Universal Game Design: Social and Practical Insights.

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Abstract

The world is experiencing an "aging population" in many countries. However, the elderly are the first to be forgotten in government programs and industry. Recent studies show that users tend to adhere to a new technology according to their user experience and not according to their age. Therefore to design products properly an investigation about usability is necessary. This investigation would embraces users in varying abilities and disabilities (e.g., deficits in motor control, cognition, vision or hearing), welcoming these new guidelines to the game design. This research project is a draft consisting of two initial stages: (1) bibliographic research to identify best practices in GD focusing on an universal accessibility; and (2) a field research to validate these universal game design guidelines. As a result, we expect an initial guide to good development practices for GD with universal accessibility.

Keywords: universal game design, accessibility, usability, game design guidelines.

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1. Introduction

The worldwide population of people over the age of 65 is expected to more than double from 375 million in 1990 to 761 million by 2015 [Sax and Qiao 2010]. Many demographic variables point to this reality, especially the increase of life expectancy. In 2010, estimates showed that the percentage of people aged 65 or older were over 7.5% of the population in Brazil [IBGE 2010]. By the year 2045, that number will increase to 19.96%.

Clearly, the world population is aging and while increased life is good, there are social problems that will have to be overcome. "Age on its own is not a disability" [Mustaquin 2013], but older people are more likely to experience disabilities of various kinds: both single severe impairments and combinations of multiple minor sensory, cognitive and physical impairments, which combine to increase the difficulty of product use by the elderly. This increase of difficulty can explain why the elderly dependency ratio is about 11% in Brazil and 40.5% in Japan [Index Mundi 2014a; 2014b].

1.1 Ageism

The term "ageism" seems to exist before 70's, as it was used by Butler in 1969 [Neves and Amaro]. It describes the prejudice against elderly, and it affects them in many ways, creating a false feeling of worthlessness leading them to reclusion. In such cases, it is very common that the loneliness causes depression and the impression that life has lost its meaning [Mønsted 2011]. Goldani [2010] reveals that one of the clearest results of bias in the Brazilian health was in the increasing cases of HIV positive patients among the elderly, because programs to combat this disease were primarily aimed at young or middle-aged people, while elderly people were ignored (assuming they're not sexually active)

As in many Western societies, ageism occurs in families, government agencies, the health system, the wage labor markets and across all the media. At workplaces, people approaching their retirement age tend to be less willing to seek a job, because of their own negative personal experiences on discrimination. In 2009 [Couto apud Goldani], there were researches provided by the USA, Portugal and Brazil suggesting that the "ageism" is a general and transcultural phenomenon.

Goldani [2010] also argues that entertainment and computer technology industries are extremely geared for the young and that employees who have passed the age of 30 are seen as almost useless. Meanwhile, Galetti [2008] shows a negative and declining scenario to pathological gamblers, while showing good health among older adults who play recreationally.

1.2 Non-suitable Technology

Communicating using some technological devices (smartphones, DVD, Blue-ray, notebook etc) and engaging in social networks is difficult for older people [Souza apud Mønsted 2011]. It is believed that to make technology useful by older adults, a challenge for the research and design community is to 'know thy user' and better understand their needs, preferences and abilities. To a large extent, the lack of accessibility is due to the fact that designers are

unaware of the needs of users with varying disabilities (e.g., deficits in motor control, cognition, vision or hearing), or simply do not know how to accommodate such needs in the design process [Mustaquin 2013].

The actual elderly generation lacks the required experience to use digital devices. But, today we can say this problem is not specific to the elderly. It was analyzed that while e-books have been adopted by people of different ages, nearly 75% prefer paper. “It is not the age of the user but the user’s experience that predicts acceptance or adoption of a device” [Coughlin 2013]. Because of this insight, it is possible to predict the habits of the future elderly population, where games will be the major recreational activity as well as a tool for completing common tasks. Therefore a 'properly designed' mass market of computer games not too different from what we now have will exist. To achieve this kind of 'proper design' a comprehensive research is needed to consolidate many good practices into fields of game design (GD), usability and social interaction. “New approaches can benefit everyone involved”, said Coughlin and Yoquinto [2013].

1.3 Games for Bad: Gambling

When a person feels the natural degradation of the physical and mental aging process, their self-image becomes negative, increasing their chances of getting into depression. In these cases, many flee to addictions, whether drugs, alcohol or gambling, creating a vicious cycle of self-degradation. Galetti [2008] shows a negative and declining scenario related to pathological gamblers, meanwhile showing good health among those who only play recreationally.

1.4 Games for Good: Enhancing Health

Public healthcare is a social issue everywhere. The lack of quality in healthcare can be seen by the shortage of nurses and low hospital bed densities in Brazil and many other countries [Index Mundi 2014a; 2014b]. For seniors, constant monitoring is essential to provide adequate care as there is an increased risk of falls, strokes and other health problems which could prove life threatening or impact negatively on their quality of life. This reality calls for a search for creative and effective solutions to improve the well-being of the elderly. Fortunately, there is research that suggests that games could efficiently enhance senior's health both physically and mentally [Sax and Qiao]. It is possible to promote digital inclusion and social interaction of elderly through computer games, because they are a part of our modern culture, acting as a “locus” where subjects share thoughts, actions, words and feelings. Good social interaction can be provided through social games, multiplayer games etc.

2. Related Works

The present research project aims to fight ageism by clarifying game industry and design professionals about the needs of the elderly. The industry should design useful, exciting products suitable for all ages rather than anything that screams “old man’s” or “old woman’s”, i.e., “as more people live longer with chronic health issues, product engineers stand to succeed by designing products that assume end-users who are, say, 67 and arthritic, not 27 and healthy”[Coughlin and Yoquinto 2013]. It's possible to improve game design process, considering multimodal HCI (Human Computer Interaction) as a manner to avoid risk of injuries from repetitive efforts (strain injuries, carpal tunnel syndrome). Games should be made with ergonomic guidelines.

Sposito et al [2013] points out investigations about the use of video games as an assistive tool for the elderly, presenting good effects on aerobic capacity, balance and gait. Games also provide an interesting new potential for better access and for supporting people with disabilities. They can be used to acclimatize people who have had little to no exposure to technology, to interact with modern Information and Computer Technology (ICT). As stated best by Holzinger et al [2008], “The logical consequence to these considerations was to look at environments where play can also be used successfully to encourage learning among adults, facilitate training and provide mental and physical exercise for the elderly and disabled people”. Unfortunately, game designers still are not aware to design games to benefit people with disabilities, the same way the web designers are when designing an web page. Since the 90’s, while the World Wide Web started to grow, many researchers and practical web designers took actions towards accessibility and standardization, assisting people of every age (and disability) to use the internet as an educational, economic, social and entertainment tool. At this point, it's wise to look back (at web accessibility guidelines) and track some best practices of design that could be recycled for use into game design. Also, some guidelines and gameplay heuristics associated with universal design are included.

3. Methodology

This research project consists of bibliographic research to identify best practices in game design focusing on an universal accessibility; and in future field researches to validate them. The main references are listed below into proper section. Some of these previously researches included design and evaluation of digital games for frail elderly persons [Gerling et al 2011; Oliveira et al 2015; Medeiros and Coutinho 2015].

4. Universal Game Design

"Universal Design" (UD) is a philosophy for designing products and systems that are usable by people with the widest possible range of functional capabilities. All potential users are considered during inception of the idea and in the design and marketing of the product [UDP Toy Guide 2004]. Universal design is not a new concept but is still forgotten by game industry. An UD concerns with the majority types of impairments and consider them into the design process.

Therefore, we'll call "Universal Game Design" (UGD) a game design process in which an UD is applied. Into an UGD, it's considered at least the following types of impairments: (H) hearing, (V) visual, (C) cognitive and (M) motor – see Figure Erro: Origem da referência não encontradaErro: Origem da referência não encontrada. In all these cases there are many different levels of impairments. So the biggest challenge of UD in game design should be to provide a game experience even if the player have two or more of these impairments together.

Figure 1: Diagram of impairments to be considered into an UD.

5. Early Guidelines

Following are some "early" guidelines about the best practices in game design for an universal usability:

1) Plan the game complexity (mechanics): think about various impairments, such as:

- *Hearing* (H): 76.3% of elderly over 82 years have mild and moderate deafness, according to RNID [W3C]. So, in a game, every sound element must have its complementary (visual or logic). A dialog could be followed by its subtitle, i.e..
- *Visual* (V): Some degenerative effects associated with aging are diminished vision, eye coordination, color perception and other vision deficits. A game is primarily based on visual elements, thus the UD doesn't need to eliminate graphical design. However the main gameplay mechanics couldn't rely only on visual details, and specific guidelines for visual design must be followed.
- *Cognitive* (C): Elderly will be slower when learning new skills or performing some actions [Neves and Amaro 2012]. Some players could have some degree of dementia, so that the game designer must avoid complexity into narratives, mechanics or game logic. It can be achieved by providing few choices for those with "Mild Cognitive Impairment".
- *Motor* (M): For those with deficits into motor control, i.e., the mechanics needs to be adaptive. It's desired that the controllers be changed from time to time as a manner to avoid risk of injuries from repetitive efforts (strain injuries, carpal tunnel syndrome).

2) Plan the basic gameplay (player experience): accessible gameplay can be created through meaningful metaphors related to real-world actions to facilitate the entry into play [Gerling et al 2011]; create different player roles and levels of the game complexity; allow the game to adapt itself to a broad range of players and gaming situations.

3) Plan the social interaction: Recent studies pointed out by Carneiro and Falcone [2013] suggest the importance of the quality of social relationships to the physical, psychological and social well-being of the elderly. Social interaction has major emotional significance instead of mechanical interaction quality. This reality leads to a search for creative and effective solutions to improve the well-being of the elderly through social interaction.

Some players can have different kinds of impairments increasing the game difficult, but it can be overcome by combining the players capabilities, through collaboration (while a player handles with the avatar movements through a controller, the second player could handles another action through other kind of input). The fun must be found with creativity and engaged player collaboration.

4) Plan the audio design: The game design could have audio as input (controllers based on speech recognition, player communication etc) and output (digital voice, sound FX, music). "In tasks where experience and verbal abilities are essential, older individuals maintain a high productivity level" [Neves and Amaro 2012]. However, the gradual age-related reduction can appear with the increasing inability to hear high-pitched sounds and even with complete deafness itself [W3C]. Inclusive games could have speech recognition, so that it supports emotions, attitudes, tones etc, because "such expressions can be vital for gaming" [Mustaquim 2013][1].

5) Plan the visual design: This is a challenge activity for a game designer, because of the wide visual impairments that are so common among elderly people (decreasing ability to focus on near objects; fails on color perception and sensitive; pupil shrinkage; decreasing of contrast sensibility; reduction in visual field, "change blindness" and so on). Below some heuristics:

- Make it easier for players to see content: avoid visual pollution (do not design content in a way that it is know by cause seizures) and provide a suitable contrast for those with vision deficits. Avoid blue and green tones; background screens should not be pure white or change rapidly in brightness between scenes; apply a high contrast between the foreground and the background, etc.
- There are many more visual guidelines. These above are just a briefing. See more at Kurniawan and Zaphiris's work at Oliveira et al [2015].

6) Plan the game metrics: Establish the validation methods and metrics that will accommodate your game as "senior-friendly". Gerling et al [2011] suggests the following metrics: tension, challenge, flow, competence, immersion, negative and positive affect.

5. Conclusion

Designers, engineers, manufacturers and retailers will have to rethink who is a "lead adopter". Specifically, what services, experiences and education the producers will have to provide along with the technology to ensure the understanding of new systems, as well as their purchase and adoption. It's crucial that the different components of game development, interaction and design work together in order for the game to be accessible to people with disabilities as an web page is accessible. One expected result of this research is the publishing of a broad guideline of good practices for game design with universal accessibility (UGD) and when every guideline should be applied.

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