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Older Adults "jump" into coDesiging a Digital Game: A & Field Study &

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Abstract. The aim of this paper is to contribute to establishing practices to involve adults aged 50 and over in the design of digital games within the paradigm of active ageing. This paper focuses on a component of a larger project entitled SERIOUSGIGGLE integrated in the SEDUCE 2.0 research that enabled to develop the digital game JUMP that goes beyond illness recovery or skill maintenance, addressing active ageing. Using a Participatory Action Qualitative Research that deployed 64-session group discussions and participant observation of 33 learners at a Portuguese University of the Third Age, the necessary course of actions to involve the end-users in game design were identified. Results suggest four phases: 1. Validate the content and the materials that will be used during coDesign with experts in the area, using the Delphi method; 2. Carry out the activities in the end-user's places; 3. Design the game tool based on the end-users' context and the content validated by the experts during the previous phases; and 4. Validate the game-based product with the end-users. Literature is still scarce in giving standards for designing digital games for active ageing and most of the solutions on the market tend to focus on health and rehabilitation rather than on other dimensions, such as security and social participation.

Keywords: coDesign, Security, Social Participation, Action Qualitative Research, Digital Game

1 Introduction

The global ageing population has brought to the fore a renewed interest in identifying a set of strategies for increasing the participation of older adults in society [1-8]. In fact, the current framework of active ageing is launched by the World Health Organization

[9], defined as the process of optimizing opportunities for health, participation, and security in order to enhance the quality of life as people age. The concept was further refined in 2010 with the addition of opportunities for lifelong learning to the definition [10], and a boom occurred in the development of the so-called 'technology for active ageing' [11]. However, the current solutions in the market tend to overlook the end-user's involvement in the design process and are too much focused on health-related issues rather than embodying such important pillars of active ageing as security and participation in society [9]. The end-user's involvement in the design process is essential to understanding the context of the use of a certain technology and there is a lack of research in the use of coDesign with older adults [12]. Moreover, in the game sector, there is a need to document practices that need to be undertaken and in which phase of the product development cycle, which are relevant to build a certain empathy between the end-user and the interface and meeting the philosophy "for, with and by the users" [13].

Literature [7, 14] has shown that games can be beneficial to older adults' physical and mental health by fostering social connectedness and participation in daily life activities and contributing to neighborhood, sense of purpose, and a 'care for place' culture. Concomitantly, social disengagement is a key concern as it may affect both older adults' interpersonal activities and decisions in the political sphere [6]. Yet, in the specific case of games, coDesigning is a particular challenge because games are often considered as an art form [15] and a balance between the level of involvement of the end-users and the creativity and role of the design and development teams is needed. Literature shows that game design techniques and mechanics can be used to enable players to 'witness and experience' certain phenomenona, collect stories or/and testimonials, and present daily-life events [16, 17].

This study is part of a larger project that covers all pillars of active ageing, under the project SeriousGiggle that encompasses the development of the JUMP game, and health-related domains were reported in other publications [16, 18].

2 CoDesigning JUMP

CoDesign refers to the involvement of the end-users in the design process and may comprise the following techniques: BrainDraw and Group Elicitation Method (GEM); PICTIVE; Strategic Visioning and Future Workshops; Card Sorting; Low-tech Prototypes; Storyboarding and Scenario Building, Collaborative Analysis of Requirements and Design (CARD), and Contextual Inquiry.

The game JUMP was developed under the project SERIOUSGIGGLE integrated in the SEDUCE 2.0 research, with the purpose of encouraging a positive attitude towards the ageing process. The content covered was based on the WHO framework, being divided into the following themes: Health, Security and Participation in Society. The game premise was the following: "Sul, the city's fisherman, is tired of getting stuck to a routine that he never got used to. Depressed and isolated, Sul has to face the storyteller Nubel, who forces him to a time travel experience, in order to recover values and significant meaning to his own life." Although the game premise was a result of the team's

creative authorship, the possibility to travel to different places as game activity was based on the participants' reported favorite activity during the co-design sessions. Therefore, time-traveling encompassed the following scenarios: 1) Paris, France 1948 (Palais de Chaillot in Paris, France, 1948 – The Universal Declaration of Human Rights); 2) Hizen, Japan 1709 (Hizen Province, The Art of Being a Samurai with Physical and Cognitive Challenges); and 3) London, England 1895 (Scenarios of malnutrition and violation of basic Human Rights).

This paper focuses on 'Paris, 1948', i.e. missions related to 'Human Security' and 'Human Rights' that were introduced in order to create awareness of the role of institutions in Human Rights, through the use of history-related symbols (*e.g.* Palais de Chaillot) (Fig. 1). It is worth mentioning that the game settings were based on the place and date when the Universal Declaration of Human Rights was adopted since adventure games with problem-solving and history-based narratives are preferred by older adult gamers [16, 18].

Figure 1. Game setting – Paris, 1948

Therefore, this paper aims to contribute to identify a set of practices on how to involve older adults in the design of a digital game for active ageing. The focus is on the variables of security and participation in society, which are the least considered pillars of active ageing within the game area.

3 Method

In this project, a Participatory Action Qualitative Research (PAR) was adopted in order to understand the meaning of a social and mediated experience [19] that is coDesigning a digital game (JUMP) for active ageing with a focus on the variables of security and participation in society. The PAR was chosen since it embraces [20]: (a) a holistic view of the phenomenon; (b) offer multiple perspectives and sources of information, and (c)

context-awareness. Therefore, this method allows us to get a comprehensible knowledge of a phenomenon for obtaining the best solution and involve the participants in a cyclical study [21]. The Ethics Committee of the University of Aveiro (Resolution n.3/2015) has approved this study.

3.1 Preparing the Involvement of End-users

Before involving the end-users in the design process, experts in the area validated the materials and contents for the coDesign activities, using the Delphi method. The researchers developed the materials for debating two topics with the end-users. The first topic was the sense of security (Learning goals: Describe the rights associated with Human and environmental security; Apply the strategies of security and prevention in different contexts, and Build a learning program that encourages the sense of security). The second topic was participation in society (Learning goals: Identify some projects related to participation in society through the use of Information and Communication Technologies; and Build a learning program that encourages participation in society).

The Delphi method was employed in order to discuss the content and coDesign materials with a group of four experts in a wide range of fields: Gerontology, Psychology, Education, and Social Work. The Delphi technique is used to structure group communication when dealing with a complex problem, gathering experts' information and opinions towards the modus operandi, instruments, and materials used for assessing the participants' context, and co-design activities by using a questionnaire. Experts were asked to validate the materials considering: content; sequence of contents; and questionnaires in use. After having the co-design materials and surveys validated by the group of experts, the Universities of the Third Age were contacted in order to recruit older adult learners (50+ years old), who were available to be involved in the design process of a digital game.

3.2 Recruitment of Participants

The participants in this study were selected accordingly with the following criteria: (a) aged 50+ years old; (b) know how to read and write; (c) voluntary participation, and (d) interest in learning. The initial convenience sample that was involved in the co-design sessions consisted of 37 participants. Four participants did not fit within the age bracket and three did not complete all sessions. The total of participants was 33, 51.5% females; the average age was 67 years old (SD = 7.06, minimum = 55; maximum = 82) and the majority had between 10 and 14 years of schooling.

3.3 CoDesign Sessions

The coDesign sessions were then carried out from March 2015 to December 2016, enabling us to determine the context of use beyond the content, usability and accessibility issues. The global project comprised a total of 64 sessions (160 hours) (Table 1), carried out with the following purposes: (a) understand the participants' context and their perception towards ageing (sense of security and participation in society); and (b) brainstorm the functionalities of a game-based learning program for active ageing. Although

the process covered all the active ageing pillars (*i.e.* health, security, and participation in society), this paper will address solely security and social participation, with the aim of affecting both older adults' interpersonal activities and decisions in the political sphere.

The sessions specifically on the topics of security and participation in society are the five and six (Table 1).

Table 1. Sessions and activities: Project SERIOUSGIGGLE – SEDUCE 2.0, game JUMP

Designation &	Activities
0 [March - 26th 2015, weekly] '	Building alliances with the researcher. &
1 [*March 6th, 2015]*	*Presentation of the Research Project.* Introduce the researcher, the research project, procedures, the rationale for doing research, the main goals, the topics to be drawn during the course, and the chronogram of the learning sessions.
2 [*March 13th, 20th 2015*]	*Debate on physical exercise for active ageing*. Discuss the role of leisure and physical exercise in encouraging active ageing; Build a learning programme that encourages physical exercise.
3 [*April 10th, 17th 2015*]	*Debate on nutrition for active ageing*. Describe the factors that influence nutrition and the consequences of malnutrition; Identify the nutrients that exist in different foods and diets; Build a learning programme that encourages healthy diets.
4 [*April 24th, 2015*]	*Debate on cognitive* activity. Discuss the role of leisure and cognitive activity in encouraging active ageing; Build a learning programme that encourages cognitive activity.
5 *[May 08th, 2015]* '	*Debate on the sense of security*. Describe the rights associated with Human and environmental security; Apply the strategies of security and prevention in different contexts; Build a learning programme that encourages the sense of security.
6 [May 15th, 2015] '	*Debate on participation in society*. Identify some projects related to participation in society through the use of Information and Communication Technologies; Build a learning programme that encourages the participation in society.
7 [May 22th, 2015] '	*Debate on the process of* learning. Look at the different factors of the learning process; Discuss different elements of the learning programme.

8 [Oct 6th 2015 - Dec. 6th, 13th 2016, weekly]	*Interaction with Information and Communication Technologies*. Identify the learners' needs and motivations to use and learn Information and Communication Technologies, as well as barriers.

Like all sessions, these two began with a welcoming message and icebreaker questions followed by a survey or discussion towards a plan for preventing and addressing top threats to Human security. It should also be stated that the project was developed with the principle of reciprocity and collaboration, i.e. researchers and participants build an alliance and benefit from these interactions, mostly through knowledge sharing, context-aware variables, and strength of the relationships (sessions 0 and 8, Table 1).

3.4 Session 'Sense of Security'

Regarding the topic "Sense of Security", the sessions aimed to (a) identify some projects/initiatives that encourage participation in society through the use of digitally- mediated products; (b) describe the rights associated with Human and environmental security; (c) apply the strategies of security and prevention in different contexts, and (d) build a game-based learning program that creates awareness to Human threats and encourages participation in society. The topics covered were based on the definition of Active Ageing pillar "Security" (WHO 2002): the concept of Human security; types of Human security; Human rights; Human development and social intervention policies; intervention policies in the environment; intervention policies in education; and intervention policies in health. Extra classes on Information and Communication Technologies (ICT) were given in order to gain the participants' confidence and assess the participants' motivations, interaction patterns, and difficulties when using ICT.

The methods in the sessions were group discussions, using semi-structured open-ended questions to generate new insights into the design issues of a game-based approach for community engagement and security and participation in society. Participant observation was used through an observation protocol with the following structure: reference number, place, date and time, activity and goals, portraits/ description of the main actions with the participants' statements, and references to audio-visual materials/photos/documents. The participants were invited to answer a questionnaire about the perceived sense of Security and Human Rights. They were given a list of statements based on the possible threats to Human Security ascertained by the United Nations [22]. The threats are to the survival, subsistence, Human dignity, economy, environment, personal security, threats to community, and abuse of Human Rights. A 5-point Likert scale ranging from 1 (totally disagree) to 5 (totally agree) was used to rate the sentences. Beyond these specific threats, the statement "I do not feel threats to Human Security" was added in order to assess the participants' overall perception of their sense of security and reduce acquiescence bias. Globally (Table 2) participants tend to feel safe at home and have someone to help in case of illness or emergency. In terms of the group discussions, the participants had to define a plan for preventing and addressing the top threats to Human Security. The following scenario was posed: "People are not aware

of their rights. As a policymaker and citizen, it is your mission to solve this problem." The participants were divided into 2 groups of 15 participants, who had about 10 minutes to discuss the problem and how to solve it. In addition, the following strategies were used to ensure internal validity: (a) carrying out the design session iteratively with the group; (b) peer debriefing for the content used in the sessions; and (c) triangulating multiple sources of data collected (i.e. observation field notes, survey results).

Table 2. Sessions and activities: Project SERIOUSGIGGLE – SEDUCE 2.0, game JUMP

Statements	Mean	SD
1. I feel safe in my home.	4.10	0.94
2. I feel safe outside home.	3.13	1.21
3. I feel discriminated against for some reason.	1.94	1.35
4. I feel safe about my health.	3.65	1.17
5. I feel threatened by the environment.	3.31	1.20
6. I feel threatened or harassed.	1.90	1.51
7. I feel pressure to practice religion.	1.26	0.99
8. I feel my rights as citizen are respected.	3.48	1.53
9. I have someone who can help me in case of illness or emergency.	4.03	0.82
10. I do not feel threats to my Human Security.	3.03	1.68

3.5 Session 'Participation in Society'

The participants were also given a list of statements with a 5-point Likert scale ranging from 1 to 5 relative to Human Rights based on the United Nations report [22] (Table 3). The rights are freedom from discrimination, freedom from violence, social security, health (healthcare), property and inheritance rights, continuing education, and participate in political and cultural decisions, to work and have access to justice.

Most of the participants feel that they have access to goods and services regardless of their age, gender or physical condition (M=4.3, SD=0.75) (Table 3). One of the services that they find to have access to is relative to the health sector (M=4.30, SD=0.95). However, they do not feel that their participation in political decisions is valued (M=1.73, SD=1.82).

A group discussion was carried out in this session in order to gather the participants' perspective to ways that they can participate in society through the intervention in creating solutions and awareness to Human Rights.

The group discussions were carried out in order to define a plan for addressing two out of the eight of the Millennium Development Goals and the participants chose "eradicate extreme poverty and hunger" and "ensure environmental sustainability". For each goal, they decided to define: "intervention/resources", "strategies" and "impact." The participants proposed for the following strategies to overcome the goal "eradicate extreme poverty and hunger": reuse wastes; minimize social gaps; provide access to water supply; and run learning programs to manage resources.

Table 3. Participants' perception towards Human Rights

Statements	Mean	SD
1. I have access to goods and services regardless of my age, gender or physical condition.	4.30	0.75
2. I feel protected from verbal, sexual, financial, psychological abuse…	3.57	1.59
3. I feel that I have access to social protection.	1.94	1.35
4. I have access to the health system.	3.90	1.39
5. I feel threatened by the environment.	4.30	0.95
6. I have access to learning/training initiatives.	3.58	1.42
7. I feel that my participation in the political decisions is valued.	1.73	1.82
8. I have access to justice and judicial remedies.	2.59	2.02
9. I feel protected against material goods.	3.38	1.41
10. I feel that my rights are respected.	3.46	1.55

In this process of problem-solving, participants suggest four Phases to tackle these societal problems: 1. Create awareness to Human Rights; 2. Educate to Human Rights and perceived threats to Human Security; 3. Simulate real scenarios and encourage changes in behaviors; and 4. Connect the learning content and goals to daily activities. Figure 1 shows an illustrative example of the application of problem-solving, using scenario building.

As a result, a history-based game scenario in which the Human Rights were at risk was simulated, aiming to encourage the players' action.

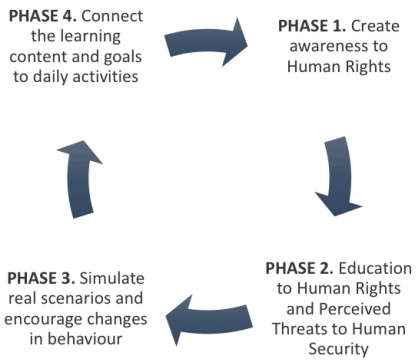

Figure 1. Example of the application of problem-solving, using scenario building

4 Practices for coDesigning a Digital Game on Security and Social Participation

The results of this research give two main insights: (A) Four phases of the end-user's involvement in the design process of a digitally mediated tool; and (B) Set of design recommendations to foster security and participation in society.

(A) Phases of the end-user's involvement in the design process of a digitally mediated tool.

Following the procedures undertaken in the Method section, the users' involvement in the design process of digitally-mediated tools can be divided into the following four phases:

i. & Validate the content and materials that will be used during codesign with experts in the area, using the Delphi method;
ii. & Carry out the activities in the end-users' places;
iii. & Design the game-based tool based on the end-users' context and the contents validated by the experts during the previous phases; and
iv. & Validate the game-based product with the end-users.

(B) Set of design recommendations to foster security and participation in society.

During the phase "Validate the Game-based product with the end-users", the following design recommendations to address games that foster security and participation in society can be pointed out:

i. & Offer the possibility of using a game-based tool at home but assist the adult learners in outdoor activities, since they mainly feel safe at home;
ii. & Design missions that ask the participants to act upon their environment and political decisions and increase awareness to Human Rights through visual novels. The purpose of visual novels is twofold: give a sense of purpose to the activity and create empathy with a game character to model a behaviour. Few participants felt that their participation in political decisions was valued, and self-expression should also be strengthened with the link to social media and communities;
iii. &Simulate real scenarios and encourage changes in behaviour by giving it a purpose through storytelling and providing a 'witnessing experience' through the use of hints and schemas in the game scenario in which the participants have to interfere. In the participants' observation diary, the researchers note: "Relative to the game, the participants liked the graphics, narrative and they found it easier to interact with the mouse. They have also revealed that in Paris, there should be hints indicating the poster 'Human Rights' and the newspapers' seller were clickable and opened different missions.";

iv. & Foster cognitive challenges to improve the participants' cognitive capacity. Their main motivation to play digital games was to train their cognitive capacity and games should enable them to practice Problem-solving, Memory and Attention, Logic and Reaction Time. Education to Human Rights and Perceived Threats to Human Security should be performed through these cognitive challenges in the game;

v. & Connect the learning content and goals to daily activities, encouraging the players' search for information, retaining information and creating awareness of non-governmental organizations' (NGOs) actions. As one participant states: "As long as the learning content is suitable for our daily lives, it is fine." The participants also suggested to establish a link between recent news and Violation of Human Rights, Petitions and Initiatives of the International Amnesty and other organisations.

Together these results provide insight into a set of practices on how to involve older adults in the design of a digital game for active ageing with a focus on the variables of security and participation in society.

5 Final Considerations

The aim of this study was to identify a set of practices on how to involve older adults in the design of a digital game for active ageing with a focus on the variables of security and participation in society. In specific, the procedures to involve the end-users in the design process of a game-based tool, and the design recommendations to foster security and participation in society in older adult learners of the Universities of the Third Age. Results suggest four phases for involving the older adults in the design process of a game-based tool: (i) validate the content and the materials that will be used during coDesign with experts in the area, using the Delphi method; (ii) carry out the activities in the end-users' places; (iii) design the game tool based on the end-users' context and the content validated by the experts during the previous phases; and (iv) validate the game-based product with the end-users.

In terms of the codesign recommendations to foster security and participation in society, results have identified the following phases that are essential to the game design process: Phase 1. Create awareness to Human Rights; Phase 2. Educate to Human Rights and perceived threats to Human Security; Phase 3. Simulate real scenarios and encourage changes in behaviours; and Phase 4. Connect the learning content and goals to daily activities. Based on these phases and the end-users' feedback on the game prototype, the following recommendations can be suggested: (a) offer the possibility of using a game-based learning programme at home but assist the adult learner in outdoor activities; (b) design missions that ask the participants to act upon their environment and political decisions; (c) simulate real scenarios and encourage changes in behaviour by giving it a purpose through storytelling and providing a 'witnessing experience'; (d) foster cognitive challenges to improve the participants' cognitive capacity; and (e) connect the learning content and goals to daily activities, encouraging the players' search for information, retaining information and creating awareness of the Non-governmental Organizations' (NGO) actions. The application of a PAR in this context differ from

regular Participatory design by avoiding abstraction-related activities and low fidelity prototypes and establishing strong empathetic connections with the product/service, relying on scenario-building and contextual information.

The small sample size and the lack of an instrument to design and assess the effectiveness of digitally mediated artefacts to boost community engagement and adherence to societal initiatives make this study exploratory. Thus, further work needs to be done in order to improve the game prototype, taking into account the identified design recommendations and construct a scale for assessing its effectiveness, extend the sample and compare the results obtained with other initiatives.

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