The adoption of a serious game to foster interaction between the elderly and the youth

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The ratio of elderly people will increase significantly during the coming decades. Having a hyper-aging society will increase the number of lonely elderly and therefore it is needed to act upon this. Young people could provide a solution to this problem by spending more time with the elderly, but negative intergenerational perceptions prevent this and create a generational gap. Serious gaming has the potential to develop positive intergenerational perceptions as shared leisure activities. Therefore the research question for this paper is what factors are essential for the adoption of serious gaming to bring elderly and youth together? The research was done by first reviewing the literature and followed up by a total of 36 qualitative interviews amongst elderly 65> and youth <25 according to the "USE IT" interview protocol. The literature reviewed describes a series of design and motivational factors for developing a serious game for intergenerational play. The added value of this paper is divided into theoretical and empirical value. The theoretical value of this paper found 13 design factors, from which five factors were found to correspond with the interviews. The empirical research additionally found that (1) both elderly and young females find serious games with intergenerational play more relevant to them in comparison with males. (2)The awareness of intergenerational games is very low and must be addressed if we want to solve this problem of finding enough players, preferably by female players since they were most motivated to play. (3)The game must be secure because both young and old believe their privacy could be at stake. (4) To make the game playable for the elderly it should be available on a multiplatform in the browser so computers are not excluded.

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1. Topic and motivation

Our current society consists of a growing number of elderly people who are lonely and isolated.[1] The United Nations (2013) has projected that worldwide, the number of people above the age of 60 years will increase from 739 million to 2 billion by 2050. In more developed countries like the Netherlands, the ratio of elderly people is expected to grow from 22% today to 33% in 2050. However, also many developing nations are facing the challenge of a hyper-aging society. The ratio of elderly people in developing countries is expected to double from 9% today to 20% in 2050. This phenomenon will increase the number of lonely elderly even more and therefore it is needed to act upon this.

Young people could provide the solution for this problem by spending more time with the elderly, but the youth view communication with the elderly less than satisfactory and problematic (Hummert, 2010) while the elderly feel patronized and prejudiced by ageist sentiments (Giles & Gasiorek, 2010) which together contributes to a generational gap. A generational gap is commonly perceived to refer to differences between generations that cause conflict and complicate communication.[2] William Safire (2008) provides a more positive definition: "A generation gap can be a frustrating lack of communication between young and old or a useful stretch of time that separates cultures within a society, allowing them to develop their own character." Though despite this stretch of time these separate age groups have something in common.

In recent years digital devices like a computer, tablet or smartphone have become a daily part of life for health, fun and retrieving information (Juul, 2010). Having fun can be experienced by playing digital games and this is a good example of how digital devices can be used to enhance the mental and physical health, but also social well-being of all both young and old (Kaufman et al., 2016). As stated by Barker et al. (2004), contexts where elderly and young participants can relate to each other without the burden of stereotypes and prejudices toward each other may be useful in improving the interaction between the generations. Serious gaming could be the context described by Baker that allows both age groups to connect without the burden of stereotypes. Serious gaming is defined as: "any form of interactive computer-based game software for one or multiple players to be used on any platform and that has been developed with the intention to be more than entertainment" (Ritterfeld, 2009). The casual playing of a game allows both groups to connect on basis of mutual interest and stimulates communication through a shared experience.

2. Research context and gap

The context of this topic relates to behavioural science, communication science and computer science with regards to serious gaming and intergenerational perceptions. According to Chua et al., (2013) serious games have the potential in developing positive intergenerational perceptions as a means of shared leisure activities when the young and old participants play together. However, further research is needed to understand the specific game characteristics and factors that are needed to make both sides participate in serious gaming and what are the best conditions to create a setting for youth and elderly to come together. The research problem for this paper is to investigate what adoption factors are described in the literature and contribute by finding out what factors are confirmed or need to be added to these results by conducting an empirical study. The research question for this paper will be the following:

What factors are essential for the adoption of serious gaming to bring elderly and youth together?

For this research question the following sub-questions are designed:

- What is serious gaming?
- What are intergenerational perceptions?
- How does a digital serious game influence intergenerational interaction?
- How do both age groups feel regarding the adoption of a serious game?
- What are the adoption conditions for a serious game from both age groups?

3. Methodology

First, there needs to be conducted a literature review on the combined topic of serious gaming and intergenerational perceptions. Using a Grounded Theory approach will result in a thorough and theoretically relevant analysis of the well carved out niche topic (Wolfswinkel et al., 2013). The databases used are the library of the University of Twente, Google Scholar, Scopus and Web of Science. These databases were searched using the following keywords: serious gaming, serious games, GAM* gamification, intergenerational, video games, digital games, elderly and young. These keywords were used in different sets of combinations and with the AND / OR function that the databases have. While searching the snowball method was applied, this means that new keywords were used based on the literature found. The search on the topic of fostering interaction trough serious gaming between elderly and young resulted in 3 recent systematic literature reviews that describe the current body of knowledge on this. Starting with the review of Zhang and Kaufman (2016) on intergenerational play for facilitating interaction and learning. Followed by the review of digital games and their potential to enhance intergenerational interactions by Costa and Veloso (2016). Finally the systematic literature review by de la Hera, Loos, Simons and Blom (2017) about the benefits and factors influencing the design of intergenerational digital games. These reviews were used as a basis in combination with individual articles found.

Secondly, qualitative interviews were conducted by applying the model-based research method termed in the Netherlands as "PRIMA" (Spil & Michel-Verkerke, 2012), but internationally known as the "USE IT" interview protocol (Michel-Verkerke

[1] https://www.theguardian.com/commentisfree/2017/sep/04/generation-gap-social-divisions-young-old-age-segregation

[2] https://www.verywellfamily.com/looking-at-the-generation-gap-1695859

& Spil, 2013). The model shown below in figure 1 is based on a large body of knowledge including TAM (Venkatesh & Davis, 2000), the Information System Success Model of Delone and McLean (2003) and the innovation diffusion model of Rogers (1983).

USE IT		Domain	
		User	Information Technology
Innovation	Product	Relevance	Requirements
	Process	Resistance	Resources

Figure 1, USE IT model (Michel-Verkerke & Spil, 2013)

A qualitative research interview seeks to cover both a factual and a meaning level, though it is usually more difficult to interview on a meaning level (Kvale, 1996). The interviews are set up as standardized open-ended interviews, where the same open-ended questions are asked to all interviewees; this approach facilitates faster interviews that can be more easily analyzed and compared. The data has been collected as part of an academic course in which students were instructed to set out interviews using the PRIMA-model (Spil & Michel-Verkerke, 2012). The interviewers were all provided with the same instructions and question lists, but by using different interviewers and various interviewees across various socio-demographic criteria allowed us to triangulate the data through cross verification which improves the validity (Miles & Huberman, 1994). The PRIMA-model consists out of five areas of analysis: (1) Process, (2) Relevance, (3) Information needs, (4) Means & People and (5) Attitude.

Process examines the fit of a serious game within the current life and work processes and also looks into the current communication preferences and disturbances of both the age groups. Roger (1983) stated that an innovation has to be compatible with existing values, experiences and practices. Hence investigating the current computer processes/activities and communication preferences are expected to be a good indicator of the compatibility of a serious game.

Relevance looks at the personal value of a serious game for the user and if they believe it will be easy to use. Does this value differ for both age groups and why is it relevant to them personally? Also asking the question of how ICT contributes to the way both age groups currently receive information and if a serious game could be useful in this situation.

Information needs describes which information the user would like to receive and what the expected quality would be. Since elderly have a lot to do with receiving medical information this aspect is specifically asked for in terms of amount, access, quality, synergy with the doctor and personal health. This topic could be a mutual interesting factor because studies show that there is a shift in awareness and behavior regarding health especially among the young.[3] Accordingly, there is also asked what information both age groups are willing to share.

Means & People aspect examines the resources that are available from both age groups. Here the hardware available is a key factor since the serious game must be played on a device, combined with the preferred hardware to play the serious game on. Also what own available resources like time, money and getting support will be examined.

Attitude aspect explores the mindset and awareness of both age groups regarding ICT and the use of a serious game. It also explores the resistance versus the use of serious game by naming possible liabilities like privacy. Resistance is not per definition positive or negative but can serve as useful input exposing flaws in the system (Lapointe & Rivard, 2005). Finally, in brief words is asked what the essential factors are for either a serious game or not. The full interview questions are stated in Appendix A.

In total 18 interviews with elderly (65>) and 18 interviews with young people (<25) were analyzed and transformed into a data model following the qualitative data analysis method of Miles, Huberman & Saldana (2013). This results in an understanding of the fit for a serious game, the requirements needed, attitude regards participation, available resources, information needs, and essential factors for both age groups. These results will then again be analyzed and discussed using the drivers found in the literature review to see if they correspond with the results or on the contrary yield new insights for the adoption of a serious game. Below the literature review is divided into three compact chapters. First, an introduction of what is meant with serious gaming to provide a clear definition for this paper, followed by the description of intergenerational perceptions to understand the problem better and finally the combination of these two topics as this is the foundation of this paper.

4. SERIOUS GAMING

Games used for serious purposes, hence the name "serious gaming" date back multiple years. From primarily being used by the military at first, it evolved into education and business purposes around the second half of the 20th century (Halter, 2006). The upcoming popularity of digital games made this to become a substantial industry over time. These digital serious games are defined by Ritterfeld (2009) as "any form of interactive computer-based game software for one or multiple players to be used on any platform and that has been developed with the intention to be more than entertainment". This is definition is in compliance with others who define serious gaming as games that are not only used for entertainment purposes but are also used for learning objectives as well (Connolly et al., 2012). Serious gaming is often connected to video games (Sawyer, 2002), nonetheless there are some definitions are described without the inclusion of video games. According to Susi and Johannesson (2007) most agree on a core meaning that serious games are (digital) games used for purposes other than mere entertainment "with the intention of serving learning

[3]https://www.huffingtonpost.ca/timi-gustafson/younger-consumers-are-mor_b_14290774.html?guccounter=1&guce_referrer_us=aHR0cHM6Ly93d3cuZ29vZ2xlLm5sLw&guce_referrer_cs=Nv_D-Tz0rrP2m-7Pqde7Tw

goals, behavioral goals, organizational goals and or intervention goals set by its developers" (Spil et al., 2017, p.1). The use of game design elements in non-game contexts is called "gamification" (Deterding et al., 2011). So one might think serious gaming is also part of this definition, however, Deterding et al., (2011) state that both games and serious games can be differentiated from "gamification" through the parts/whole dimension. The difference is that with gamification one only uses game elements like the design of a game and not the whole game as is done with serious gaming. So binding all these definitions together makes serious gaming for this paper a complete digital game that is used to serve the behavioral goal of fostering communication between elderly and youth by providing a new way of interaction between the generations. With this goal it could also be defined as an innovation: "innovation is a product or practice that is new to its developers and/ or to its potential users" (Klein and Knight, 2005, p.243). An example of a serious game designed for intergenerational play is called "TranseCare" (Derboven, 2011). This game is designed to offer a fun way to connect the elderly (suffering from a chronic or degenerative illness) with their family and friends. It is a shopping game where players see a groceries list which they need to memorize. Then they enter the store and buy items for the shopping list while discussing the progress over video chat with the other player. At the end of each game both players pay for the chosen items and the initial grocery list is compared to the items bought. Both elderly and youth are potential users that are new to playing a digital game with the other age group. This is partly because of the intergenerational gap between the youth and the elderly and hereby have not been exposed to it. To explore this topic further the following sections will describe more extensive what the current body of knowledge is on intergenerational perceptions.

5. Intergenerational perceptions

Primarily, the study of intergenerational perceptions has two broad perspectives (Harwood and Williams, 2004). The issue is approached from the intergroup perspective or from the family perspective A significant chunk of prior research has been done on the intergroup perspective to explain negative perceptions and communication between elderly and youth (Harwood, Giles, & Ryan, 1995). Research has exhibited that the youth view communication with the elderly less than satisfactory and problematic (Hummert, 2010), while the elderly feel patronized and prejudiced by ageist sentiments (Giles & Gasiorek, 2010). Youth also report that they feel patronized by the elderly and feel that elderly convey undesired stereotypes about their age group. Furthermore, the elderly might be recognized by the youth as non-accommodative, authoritarian, dismissive and inattentive to the concerns of others (Giles et al., 2003). The problem of negative intergenerational perceptions is however not culturally specific but has been found in other cultures around the globe (Giles et al., 2002). Creating a setting where these negative stereotypes do not apply is essential for the successful adoption of serious gaming to foster interaction between the youth and the elderly. Studies in the family perspective show that the grandparent can reduce the negative stereotypes young people associate with the elderly (Harwood and Lin 2000). Increasing the interaction children have with their grandparents could improve their perceptions about the elderly in general (Harwood et al. 2005). Participation in various types of leisure activities influences the perception of family satisfaction differently for different age groups. Zabriskie and McCormick (2003) also found that positive experiences during joint participation in leisure activities can facilitate relationship-building in peer and family relationships. A study that looked into this was done by Voida and Greenberg (2011) who observed intergenerational gaming in the family context. They described that the setting of playing video games together allowed players to share experiences and also rotate in roles. This flexibility allowed the elderly and young to interact more freely without the stereotypes and thus provided developmental benefits for both generations. Gaming has been popular with the youth since the early stages, but also the elderly are becoming more interested in playing video games. This dates back as early as the study from Goldstein et al., (1997) who noticed that the elderly were still enthusiastic about their gaming experience after the research ended. So how does playing video games affect the elderly and especially with the youth? The next section will explore the effect of playing video games between elderly and youth on intergenerational perceptions.

6. Intergenerational gaming

The research of Chua et al., (2013) showed that the innovation of video games as serious game can result in a change of general perceptions. The novelty of elderly playing video games may help break down negative stereotypes that youth have regarding elderly while on the other hand, the learning aspect for elderly might result in developing an attraction towards the individual youngster what results in a more positive attitude in general regarding youth. Video games can provide common goals and intergroup cooperation. (needed for successful intergroup interactions). The review of de la Hera et al., (2017) identified the benefits of intergenerational digital games into four categories: reinforcing family bond, enhancing the reciprocal learning, increasing understanding of the other generation and reducing social anxiety. The review of Boyle et al., (2016) about serious gaming also showed that playing entertainment games can change behaviour in a positive way. Together these different but coherent findings make it safe to say that serious gaming can foster interaction between generations.

So then one asks how does this interaction take place. The research of Nguyen et al., (2015) followed up on Chua et al, (2013), but focused on social games that which are specifically designed to facilitate intergenerational interaction and communication. The model of social games and intergenerational communication from Nguyen et al., (2015) predict that age is a moderating factor for the effect of task enjoyment and experience enjoyment on intergenerational perception and the intention to

communicate. The actual communication may change as the two generations spend more time together and know more about each other even though both are reserved at the beginning (Zhang and Kaufman, 2016). Nguyen's predicts that when the elderly play the game with a young person it is more satisfying and enjoyable for the elderly than playing the game just by themselves. Therefore the experience enjoyment for them has more effect on their perception of the other and intention to communicate with them. This can create a positive feedback loop for the elderly, but for the youth it is uncertain. The youth will have a stronger effect by the actual task enjoyment, for them the actual game tasks and particular guiding the elderly to play is more important. This is also found by the review of Zhang and Kaufman (2016) who state that it is the enjoyment of interaction and communication with family members that drive the elderly to engage in intergenerational play rather than the game itself. Also, Zhang and Kaufman found that older adults traditionally adopt the roles of organizer, instructor, caregiver, playmate or teaser when playing a game. But when the intergenerational play is mediated by new digital technology like (online) digital games, the traditional roles of older are reversed with their younger player. This corresponds with the task enjoyment in the model of Nguyen et al., (2015) where the youth finds game tasks and particular guiding the elderly to play more important.

As in the challenges of design, there is no one size fits all game for intergenerational play (Rice et al., 2012). However a number of common characteristics of intergenerational digital games were found by Zhang and Kaufman (2015) such as short game sessions, easy to get in and out, provide learning opportunities and last supporting the various roles of both age groups by weighing in different motivational factors, but also the important on design factors to achieve goals like knowledge sharing, relationship building or single/multiplayer mode.

The game design principles of Chiong (2009) for intergenerational interactions show similarities such as short-duration of games, learning opportunities embedded in the game and accommodating different interests from both generations. But also add new factors such as enabling asymmetrical and asynchronous play and creating socially desirable reward systems.

The review Costa and Velosa (2016) for designing intergenerational digital games also found that collaboration and learning are important because it stimulates the cognition of both generations. Further, both generations should be involved in the design because handling a player-centered approach by involving both generations helps to blur intergenerational gaps and fosters a sense of togetherness between players. They also found that there should be a low time commitment, asynchronous play and the ability for passive/watching play to balance both users skills and challenges. Furthermore, the review adds to this by first, prioritizes physical, mixed-reality games and multi-modal interaction as an important design factor, followed by prioritizing collaboration, peer-to-peer mentoring in a game, because it helps with the individual sharing of knowledge experience. Third, having shared context and meeting places enhanced social interactions between different generations towards a communal activity. Fourth, provide an easy-to-use interface and adaptable game controllers. Finally, by adding video chat functionality and computer-mediated communication to a game helped to developed positive intergenerational perceptions and positive changes in intergroup anxiety and attitudes, but also act as a reminder in the current status of family members when seen online.

Similarities were found by the review of de la Hera et al., (2017) who classifies them into two types of factors that are important to take into account. Player-centric and secondly game-centric factors. The important player-centric factors for designing intergenerational games are the nature of interactions between the two generations, for example, are they strangers or family. Followed by, their motivation to play digital games, found here was that older players were against playing reflex-oriented games like fighting or racing games and are less competitive than younger players. Finally the difference in abilities, elderly have not grown up with all the technology and thus are less comfortable playing with digital devices.

The two most relevant game-centric factors found by de la Hera et al., (2017) are goal-related and space-related forms of interaction. As stated before elderly are less competitive and collaboration games with a common goal were found to the best fit for both generations. This correspondents with the study of Peng and Hsieh (2012) who found that games with a cooperative goal structure led to higher motivation than those with a competitive goal structure and the study from Dolgov et al., (2014) even showed that cooperative gameplay increased future spontaneous helping behavior between players. So a cooperative structure seems to be an important design factor, but Cohen (2014) stated that overall the most important factor for serious games is enjoyment or simply stated fun. In the end, enjoyment encourages players to continue playing over a longer period of time, which is needed to positively influence the interaction and in time the communication between both age groups.

To allow players to continue playing over a longer period of time the usability of a serious game is also an important factor. Providing an easy-to-use interface and adaptable game parameters is essential to balance both the user's skills and challenges (Costa & Velosa 2016). The rising age of elderly is often accompanied with physical and mental decline, but despite this Broady et al., (2011) states that elderly have the eagerness to adapt to technological developments and show the same positive attitudes towards the use of digital devices as the youth. However, making a game easy to understand and to use is essential for the elderly because technological anxiety is one reason to avoid the use of new technology. Making a game easy to use (high usability) does not automatically mean simple interaction between players, but does mean that games should not burden older people with difficult to grasp interfaces (Khoo et al., (2008).

The research described has shown that video games can change intergenerational perceptions

and foster interaction between the elderly and the youth. The literature also provides a picture of what design factors need to be implemented to allow an optimal fit for both generations. These results are summarized in figure 2. To test and complement these findings with additional adoption factors 36 qualitative interviews were conducted according to the PRIMA-model / USE-IT interview protocol described in the methodology section.

Figure 2: summary of design factors

Researcher / Factors	Chiong (2009)	Zhang & Kaufman (2016)	Costa & Velosa (2016)	de la Hera et al., (2017)
Weighing in different motivations from both age groups	x	x	x	x
Learning embedded in the game	x	x	x	x
Short game sessions	x	x	x	x
Easy to use interface		x	x	x
Collaboration games with common goals have best fit for both		x	x	x
Peer-to-peer mentoring by teaching each other		x	x	x
Enable social interactions, shared context and meeting places			x	x
Video chat and computer mediated communication helps			x	x
Asymmetrical and asynchonous play	x		x	
Nature of interaction is important		x		x
Enable passive watching play		x	x	
Prioritize physical, mixed-reality games and multi-modal interaction			x	
Create socially desired reward systems	x			

7. INTERVIEWS

The qualitative results are coded and transformed into a data model by using Miles, Huberman & Saldana (2013). The first step is to code the results, codes are labels that assign symbolic meaning to the descriptive or inferential information. For the first cycle of coding, both Vivo and Emotion coding are used.

Vivo coding is one of the most well-known qualitative coding methods. Vivo coding uses words or short phrases from the participant's own language in the data record as codes. It is appropriate for virtually all qualitative studies but particularly for beginning qualitative researchers learning how to code data, and studies that prioritize and honor the participant's voice. Phrases that are used repeatedly by participants are good leads; they often point to regularities or patterns in the setting. The full data model can be found in Appendix D.

Secondly, emotion coding is used. This method labels the emotions recalled and/or experienced by the participant. Emotion coding is particularly appropriate for studies that explore intrapersonal and interpersonal participant experiences and actions. It also provides insight into the participant's perspectives, worldviews, and living conditions. Below the summarized results will be presented according to the interview structure. The full data model can be found in Appendix B. Finally the age and gender distribution of the respondents can be found in Appendix C. The age distribution of elderly has two additional box plots showing the differences between genders. For youth there is only one boxplot since the distribution here was equal.

7.1 Results Elderly

Starting with **process**, 73% of the elderly is positive about the fit of a serious game in their daily routine. However, it must be noted that only 25% of the male respondents answered the question positively. Elderly participants mostly use their computer for communicating with others by sending emails but often use a regular phone for verbal contact, texting is used least. Elderly prefer face2face contact, this is the most common exception to connect via other ways than online communication tools.

Relevance, from the females 70% found a serious game relevant to them personally and believes it could improve their personal life, however amongst male respondents only 40% was positive. The most referred reason by females was that it will improve their personal life by having more contact with younger people, getting insight into the youth and learning from each other. From the elderly, only 44% believes it will be easy to use a serious game.

Information needs, in addition to the previous statement only a third of the elderly believes it has enough knowledge to play the serious game. Getting medical information through a serious game or insight into personal health is something only 20% of the elderly agrees with. Most of the elderly are prepared to share either identity, habits or environmental information even though 80% thinks that the information can be misused.

Means and people, more than 90% of the elderly has personal hardware. Ranging from a PC or laptop (80%), a smartphone (60%) or a tablet (40%) and 80% has access to either wifi or 3/4G. There is no clear favorite device to play the serious game on. Amongst the elderly 90% has time to use, on average 1 hour a day, but only a small percentage is willing to spend money on the game. Positively 60% feels they would get enough support if they want to use a serious game.

Attitude, overall 85% of the elderly (90% female, 67% male) has a positive attitude regarding the use of ICT. A common theme is that ICT is good for supporting and making life/communication easier. However, the negative consequences of ICT are that it causes us to be less social and some feel and I quote "smartphones are a plague on our society". Amongst the elderly, only 17% had ever heard from a serious game before or discussed a serious game with someone this is quite low.

Finally, the respondents were asked what the essential factors are for a serious game or not. Ascending the most stated phrases by the elderly

were: “easy to play”, “need for both parties”, “it must be fun” and “the data must be secure”. First off easy to play was named most by elderly because they realize that if the if the game is to difficult to use they will not be able to play it at all on their own. This is also partly because the elderly are nervous using ICT, so they must be assured the game is easy to play. Secondly was named the need for both parties. Elderly are aware that without that need, no-one is going to play the game. Both parties must get something out of playing the game that is valuable enough to spend their time on. A respondent named as an example the exchange of information about topics of mutual interest. For instance, youth could learn about household tasks, were elderly on the other hand could learn more digital related tasks from the youth. Thirdly was named fun to play. This is partially addressed in the previous factor need for both parties but is named often enough by the elderly as a separate factor. A fun game is important because otherwise elderly lose interest in the game. Finally was named the data must be secure. Elderly also realize that their online data can be hacked. The interviews showed that 80% thinks that their information can be misused, so this is an important point for the elderly.

7.2 Results Youth

Starting with **process**, 75% of the youth (88% female, 63% male) is positive about the fit of a serious game in their daily routine. Youth participants answered that they mostly use their computer for school-related activities and secondly entertainment purposes like music, games, and movies. To contact other people the youth mostly uses WhatsApp, secondly social media like Facebook, Snapchat or Instagram. Mail is used for more formal activities like work or school. Exceptions to connect via other ways than online are when there is no connection, data or battery life.

Relevance, 63% of the youth (75% female, 50% male) found a serious game with elderly relevant to them personally and stated it could improve their personal life. Most females stated that they think their respect and understanding for the elderly will increase and the game would provide more insight into the life of the elderly. Males however mostly think a serious game could improve their personal education and general knowledge. Only 2 males from the sample mention social life or understanding of the elderly. Nearly 90% of the youth respondents think the game will be easy to use but the most named problem is that it will be hard for the elderly to adopt new technology needed for a serious game.

Information needs, in compliance with the previous statement the 80% of the youth think they have sufficient knowledge to play the game. Getting easier access to medical information through a serious game is something 85% of the youth agrees with and 67% thinks this could lead to synergy with the doctor. However, only 29% thinks a serious game can give a good insight into their personal health. Regarding the sharing of information, most males are not prepared to share identity information, though 50% of the female respondents have no problem with this. The sharing of general habits or environmental information is no problem for most youth, but still 80% answered that information can be misused.

Means and people, all respondents had a smartphone and nearly all have access to a second device like a laptop or tablet. Also, every respondent had wifi access or mobile internet like 3G. The preferred device to play a serious game is a smartphone. The amount of time willing to spend on the game varies between male respondents from 50% playing an hour a week to 25% an hour a day. Amongst female respondents, 50% is willing to spend a couple of hours a week and also 25% an hour a day. Together 67% feels they would get enough support if they want to play a serious game.

Attitude, all of the youth participants are positive regarding ICT. From the males 50% states they cannot live without ICT anymore. Females answer more that it made their life easier, but improving the quality of life must be done by people themselves. Both males and females agree that ICT helps a lot in communication. Only 30% of the youth had ever heard of a serious game or discussed it with someone else before the interviews.

Finally. the most named essential factor is easy to use. The youth realizes it will be challenging for the elderly to work with the new technology. The second factor is fun to play, in combination with the game must be relevant/challenging for the youth to make it appealing. The third factor is security, especially about information and privacy. The fourth factor is that the game should not cost too much time, so it will be easy to incorporate in their schedule.

8. ANALYSIS

Here the results of both the elderly and youth will be compared with the results found in the literature and analyzed. The literature showed 13 factors that are important for the adoption of a serious game. The interviews show that a serious game fits in the routine of both elderly (73%) and young (75%). Especially female respondents (90% elderly and 88% young) were positive about this. This corresponds with the research of Broady et al., (2011) who stated that elderly have the eagerness to adopt technological developments and show the same positive attitudes towards the use of digital devices as the youth.

Weighing in different motivations from both age groups is the first factor stated in figure 2. The majority of females both elderly (70%) and young (88%) found a serious game relevant to them personally. They even have similar motivation were both groups stated it would improve their personal life and that having more contact would lead to more insight and an understanding for each other. This is also found in the review of de la Hera (2017) who identified an understanding of the other generation as one of the four benefits as a result of serious digital gaming. The male respondents, however, are less positive and have different motivations. Only 25% of the elderly males and 50% of the male youth thought it was relevant to them personally. Noticeable is that the motivation for playing a serious game is more focused on personal education and increasing general knowledge amongst male youth respondents. This could be the focus on task enjoyment as stated by Nguyen et al., (2015). This has a greater influence on the youth and the actual task performed then on

elderly and the results show this is especially strong among male youth respondents. This is also what links to the second factor summarized in figure 2 learning embedded in the game. It is important that players have a need to play the game and keep playing it in order to enable longtime success.

The short duration of games is something that was also found in both in the literature and in the interviews. The interviews showed that especially the youth had a preference for shorter games. Suggestions were given by the youth for a form of a "tinder app" were elderly and young can swipe easily wanting to find another player. So when a relatively short game is finished, the elderly might want to play again, but the youth not. Then the elderly can easily swipe for another "match" and play a new game with a different player. This could help the youth to incorporate a game more easily in their schedule.

An easy to use interface is also often named in the literature. Amongst elderly 44% believes it will be easy to use the serious game and 33% thinks that he or she has sufficient knowledge to play. Young people double that percentage with 88% think it will be easy to play and 80% believes they have enough knowledge to play. The most named problems are that the elderly are most likely not familiar with the technology. This is something both groups agree on, so the game should be easily accessible preferably on a format that the elderly are familiar with. This is also stated by Khoo et al., (2008) who wrote that games should not burden elderly with difficult to grasp interfaces and in compliance with (Costa & Velosa, 2016) who stated that providing an easy-to-use interface and adaptable parameters is essential to balance both users skills and challenges to make the game viable for elderly. Alike this was also found in the review of de la Hera (2017) which stated that the elderly have not grown up with all the technology and thus are less comfortable playing with digital devices. However an easy game does not automatically mean simple interaction between players, but does mean that games should not burden older people with difficult to grasp interfaces (Khoo et al., (2008).

The youth named fun to play and the game must be relevant/and challenging to make it appealing as essential factors. This also corresponds with the second factor named by the elderly "need for both parties" and "it must be fun". Cohen (2014) also stated that the most important factor for serious games is fun. Though the literature prioritizing collaboration (Costa and Velosa (2016) or cooperative games, because they were found to have to best fit for both generations (de la Hera et al., 2017), let to higher motivation (Peng & Hsieh, 2012) and even showed future helping (Dolgov et al., 2014). Cooperative collaboration games thus will result in the most fun. Working together creates a need for playing with a partner and the possibility of learning from each other while having to communicate. This then also works well with the factors peer-to-peer mentoring, teaching each other and having shared context.

Communication with family and friends is shown in the interviews as the main use for ICT by the elderly. This happens mostly by mail, but also social media or texting apps like WhatsApp. This is also how the elderly receive most of their information through ICT and where they like to use it for. This factor is also in figure 2 as the nature of the interaction is important. Elderly like to stay in touch with their family and this something they care more about than the actual game. Youth respondents answered that they receive nearly all of their information through some form of ICT and use it for communication, the searching of information and personal development. So communication combined with the sharing and receiving of information is something both groups can relate to. That communication is important is also found in the review of Costa and Velosa (2016) who stated that adding video chat functionality and computer-mediated communication to a game helped developed positive intergenerational perceptions and positive intergroup anxiety and attitudes which are needed for successful intergroup interactions (Chua et al., 2013). De la Hera et al., (2017) found that virtual communication is an important factor and that the elderly are especially interested in communication. Elderly, however, do not believe that medical information is something that should be shared through a serious game. Youth are more optimistic about this and 85% believe they can get easier access to medical information through a serious game and it could lead to more synergy with the doctor. They do agree with the elderly that it cannot provide a good insight into every aspect of their personal health.

The security of personal data is something that was not found in the literature. In both groups, more than 80% believes that the information can be misused and this could be a reason why sharing medical information is something elderly are not positive about. Youth rather keep their identity information private, especially male respondents. The sharing of habits like personal hobbies and environment information is something both groups have in the most cases no issue with.

When both parties are willing to play and/or communicate with each other raises the question on what platform or on what hardware this should happen. More than 90% of the elderly has access to hardware and 80% has a viable internet connection. The preferred device nonetheless differs between elderly participants. Youth participants all have hardware and access to the internet, but the smartphone is mentioned the most as preferred the device. To not exclude someone the game should be accessible in the browser which can be accessed by PC's, laptops, tablets, and smartphones. On both groups, participants are willing to spend time, but very few are also willing to spend money.

The attitude between both age groups regarding the need for ICT applications to improve the quality of life differs. Even though 85% of the elderly is positive about the use of ICT, they see it more in a supporting role or nice gimmick and not an essential factor to improve the quality of life. Elderly also mention that is society becoming less social with each other and everyone is drawn increasingly more into their phones. Prioritizing physical, mixed-reality games and having multimodal interaction is stated in the review of Costa and Velosa (2016) and could counter the negative perception of playing on digital

devices. On the contrary, youth respondents are a lot more convinced of ICT being necessary to improve the quality of life. On most all stated that technological developments make life easier in many different aspects ranging from medical care to communication and thus significantly improve the quality of their life.

The awareness of a serious game for intergenerational play is very low, also something not found in the literature. Only 17% of the elderly and 30% of the youth had ever heard of a serious game with the goal of bringing the elderly and youth together. This percentage needs to be addressed in order to make the game a viable option by having enough players. The results found are complemented by the literature who states that females are more likely to share the game with others than males and in fact, females were more likely to share the game during the week following first playing the game. (Cohen, 2014). This is consistent with some qualitative evidence that females may be more inclined to pass along messages to their friends (Phelps et al., 2004). These facts make females players an essential adoption factor.

Together the factors found in the literature (figure 2) and the interview results combined help paint a picture of what factors are essential to bring elderly and youth together for the adoption of a serious game. In the concluding section this picture will be completed by combining the individual results into a final piece of advice by answering the research question of this paper.

9. CONCLUSION

The loneliness and isolation experienced by the elderly in our society can be solved by having more interaction with young people. This interaction can be fostered by playing a serious game together. The main research goal for this paper is to examine what factors are essential for the adoption of serious gaming to bring elderly and youth together. This research found as theoretical value 13 design factors in the literature which are summarized in figure 2. The empirical value found that five of these factors matched with the interviews. Weighing in different motivations from both age groups was found to correspond with the interviews because different ages and genders apply to different gaming needs, seeing that males were more focussed on personal development and females were actually interested in the other age group. The need for a learning component in the game was also found in the interviews seen in that there has to be a need for both parties and the playing must be challenging and relevant to the youth. Having the option for short game sessions was named specifically by the youth in order to incorporate the game in their schedule. An easy to use interface was named as an essential factor by both elderly and youth because both groups understand that the elderly are not as technically able as the current generation. The importance of communication and the nature of interaction were found to correspond with the interviews because both age groups use ICT for communication, but elderly stated that they use ICT especially for communication with family and friends. The interviews additionally found 4 factors that were not in the literature. First, that females find serious gaming more relevant to them personally than males. Secondly, that the awareness of a serious game for intergenerational play is very low among both age groups. Third, that the game must be secure since both age groups think their privacy could be at stake. Finally, the game must be available on a multiplatform in the browser so computers are not excluded. Together these 9 factors are essential for the adoption of a serious game to bring elderly and youth together. As a recommendation, the optimal start for a digital serious game should be an easy to use, secure, cooperative, multiplatform, learning game that requires computer-mediated communication between both players with the goal of connecting elderly females with their granddaughters.

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APPENDIX A

P To what extent does a SERIOUS GAME fit in your daily routine?

P1 Most SERIOUS GAME systems contribute to different life and work processes. Can you name the main processes/activities using the computer? This does not necessarily have to be via a SERIOUS GAME.

P 2 Which media do you use most to get in touch with other people? (Mail, apps, social media)? Which devices do you use most to do that?

P 3 What are the exceptions or disturbances that a system like this sometimes makes sense and that you need to connect via other ways than through the computer?

REL To what extent is a SERIOUS GAME relevant to you personally?

R1 Do you think that using a SERIOUS GAME can improve your personal life? What aspects will it improve and to what extent:

R1.1 Insight

R1.2 Monitoring

R2 Do you think the use of a SERIOUS GAME will be easy? Why, why not?

R3 Do you think the information you provide in the game can be misused.

R4 At what points could the use of ICT be of personal interest to you?

R4.1 What kind of application do you think about?

R4.2 For what purpose or in what situation?

R5 To what extent does ICT contribute to the information you receive, such as social media and mail?

R6 Do you think a serious game is useful in this situation?

INF What is the quality of the information?

I1 Do you think that the amount of medical information you receive increases if you use a SERIOUS GAME?

I1.1 Do you have easier access to it?

I1.2 Does the combination of information you provide and that of doctors lead to synergy?

I1.3 Do you think a SERIOUS GAME has enough information to get a good insight into your personal health?

I1.4 Do you think a SERIOUS GAME can give you information about every aspect of your health?

I2 Do you think that the quality of medical information you receive increases if you use a SERIOUS GAME?

I2.1 Will the information contain more errors?

I2.2 Will the information be consistent?

I3 Do you think you have sufficient knowledge to play the game?

I4 What information are you prepared to share with the SERIOUS GAME?

I4.1 Identity Information?

I4.2 Habits (Drinking, Smoking, Other addictions)

I4.3 Environment (work and living environment)

M What resources do you have available / want to make available?

M1 What ICT facilities do you have?

M1.1 Hardware (smartphone, PC, Laptop, Tablet)

M1.2 Software (operating system)

M1.3 Communication (webcam, Wi-Fi, 3/4G)

M2 Which ICT facilities do you want to use when using SERIOUS GAME?

M2.1 Hardware

M3 Do you think the SERIOUS GAME system provider can provide you with the following in combination with your own ICT facilities? Why, why not?

M3.1 Reliability

M3.2 Availability

M3.3 Security / Privacy

M4 Do you think you will get enough support if you want to use a SERIOUS GAME?

M4.1 Education?

M5 How much of your own resources would you like to use for successful use of a SERIOUS GAME?

M5.1 Time

M5.2. Money

A Attitude: What is your attitude towards SERIOUS GAME and ICT?

A1 To what extent are you convinced that ICT applications are needed to improve the quality of life

A2 Do you feel social pressure to play a game?

A2.1 have you ever discussed it with somebody?

A2.2 Have you ever heard of it in the media?

A3 To what extent do you think your privacy is at stake when using a SERIOUS GAME?

A3.1 Do you think the system can be hacked?

A3.2 Do you think the wrong people (other doctors, nurses) can consult your information?

A4 Are you stimulated by your environment to participate in the changes?

Finally, in brief words: What do you think are the essential factors for either a SERIOUS GAME or not?

APPENDIX B

Elderly results emotional coding

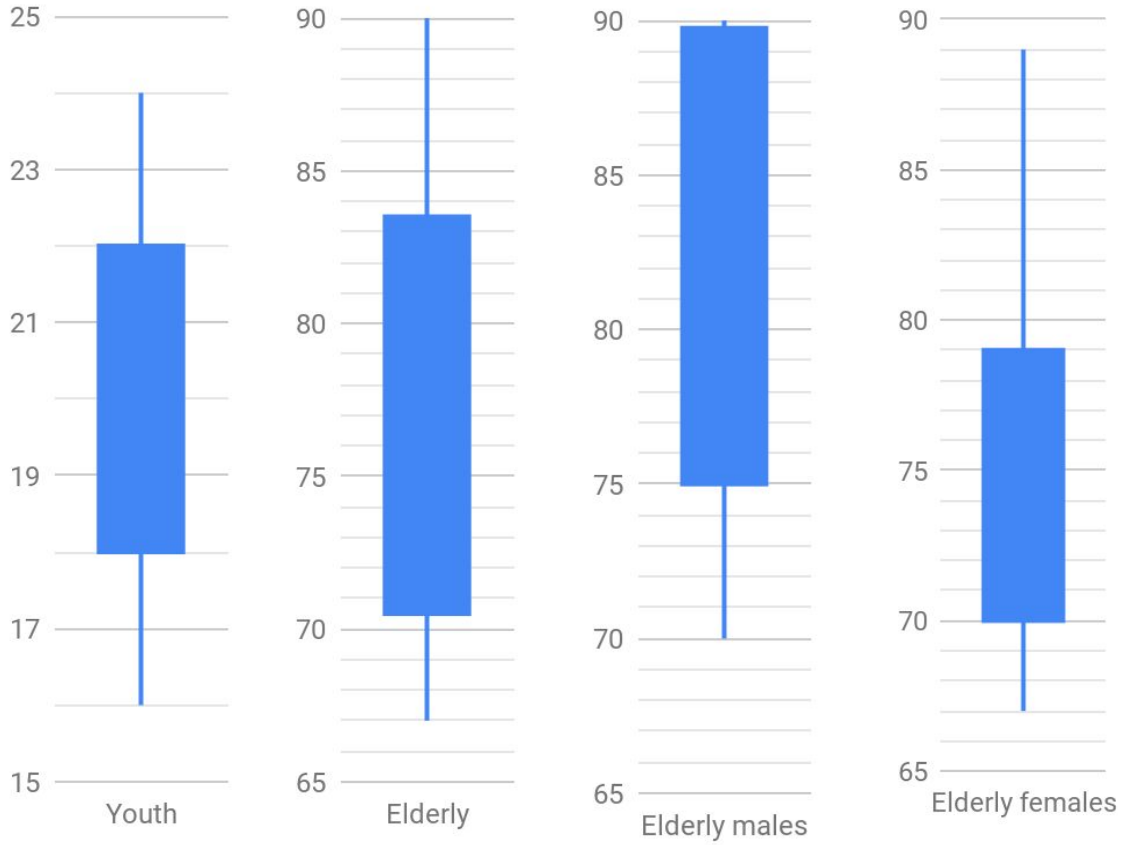
	Gender:	F	F	F	F	F	F	F	F	F	F	F	M	M	M	M	M	M	Positive about statement		
PRIMA-model	**#Respondent:**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	**Overal**	**Female**	**Male**
Process																						
P	FIT in routine?	p	p	p	p	p	p	p	p		n	p	p	n	n	p			n	73%	91%	25%
Relevance																						
R	Relevant personally?	p		n	p	n	p	n	p		p	p	p	n	n	p			n	57%	70%	25%
R1.	Can improve your personal life?	p	p	n	p	n	p	n	p	p	p	p	n	n	p	p		n	n	59%	67%	40%
R2.	Think easy to use?	p	n	n	p	p	p	n	p	n	n	n	p	n	n	p	n	n	p	44%	50%	33%
R3.	Can information be misused?	n	n	n	n	p	n	n	n	n	p	n	n	n	p		n	n	n	18%	17%	20%
R6	Is a serious game is useful for getting information?	n		p	p		n	n	p	n	p	n	p	n	n	p	n	n	n	38%	50%	17%
Information needs																						
I1.	Amount of medical information will increase?	n		n			p	n	n	n	n	n	n	n			n	n	n	8%	11%	0%
I1.1	Easier acces to it?	n	p		p		p	n	n	n	n	n	n	n			n	n	n	14%	30%	0%
I1.2	Lead to synergy with doctor?	n	p		p		p	n	n	n	n	n	n	n			n	n	p	29%	30%	25%
I1.3	Can a game have good insight in personal health?	n	n	n	p		p	n	n	n	n	n	n	n			n	n	n	13%	18%	0%
I1.4	Every aspect of your health?	n	n	n	n	n	n	n	n	n	n	n	n	n	n	p	n	n	n	6%	0%	17%
I2.	Quality of medical information increase?	n	p	n	n	n	p	n	n	n	n	n	n	n	n	n	n	n	n	11%	17%	0%
I3.	Sufficient knowledge to play the game?	p	n	n	n	p	p	n	n	n	n	n	p	n	n	p	n	n	p	33%	33%	33%
means & people																						
M3	Can the system provider can provide:	p	p	n		p			p		p			n		p		p	n	70%	83%	50%
M3.1	Reliability				p		n			p		p	p	n	p	p			n	67%	80%	50%
M3.2	Availability				p		p			p		p	p	n	n	p			n	67%	100%	25%
M3.3	Security / Privacy			n	n		n			n		n	n	n	n	p			n	10%	0%	25%
M4	M4 Do you think you will get enough support?	p	n	n	p	p	p	p	p	n	n	p	p	n	p	p	n	p	n	61%	67%	50%
attitude.																						
A.	Your attitude towards SERIOUS GAME and ICT?	p	p	p	p	p		n	p		p	p	p			p	p		n	85%	90%	67%
A2.	Do you feel social pressure to play?	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	0%	0%	0%
A2.1/2.2	Discussed it/ heard of it?	n	n	n	p	n	p	n	n	n	n	n	n	n	n	n	n	n	p	17%	17%	17%
A3.	Will your privacy at stake or not?	n	n	n	n	p	n	p	n	n	p	n	n	n	n	p	n	n	n	22%	25%	17%
A4	Are you stimulated to participate in the changes?	p	n	p	p		p	n	n	n	p	p	p	n	p	p	n	p		63%	64%	60%

Youth results emotional coding

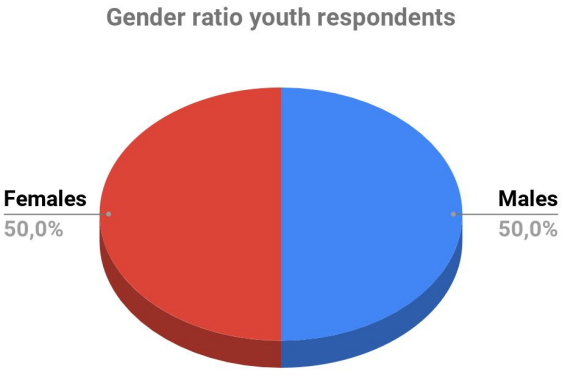
	Gender:	M	M	M	M	M	M	M	M	M	F	F	F	F	F	F	F	F	F	Positive about statement		
PRIMA-model	**#Respondent:**	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	**Overal**	**Male**	**Female**
Process																						
P	FIT in routine?	p		p	n	n	p	n	p	p	p		p	p	p	p	p	p	n	75%	63%	88%
Relevance																						
R	Relevant personally?		p	n	n	p	p	n	n	p		p	p	p	p	p	n	p	n	63%	50%	75%
R1.	Can improve your personal life?	n	p	p	p	p	p	p	p	p	p	p	p	p	p	p	p	p	p	94%	89%	100%
R2.	Think easy to use?	n	p	p	p	p	p	p	p		p	p	n	p	p	p	p	p	p	88%	88%	89%
R3.	Can information be misused?	n	p	n	n	n	n	n	n	n	n	p	n	n	n	n	p	n		18%	11%	25%
R6	Is a serious game is useful for getting information?	p	n		n	n	n	p	n	n	p	p		n	p	p	p	n	n	44%	25%	63%
Information needs																						
I1.	Amount of medical information will increase?		n	n	n	n	p	p	p	p		p				p	p			64%	50%	100%
I1.1	Easier acces to it?				n	p	p	p		p	n	p	p	p	p		p	p	p	85%	80%	88%
I1.2	Lead to synergy with doctor?		n		n	n	p	p		p	p	p	p		n		p	p		67%	50%	83%
I1.3	Can a game have good insight in personal health?		n		n	n	p	p	p		n	n	n		n	p	n	n	n	29%	50%	13%
I1.4	Every aspect of your health?	n	n		n	n	n	n	n	n	n	n	n	p	n		n	n		7%	0%	14%
I2.	Quality of medical information increase?	n	p		n	n	n	p			n	p	p	n	n	p	p	p		50%	40%	63%
I3.	Sufficient knowledge to play the game?	p	p		p	n	p	p	p	p	p	p	n	p	p	p	n			80%	88%	71%
means & people																						
M3	Can the system provider can provide:	p		p										p		p				100%		
M3.1	Reliability	p	p	p	p	p	p	p	p	n	p	p	p	n	p	p	p	p		89%	100%	78%
M3.2	Availability	p	p	p	p	p	p	p	p	p	p	p	p	n	p	p	p	p		94%	100%	89%
M3.3	Security / Privacy	n	p	p	p	n	p	n	p	p	p	p	n	p	n	p	p	n	p	67%	67%	67%
M4	M4 Do you think you will get enough support?	n	n	p	p	n	p	p	p		p	p	n	p	n		p	p		67%	67%	67%
attitude.																						
A.	Your attitude towards SERIOUS GAME and ICT?	p	p	p	p		p		p	p		p			p	p				100%		
A2.	Do you feel social pressure to play?	n	n	n	n	n	n	n	n	n	n	p	n	n	n	n	n	n	n	6%	0%	11%
A2.1/2.2	Discussed it/ heard of it?	n	n		p	p	n	p	n	n	n	p	n	n	n		p	n	n	31%	38%	25%
A3.	Will your privacy at stake or not?	n	n	n	n	n	n	n	n	p	n	p	n	n	n	p	n	n	p	22%	11%	33%
A4	Are you stimulated to participate in the changes?	p	n	n	n	p	n	p	p	p	n	p	n	p	p	n	p	p		59%	56%	63%

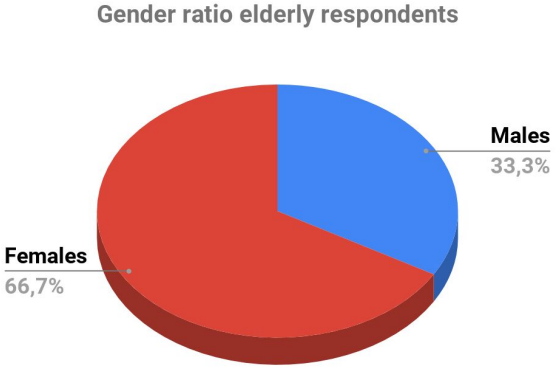
Appendix C

Age distribution elderly and youth



Gender ratio elderly and youth





APPENDIX D

Elderly results VIVID coding

#	P1.	P2.
1	Email and facebook	computer
2	email	computer
3	cardgames	whatsapp & call
4	typing	Ipad for email, phone for whatsapp
5	Internet and emails	PC for mail, phone for app
6	No computer	Smartphone Ipad for mail SM games
7	send emails to family	laptop for mail
8	got rid of it	emails
9	Do not know about PC	wechat on mobile
10	email	preferably verbal or mail
11	tablet for email +FB	mail & FB
12	PC for mail	phone for whatsapp
13	Finances & emails	phone or mail
14	Check weather play card games	email whatsapp
15	Find things he doesn't know	whatsapp for personal, mail for official
16	Email, read newspapers online	email and normal phone
17	marktplaats, FB en email	email, FB, whatsapp
18	surfing internet, sharing information	Mail with PC

#	P3.	R1.
1		Personal life, social skills, contact with younger people
2		Personal life, social skills, contact with younger people
3	use my landline	Rather have younger people visit me in person
4	Nothing beats a face-2-face conversation and company	Increase my technological capabilities
5	when i'm not at home	Better insight into younger people
6		If it's helps me get more exercise or go outside
7	i do not prefer contact trough electronic	become more skilled in using the PC
8	Don't want to spend hours learning how to use it	Improve personal life, interact with young people
9	mobile is more convenient than pc	more contact with (grand)children
10	go to my neighbours	insight into young people, can teach us
11	I like more to talk face2face or phone	Old & young can learn from each other
12		I don't see how it would improve
13		no interest in digital games
14		Teach each other something
15	when giving other person a lot of information	Expel time and have challenge
16		
17	if they don't use whatsapp	I've lived for 89 years without and i'm fine
18	sometimes if it doesn't work	no

#	R2.	R4.
1	If it is made for old people why not.	I can't think of anything
2	Difficult, because of lack of experience	Application were elderly can advice younger people. Or vice versa.
3	no i'm nervous, make no mistakes	Keep in touch with children and grandchildren
4	Has to be readable and explained	Communication with family and friends
5	I think i can manage	For the benefits it gives me
6	I'm familiar with games and like to puzzle them out	Visiting my kids, by booking tickets online
7	I will need training	share pictures with family
8	Don't know, but will try	Learn to play mobile games with others
9	No, because i need to learn new thing	video contact with my children
10	no we are not raised with ICT	Search people i knew back in the days
11	Help first time, then i can manage	contact family and friends
12	Most apps i try are easy	ICT is more for youngsters
13		Have no interest in ITC
14	Very hard because of different interests	keep in contact with people
15	everyone can learn to play	for communication ICT is big help
16	Will be hard. took me 5 years to learn turn on pc	better news acces, more contact with family
17	it won't be easy enough	FB is kind of fun, but don't need it
18	probably yes, or its a bad game	keep in touch with people further away

#	R5.	I4.
1	Information about family stuff	nothing
2	mail with family	depends on safety
3	Keep informed about the world through ICT	All of the required info
4	World info from tv & personal from whatsapp/mail	All of the required info
5	Stay in touch with family	Gender, age habits
6	Facebook to stay in touch with family and friends	Habits and environment
7	Mail with family	name and area of living
8	not much got rid of my pc	all of the required info
9	I don't use ICT	All required
10	other kind of info by newsletters	no personal info
11	news from FB	Name age habits
12		only name
13	Send a lot of emails	nothing
14	most info i get from newspaper and tv news	habits & environment
15	Handy and fun to share pictures of relatives	all of the required
16	emails and occasional skype call	Only identity
17	FB or info about the news on tv	only necessary
18	A little	all but no identity

#	M1.1	M1.3
1	Computer	Wifi
2	Computer	Wifi
3	Smartphone/ tablet	Wifi
4	Smartphone, tablet & pc	Wifi
5	PC & smartphone	WIfi 4G
6	Smartphone & tablet	wifi
7	laptop	wifi
8	none	
9	smartphone	wifi
10	Phone, PC, Ipad	Wifi
11	Tablet and PC	wifi
12	PC, phone	webcam
13	PC, tablet, smartphone	
14	PC smartphone	
15	smartphone, ipad, laptop	4g
16	PC	wifi
17	laptop, smartphone	wifi
18	Desktop	wifi

#	M2	M3
1	Smartphone	LIttle bit of time
2		Time not money
3	Smartphone	nothing
4	Tablet	1hour/week no money
5	PC &phone	Time
6	Smartphone/ipad	30min/day
7	laptop	30min/day
8	smartphone	all the time in the world
9		3hours/day
10	Ipad	Time
11	tablet	time
12	smartphone	Time
13	none	nothing
14	laptop	little of both
15	ipad	Plenty of time
16	PC	time, money max 5euro
17	laptop	little time
18	desktop	very little of both

#	A1	Crucial Factors.
1	They dont need to, but its good they do	Has to be fun
2		Data is private & secure. Easy to play
3	ICT sometimes causes people to be less social	Easy to play
4	Its usefull for hospitals shops and such	
5	Support us, but not most important	Finding NEED for young and old 2play
6	More an extra not neccesary	Its secure and easy to play
7	Smartphones are a plague of society	It has to provide value to me
8	Better if people would stop using phone and talk again	Interesting fun, free2play research to make new friends
9	Easier contact with others	Do people really need it
10	It allows lonely elderly to contact others	Connect young and old together
11	Quality of life does not depend on ICT	Safe and have benifits for all users
12	Nice gimmicks not essential	Easy to play, interesting, challenging, fun
13	It is important for progess	Challenging and keep you busy
14	We cant life without, but sometimes its a bit to much	Willing to corporate and it must be FUN
15	We can live fine without, but improves possibilities	easy to use, easy to understand
16	Life today is better thanks to technology	toturial for elderly, private information
17	people themselves are responsible for their quality of life	safety and necessary!!1
18	very little	

Youth results VIVID coding

#	P1	P2
1	School and gaming	Whatsapp then social media. But also mail
2	School work	Whatsapp, social media on phone
3	school-related or social media	Facebook, whatsapp, snapchat
4	School, games, music & SM	whatsapp on phone, secondly FB
5	school, films, programming	whatsapp on my smartphone
6	learning about the use of games	whatsapp and FB on my phone
7	Work, school, games, social and getting info.	mail. snapchat and whatsapp. primarily use my phone
8	school, movies, music, games	whatsapp and mail, on smartphone and PC
9	internet, word, powerpoint, gaming	mostly apps on phone
10	Mail, whatsapp social media	mostly apps on phone
11	lookup information and make reports	whatsapp, FB and snapchat. Mail for formal things
12	school and communication	whatsapp, social media, mail on phone
13	studying, checking social media, watching series	WhatsApp, Facebook and snapchat.on my laptop or phone.
14	Chatting, emailing, studying, movies, music, gaming	Facebook, whatsapp and skype. Mostly on phone and laptop
15	study or work	email, whatsapp. phone or laptop
16	Mailing, shopping, music, movies, research	Facebook, whatsapp and mail on my Iphone and laptop
17	Work on: research reports, analysing data. Also netflix	Whatsapp and facebook on my phone mostly
18	making schedules, typing letters and work email	Phone for on most all contact. Calling, whatsapp, some FB

#	P3
1	When internet does not work
2	When the network is down
3	When there is no wifi
4	Internet is down or battery dead
5	When i have no more 4G or wifi
6	annoying ways to type, touchscreen
7	when i reach my MB's and there is no wifi
8	when i need a quick response or i feel it needs to be told in person
9	it's faster to use my smartphone then pc
10	
11	When the other person doesn't have online communication
12	no connection
13	It would make sense to see each other in real life when you don't understand each other through text
14	If maybe the other (older) person doesn't get the computer or wants to play outside.
15	When i want to discuss a work-related topic with more than 2 people
16	When there is no connection
17	The more personal information i don't share online or through a device. Online you cant see emotions
18	

#	R1
1	Not my life, but for elderly it might improve
2	Enhance his personal education and general knowledge
3	Depends on the person. But if we get along it will probably improve my social life.
4	Can help me understand certain concepts or systems
5	Youth gets more respect for elderly and elderly will understand youth better
6	Depending on the game
7	
8	Better insight into complications in life and to think outside the box
9	A health related game would be interesting
10	understand elderly people better
11	Yes, because your doing something fun and learning. improving insight into certain fields
12	Better understand how elderly use electronic devices and think about closing the gap
13	I think it can come in handy later in life when i will be one of the elderly.
14	Gain more insight to elderly people's life and hope to get more respect from that.
15	The game could offer me new insights into a situation and therefor change my opinion on things
16	It will help to become aware of neighborhood care opportunities and improve communication between young and old
17	Good opportunity to see the world from another perspective. Seniors have much more life experience than i have and we can learn a lot from them
18	In my personal life it would improve the insight in problems of elderly people.

#	R2
1	Won't be easy because elderly are not used to telephone and stuff
2	Easy because his generation grew up with it. Elderly did not
3	Easy for young people. But hard for elderly, cause they have little knowledge on this topic
4	
5	Hard in the beginning because of age difference. But long term it will be easier and both parties will get to know each other and anticipate
6	easy yes, i have played my fair share of games before
7	easy as long as you are capable of using electronica
8	Its like riding a bike, first you have to fall before you understand how to ride it.
9	depends on the game
10	could be hard for some, but not for me
11	Reasonably, but it can be difficult to make it fun and educational for young and old
12	No, because some elderly have mental issues and less ict knowledge
13	Yes, because i am studying medicine and already been in contact with elderly care.
14	Yes because its a game and it will be made easy.
15	It will be easy when the instructions are clear
16	easy job to fulfill, because the goal of the game is very clear to all participants and that’s why I think it is easy to establish.
17	For the youth yes, for the seniors more difficult because we grew up with a phone in our hand.
18	For young people it would not be a problem, but for elderly people new technology might pose a problem.

#	R4
1	play games
2	for his study he uses a lot of computer programs
3	As a source of information. Its fast and widely accessible online
4	Can help me make a structured planning
5	Keep in touch with my friends, and important to make appointments
6	Both hobby and professional. Games music or software development
7	An application to meet elderly and connect with them and help them if they need it (example grocery shopping)
8	achieving new goals or test my skills
9	insight into my health
10	contacting people, looking up info that is not generally known
11	the administrative part of ICT would be nice
12	An app explaining the purpose of other apps
13	
14	apply social media, such as FB and twitter. So that others also get in contact with the game and share scores. Spread the message and familiarity with the app.
15	When i can use an application for study or work. like share photos easily with the parents of my students
16	Social media, applications for organizing, other applications for communication
17	"First thing that comes to mind is a ‘tinder’ like app where the youth can select an elderly person. Once selected they can start talking and take it from there. The purpose is then to get the youth and the seniors interacting with each other. "
18	I would like more automatization in home, for instance automatic light and heating based on motion and heat sensors. This might also be used for elderly people

#	R5
1	news on social media or internet
2	Social media for world news, whatsapp for communication with friends
3	From apps, social media and online messages
4	All the info i get is received via ICT
5	Whatsapp for friends, and mail for fellow students and professors
6	it fully contributes, the mail is 99% and al contact goes online
7	ICT is were i get my information from. so practically everything
8	it's easier to get rid of junk, but will make junk easier available
9	
10	A lot! almost all my info comes from ICT
11	
12	To great extent, because ICT is almost all social media and mail
13	search for information online, not via social media though. Mail for newsletters from companies
14	It will contribute to the amount of conclusions i can make. Also send and compare it with others
15	I use three different mail apps, but I am not much of a social media user. I only use whatsapp or skype
16	It has a significant impact on my daily life.
17	Huge part of how i get information: websites, newspapers but also social info by FB and whatsapp
18	It makes it possible to receive if wherever I want, which is good.

#	I4	M1.1
1	All, but no address or surname	All below
2	Nickname, facebook profile info. no private data	smartphone and laptop
3	I'm an open book. Identity, habits, work/living environment	smartphone, laptop, ipad
4	No identity, but habits and environment ok	PC, laptop, smartphone
5	general information about myself and habits. no environment and work.	Laptop, smartphone, PC, tablet
6	All except identity information	laptop, desktop, smartphone
7	prepared to share very thing about my daily routines	all of them
8	all but no identity information	iphone, macbook
9	no identity information	smartphone, tablet, laptop
10	name + general living area. school and living situation	PC, tablet, smartphone
11	Identity, habits and environment	tablet and iphone
12	All of the required	Smartphone and tablet
13	Name and age. Hobbies. Risk factors and work	Smartphone and laptop
14	Age, sex, name. Nothing that can negatively personally influence me	PC, laptop, smartphone
15	I'm prepared to share all info if i know what they do with it.	smartphone, PC, Laptop, Ipad
16	All required information	smartphone, laptop
17	to some extent, but no personal information	All of the above
18	On all the below: Yes, if it is treated confidentially	Smartphone, laptop

#	M1.3	M2
1		smartphone
2	Wifi	laptop and smartphone
3	webcam, wifi 4g	smartphone, tablet or laptop
4	webcam, wifi 3G	Smartphone
5	webcam wifi 4G	smartphone laptop tablet
6	wifi, webcam	internet, microphone
7		smartphone, ipad laptop
8	all available	laptop or iphone
9	wifi 4G	smartphone
10	microphone webcam and wifi	smartphone
11	webcam Wifi 3g	tablet
12	webcam, wifi and 3g	mobile or tablet
13	webcam, wifi and 4g	phone and laptop
14	3g	smartphone
15	WIfi, 3G	laptop/tablet or phone
16	wifi connection, 3/4G, webcam	Laptop, tablet, smartphone, wifi connection
17	4g network and wifi	no idea
18	Phone cam, webcam, wi-fi, 4G, normal phone connection.	Phone

#	M5
1	little spare time
2	30 min/day
3	hour/day
4	1 hour/week and 10 euros
5	couple of hours a week, few euros maybe
6	1hour/day max 30 euros
7	1hour/week max 5euros
8	just time, not my money
9	Depends on the game
10	4hours/week no money
11	time is no problem
12	2days/week, no money
13	spend some time, no money
14	20/min day
15	wouldnt mind invest money or time
16	
17	30/60min a day
18	cant judge that

#	A1
1	We cannot life without ICT. Important to improve quality of life
2	ICT applications or games are nice addition to his life
3	ICT makes life easier and improves you as a person. Web offers info, social media offers interactions.
4	They are already doing that, and it's needed in this fast moving global society
5	Very important, because it makes communication and other things in life easier and faster.
6	fully convinced, as software aims to make life of users easier
7	It can improve the quality of life by diagnosing and preventing disease
8	More aid in the quality, improving must be done by ourselves
9	ICT can be used to support people and make them aware of health issues
10	Yes, not necessary. But definitely can improve life quality
11	It's good for communication, but can also give problems. Overall more positive elements then negative thus quality improves
12	ICT applications are not necessary to improve quality, this can be done by other things. Its just here to make things easier
13	Easier to search for information and connect with people you don't see daily. But sharing everything online doesn't improve your quality of life
14	I don't think it is needed, but it increases the comfort of certain things in life.
15	I think they can improve people's quality of life when they learn people something or help someone to stay in contact with their loved ones
16	Very important to improve quality of life because of technology developments. ICT is all around us and makes life easier
17	Pretty convinced. Through these devices we have the opportunity to be our own doctor or helper so you can find a diagnose sooner. Or when you have questions you always look it up.
18	I think ICT applications are very good to improve quality of life, they could help with gathering data without being very intrusive in someone’s life.

#	Crucial factors
1	Easy and fun, maybe anonymous
2	Make it fun so many will play it
3	To get elderly to use the game. Overcome their lack of technical knowledge
4	That you learn from it. Only useful to deliver context to the person playing it
5	There must be a reward, especially for the youth since they often do not have a lot of time
6	Fun to play, learning is hidden but the main focus.
7	Information should be safe, easy to use. Not cost much time and game element that stimulates you.
8	Does it represent real challenges? Will i get the feeling that i'm getting better/smarter
9	game is fun enough and info in it must be relevant enough
10	Personal and confidential. First a band should be established then info shared.
11	easy, amusing, educational, leads to better society
12	Clear description of what to do, easy to play for elderly. Secure and be fun to play
13	It could help in the connection between elderly and young people. But i don’t know if it will be understandably for the older participants
14	"If there is a need to share to much personal information I don’t want it anymore Also if it costs too much time. If it is too complicated"
15	Clear instructions and not take too much time. it Should have enough info to learn from and be safe.
16	
17	a crucial factor should be that it is very easy to use, especially for elderly people
18	It should be easy to use and well protected to protect the users’ privacy.