understanding of the English language will certainly benefit from an option to select their mother language as the interface and in-game language.

The focus group discussions and contextual inquiries were one of the first studies that provided rich qualitative data of seniors that actually play digital games. Of course, a limitation of the studies presented here was the small number of participants, which makes it difficult to generalize the findings to the senior population. Moreover, most participants were tech-savvy in contrast to

the general senior population[14-16], in particular the seniors who participated in the contextual inquiries who have been playing digital games for decades. Future research is certainly necessary to further explore and validate the findings with a wider range of senior gamers. Nevertheless, the results of the studies seem to provide a valuable and interesting point of departure for future, more elaborate, research on senior gamers.

In conclusion, the senior gamers that participated in the focus groups and contextual inquiries played a small variety of digital games, mainly of the casual game genre, and had two to three favourite games that they kept playing. It was found that the main motivation to play digital games is for fun and relaxation. Important underlying motivations were to escape from reality, to stay in touch with society, and to give meaning

to the day. Similar to the findings of Aison et al.[17], it was found that seniors have negative perceptions about violence in digital games. In addition, most have no need for multiplayer gaming. A prominent difficulty with digital game play was the overall and in-game speed, which mostly cannot be adjusted to age-related abilities. The interface requirements that are presented in this paper could be used in the design of senior friendly digital games and systems. From the seniors that participated, it appeared that digital game play offers means to enjoyably pass time, to challenge cognition and reflexes, and to give meaning to the day. Digital game play can offer many benefits to seniors, and in the paper possible additional benefits were discussed that could increase the positive return from digital game play even more.

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