Serious Games for seniors:
Learning safe behaviors on the web
Position paper

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Abstract — **In a modern society, seniors want to be a part of the digital world and the research in progress seeks to present whether through Serious Games can help their learning process and understanding of cybersecurity when online browsing, namely, deciding which actions to make when facing an eminent threat.**

Keywords - seniors, older people, serious games, education games, cybersecurity, digital skills.

I. INTRODUCTION

We live in a technological society, wherein a short time, the Internet becomes a central point in our lives, but the seniors did not have the time to adapt to this new reality. Accustomed to living around the board games, where cards or chess pieces were the highlight of the day, the elderly population was entertained without the Internet. They learned and valued themselves without current technologies. However, they want to keep up with this evolution and technological world.

In this context, the learning mechanics of the Serious Games can motivated and challenge the seniors to change their behavior on the Internet by improving their knowledge, attitude, cognitive ability [1] [2], and skills [3] to become more aware of the dangers of cybersecurity gaps. To promote a Serious Game for the seniors, there are design features that provide a positive experience and help focus on playful tasks that resemble their daily lives, without pragmatically insisting on improving their cognitive abilities and eliminating barriers to the age of interaction games [4].

Certain characteristics promote the learning and motivation process of the seniors when playing a Serious Games, elements and aspects of puzzles and tasks they do their daily lives are the most motivating and beneficial to their mental training and socialization, but certain children's game elements demotivate the seniors in their learning process [5].

Quickly, the senior population has access to a mobile device and dangers associated to with online unsaved browsing. The Covid-19 pandemic changed the labor paradigm and people spend more time online, among these the seniors are the most vulnerable group to cyberattacks, social engineering, and misinformation due the digital illiteracy, lack of knowledge in cybersecurity [6], lack of economic capacity to obtain technological resources, equipment and services and the lack of intellectual capacities to the understanding of the use of the Internet [7]. Also the seniors' web usability has to developed once they have difficulty in reading and understanding texts, recognition and access to links, understanding navigation, carrying out specific tasks and online shopping, searching for and locating correct information and communicating with website managers.

To promote digital literacy and improve web browsing capabilities, seniors seek out their family and friends, and entities to help them. Within the entities, the senior university is seen as the most significant contribution to ICT (Information Communication Technologies) classes contribute to remember and deepen knowledge, avoiding above all forgetting, practicing their know-how of the web browsing and seniors are openminded to try ICT solutions to improve their needs, such as social, emotional well-being and health mental, enjoying the simplicity of the technology. They also express fear of doing something wrong with consequences and feel limited and suspicious, avoiding performing more involved and different tasks than usual, like online shopping [8].

It is crucial for seniors to learn and improve their digital skills, knowledge on how to browse on the web safely once seniors are increasingly present on the Internet and their level of confidence increases, not only due to the habit they develop in using the web as a daily medium, but also due to initiatives and actions by family members and entities, such as senior universities and government entities.

These entities must promote security activities and alerts to the dangers of the Internet for seniors. One way to promote this is by uniting the concept of Serious Games and the cybersecurity content, preventive measures, and actions, in a way beyond simple learning, help in understanding and applying the materials learned during the moment of the game.

This paper is organized into the following sections: the first section introduces the real problem that senior face browsing the Internet and how they can learn and be motived how to browse safely on the web through a Serious Games focused on cybersecurity content; followed by the subtopics contribution and motivation on the developing work and investigation. The second section presents the related work in this research in progress, followed by the third section referred to the ongoing and future research in progress. Finally, there is the section of the bibliographical references used in the paper and in the research in progress.

A. Contribution

This position paper presents the research in progress of a serious game developed through an online platform with the aim to teach the senior how to be more aware of the threats and dangers of browsing the web. Once seniors are more vulnerable to cyberattacks through social engineering, misinformation, digital illiteracy [8], malware attacks, phishing, that are some of the leading cybersecurity threat lived in 2020 [9].

The research methodology Action Research focus on identifying a problem and developing a solution by needing to create a plan, promoting an action and then observe and analyze the results, aiming to achieve a successful resolution of the problem [10]. In the phase of planning, the investigation or research is crucial to understanding the problematic scene and any related work.

Therefore, in this research it is critical to do a systematic review on the Serious Games developed for the seniors under the cybersecurity background. After this analysis, it is crucial to do an empirical study, and the demonstration will use focus groups, questionnaires, and interviews to study seniors' cybersecurity knowledge.

Then, after this evaluation, the second phase of the Action Research methodology begins, by developing the Serious Games on an online platform and then put it into practice on the seniors' group, later on, an analysis will be made through questionnaires to understand the Serious Game's successful or not.

B. Motivation

The Internet changed the world in every aspect of life, for those who grow with it see and feel all its benefits, but for those who the Internet is something totally new, hard to understand sometimes, but see it as a new thing that can help them in their daily routines and life, the Internet has revolutionized all of us.

Seniors want to become comfortable in browsing the web, and connect with family and friends, but they also want to have fun and learn, and learning is a process for all ages. Knowledge doesn't age, and knowledge is something to be shared.

By browsing the web, seniors found themselves in a new world where they have to learn how to be in it, especially on how not to put themselves and their data in risk, by cyberattacks or clicking in something that appear to be safe to click or to read a news that is unreal. Those are cybersecurity risks that people with less experience can be fooled.

So, seniors seek to learn how to be safe on browsing the web, how to know where something is not right and want to become more independent on their own online. And to promote this process of learning, why not gather the fun and this process. Serious Games are the potential for improving the cognitive functioning of the elderly, a beneficial impact on daily their lives, and improving their memory and attention [11]. Therefore, Serious Games are a fundamental pillar in constructing the learning process theories, highlighting acquiring knowledge through exploration and gaming [12].

Applying this concept, designing it for the seniors and promoting the process of learning in the cybersecurity content, senior will overcome the fear of making mistakes or fear of asking for help from others when they are online, and overcome the vulnerability of cyberattacks, and become consciously and safely web users.

II. RELATED WORK

After developing a systematic review on related research in the Serious Games and cybersecurity concerns in the senior population, some researches were considered crucial to this research in progress. The study by Santos & Alves [2], was carried out in two sessions, the first being a phase in which the seniors played an adventure game called "Guardians of the Forest", to get used to it, know the rules and gameplay. In the second session, the aim was to evaluate of seniors' learning skills through three questions. Next, by analysing the data, the authors concluded that the game successfully evolved in senior literacy and digital skills, not only by playing the game but also through Information and Communication Technologies class. Seniors felt more comfortable using a mobile device and browse the web after the playing the adventure game promoting their digital literacy and daily problem-solving skills related to new technologies.

The research of Blažič & Blažič [13] was also divided into two sessions, the first in which one senior group played directly, to get familiar with the game and the second group had to learn to use mobile devices. Later in second session, the second group played the game on a mobile device. Both groups played three different games in which these games were well-known by the seniors, puzzle and card games, all to promote the adoption of digital literacy:

- the first and introductory game in which participants drew on a tablet of their own free will, clicking on operation keys to interact with the game.

- the second game was a puzzle in which the participant, through cognitive and motor skills, completed an image with split elements of the image.

- the third game challenged the participant's coordination, such as vision, cognitive, and motor skills to perform a simple task of moving an element of the game while in a very busy environment.

This research revealed an important aspect, the third element in the surrounding environment, a helping person or educator to understand the senior's digital illiteracy's digital needs and help create a comfortable environment. All elements – game, training session and a third person to help, promoted positive emotions and acceptance in relation to games by offering challenges and learning through playing and having fun, easing the fears of not being able to be part of the modern society.

In the cybersecurity topic, the research of Kulkarni [14] presented an online platform where the author created his game that allowed the participants to remember, understand and apply the knowledge obtained during the gameplay moment, for example, the player receives an email in his box with false information, and when opening, he loses his life or when the player encounters with icons, previously studied, with reliable elements in web security and others with misleading elements, the player has to jump between secure cyber elements, avoiding viral elements. The game "DodgeTheThreats", is a useful guideline in the development of cybersecurity capabilities and awareness.

One of the biggest challenges in the mentioned research was the game's design, due to the complexity of combining learning with the elements of motivation and entertainment.

Worlds collide in the research in progress - game as an educational element versus games as an entertainment element; cybersecurity and digital literacy versus a group that was not born with these new technologies, but is interested in learning, understanding, and applying new digital concepts in their lives, want to be part of modern society, by being offered a chance to learn with the more traditional games applied in the most technological devices.

III. FUTURE WORK

By understanding the cognitive difficulties seniors have, this is important to make three sessions or even four. But before any session is vital to do the empirical study to fully understand seniors' cybersecurity knowledge, aiming a first game prototype and which subtopics of the cybersecurity are crucial for the success of the final game.

The first is where the study group is questioned about their cybersecurity skills or digital skills, and the second session is the moment of playing the Serious Games, where the seniors get to know the gameplay, rules, and aims of the game. The third session presents a questionnaire, in which seniors are tested in the game's knowledge; in a possible fourth session, the same questionnaire is presented to understand if the gameplay knowledge is consolidated in the senior's long-term memory. This is an important aspect to understand the effectiveness of the game.

Nevertheless, one crucial step is to understand game design, to seek and investigate the elements of motivation, gameplay, accessibility, learning process, and fun applied to the senior's needs. Shortly after, another step is to analyse of the online platform to develop the game in the cybersecurity topic, which must be aligned with all the accessibility elements specifically to seniors.

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