Faculty of Computer Science and Information Technology

Andragogical Perspectives in Designing Digital Games for Older Adults:
Maximizing Interaction and Experience

Nurul Farinah Binti Mohsin

Master of Science
2023

Andragogical Perspectives in Designing Digital Games for Older Adults:
Maximizing Interaction and Experience

Nurul Farinah Binti Mohsin

A thesis submitted

In fulfillment of the requirements for the degree of Master of Science

(Computer Science)

Faculty of Computer Science and Information Technology
UNIVERSITI MALAYSIA SARAWAK
2023

DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Malaysia Sarawak. Except where due acknowledgements have been made, the work is that of the author alone. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

....

Signature

Name: Nurul Farinah Binti Mohsin

Matric No.:   19020202

Faculty of Computer Science and Information Technology

Universiti Malaysia Sarawak

Date :30th May 2023

ACKNOWLEDGEMENT

I might not put names for all contributors in my study, but I totally indebted to your assistance. Thank you very much! And last but not least, I want to thank myself for not quitting in the middle of this journey. Thank you all.

ABSTRACT

The revolution of digital games has been advancing years by years. Digital games no longer serve just as entertainment but can potentially be used in different areas, such as the healthcare industry. The worldwide population of older adults is increasing, leading to an ageing world. The advancement of digital game technology can help to facilitate this ageing population. However, the current commercialised digital games are not designed and developed based on older adults' limitations. In addition, there is limited of guideline on designing and developing games specifically for older adults that consider andragogy principles. Therefore, this study proposes the *Purpose*, *Design*, *Play* and *Experience* guideline as a guideline for designing and developing digital games for older adults by reflecting the key principles of andragogy. In this study, an application named Otak Me! has been developed based on the guideline in the proposed guideline and tested by the target group, the older adults in Malaysia aged 55 and above. Participants' gaming experiences and user interface satisfaction were measured using Game Experience Questionnaire (GEQ) and Questionnaire for User Interface Satisfaction (QUIS). Based on the finding, Otak Me! received positive feedback where the positive items include the participants' feeling toward the Otak Me! application have the highest mean score compared to other items in GEQ with a score 4.00 from the participants, which vastly helped evaluate and validate the game design for older adults. Therefore, by playing and engaging with games in the Otak Me! application give benefit towards the older population in term of enjoyment.

Keywords: Andragogy, digital games, older adults, interaction, gaming

Perspektif Andragogi dalam Mereka bentuk Permainan Digital untuk Warga Emas: Memaksimumkan Interaksi dan Pengalaman

ABSTRAK

Revolusi permainan digital telah berkembang dari tahun ke tahun. Permainan digital tidak lagi berfungsi hanya sebagai hiburan tetapi berpotensi digunakan dalam bidang yang berbeza, seperti industri penjagaan kesihatan. Populasi warga emas di seluruh dunia semakin meningkat, membawa kepada dunia yang semakin tua. Kemajuan teknologi permainan digital dapat membantu memudahkan penduduk yang semakin tua ini. Walau bagaimanapun, permainan digital yang dikomersialkan semasa tidak direka dan dibangunkan berdasarkan had keupayaan warga emas. Selain itu, tiada garis panduan untuk mereka bentuk dan membangunkan permainan khusus untuk warga emas yang mempertimbang prinsip andragogi. Oleh itu, kajian ini mencadangkan rangka kerja Tujuan (Purpose), Reka Bentuk (Design), Bermain (Play) dan Pengalaman (Experience) sebagai garis panduan untuk mereka bentuk dan membangunkan permainan digital untuk warga emas dengan mencerminkan prinsip utama andragogi. Dalam kajian ini, aplikasi dinamakan sebagai Otak Me! telah dibangunkan berdasarkan garis panduan dalam rangka kerja yang dicadangkan dan diuji oleh kumpulan sasar iaitu warga emas di Malaysia berumur 55 tahun ke atas. Pengalaman permainan peserta dan kepuasan antara muka pengguna diukur menggunakan Soal Selidik Pengalaman Permainan (GEQ) dan Soal Selidik untuk Kepuasan Antara Muka Pengguna (QUIS). Berdasarkan dapatan, Otak Me! menerima maklum balas positif di mana item-item positif yang termasuk perasaan peserta terhadap aplikasi Otak Me! mempunyai skor purata tertinggi berbanding item lain dalam GEQ dengan skor 4.00 daripada peserta, yang amat membantu menilai dan mengesahkan reka bentuk permainan untuk warga emas. Oleh itu, dengan bermain dan terlibat dengan

permainan dalam aplikasi Otak Me!, memberi manfaat kepada populasi warga emas dari segi keseronokan.

Kata kunci: *Andragogi, permainan digital, orang dewasa lebih tua, interaksi, permainan*

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

CGS   Centre for Graduate Studies

DPE   Design, Play and Experience

GEQ   Game Experience Questionnaire

HCI   Human-Computer Interaction

iGEQ   In Game Experience Questionnaire

PDPE   Propose, Design, Play and Experience

QUIS   Questionnaire for User Interaction Satisfaction

SGDA   Serious Game Design Assessment

SLR   Systematic Literature Review

SUS   System Usability Scale

UNIMAS   Universiti Malaysia Sarawak

UX   User Experience

CHAPTER 1

INTRODUCTION

1.1 Study Background

The number of older populations is increasing from years to years. Tobi, Fathi, and Amaratunga (2017) stated that the ageing population in Malaysia is hit 28.3 million in 2010 and is expected to increase to 38.6 million in the following 30 years. Malaysia is predicted to be an ageing country by 2030 when 15% of the population is categorised as older adults (Yunus et al., 2017) which in Current Population Estimates Malaysia 2020 reported the number of people aged 60 years and above rose from 3.4 million in 2019 to 3.5 million and people aged 65 years and above from 2.2 million in 2019 to 2.3 million in 2020 (Department of Statistics, 2020).
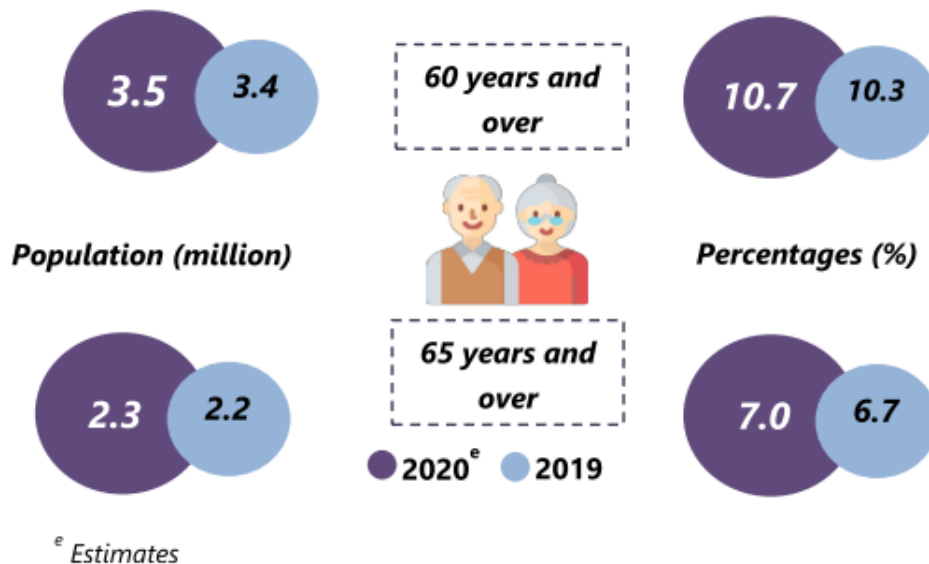
Figure 1.1: Number of older population in Malaysia 2020 (Department of Statistics, 2020)

According to Yunus et al. (2017), people aged 60 years old and above are categorised as older adults in Malaysia, based on the cut-off age adopted by the United Nations (UN). There are two main factors lead to an increasing number of ageing population in Malaysia, which are lower birth rates and declining Total Fertility Rate (TFR) (Ibrahim et al., 2017).

Older adults tend to experience negative ageing effects such as declining in cognitive abilities and physical abilities. The advancement of technology has brought many benefits to people including the older generation. The digital game is one of the examples of technology that can enhance older adults' life. Zhang and Kaufman (2016) point out that digital games have been used as a tool for psychological, cognitive, and neuropsychological rehabilitation for older adults since the mid-1980s. Digital games can boost older adults' fitness through the combination of enhanced motivation, gameplay, and fun and rhythm, and training and encourage them to improve their health (Wiemeyer & Kliem, 2012).

Although the advancement of technology is prevalent worldwide, few issues arise between older adults and technology, especially with digital games. There are few challenges face by older adults when dealing with digital game technology. Older adults are often unable to accept new technology and reject this technology entirely because of the psychological pressure caused by the fear that they cannot use it correctly (Yeh et al., 2019). Some of them are illiterate and have basic digital literacy on how to operate digital devices in an efficient manner (Blažič & Blažič, 2019).

Andragogy is related to the adults learning process, where it can be described as the art and science of helping adults learn (Jali & Arnab, 2017; Loeng, 2018). According to Malliarakis, Tomos, Shabalina, and Mozelius (2018), adopting principles of andragogy in education, especially for the educational digital games can offer substance to the learning

process through active experimentation. Six andragogical perspectives can be adopted to design an effective guideline focussing on older adults. In Section 2.8, a detailed principal andragogy is explained.

EMOTION framework, Serious Game Design Assessment (SGDA) framework and Design Play and Eperience (DPE) framework are the examples of current frameworks to design and develop digital games. However, these three frameworks do not emphasise on the design and development digital games specifically for older adults with the consideration of andragogy principles.

When designing digital games specifically for older adults, it is essential to consider the impact of the game content, genres, and the benefits gained from engaging with digital games. Based on a study by Kathrin M. Gerling, Schulte, Smeddinck, & Masuch (2012), guidelines were developed, focusing on four domains: Players and Resources, User Interface, Core Mechanics, and Outcome. In the Players and Resources domain, older adults as the target group with limited gaming experience should be considered. Design aspects such as interesting visuals and familiarity for the target group are important. The User Interface should be adapted to cope with aging-related challenges, including device selection and adjustable graphical elements like font size and color. Core Mechanics should feature simple rules and objectives to facilitate learning, avoiding excessive cognitive load. Finally, in the Outcome domain, positive results like players' enjoyment, learning, and achieving objectives should be prioritized by considering the limitations of older players.

In this study, a guideline to design and develop mobile digital game is proposed. The guideline is divided into four quadrants, Purpose, Design, Play and Experience (PDPE). The differentiation between PDPE guidelines with the existing frameworks is the consideration

3

of andragogy principles for both phase which in design and development phase for development digital games specifically for older adults.

1.2   Problem Statement

The advancement of digital game technology brings many benefits to many people, including older adults. Apart from of digital games as an entertainment tool, digital games can be used and implemented in many sectors such as in the healthcare industry, social science study and many more. This study's target focusses on older adults in Malaysian society. The central problem to be researched by the proposed study is that the present game design is not suitable for older adults.

There are two key problems are identified. Firstly, most commercialised digital games are not designed and developed specifically for older adults where most of it developed for the general type of games and aim for the younger user in mind. Most of the games are rarely designed with an older adult user group in mind (Gerling et al., 2012) and do not consider the older adults' restrictions (Cota et al., 2015; Mohsin et al., 2022) Older adults require different guideline to develop digital games specifically for them due to the negative ageing impact that affected their daily life. Apart from that, games designed for older players are not commercially available yet (Khalili-Mahani et al., 2020).

Secondly, lack of research on designing and developing digital games for older adults. Most of the games have not fully taken the older adults' needs and interests into the design consideration (Wang et al., 2019). Lack of research correlating the attributes of game technology and the consideration such as andragogical perspectives and challenges faced by the targeted group. Based on the previous research, only a study by Jali and Arnab (2016) correlated the andragogical perspectives into game design considerations for older adults.

However, the focus of the study is on console, and mobile platform and the target participants are older adults in United Kingdom.

1.3 Research Questions

This study aimed to address the following research questions:

    i.   What are the challenges related to the older adults interact with mobile digital game technology that needs to be considered?

    ii.   How can their game experiences influence design considerations?

    iii.   How to measure the effectiveness of the constructed guideline on the interaction and experience of older adults with mobile digital games?

1.4 Objectives

The main aim of this thesis is to identify user interaction and experience with digital games on mobile platforms focussing on older adults between the ages of 55 to 75. There are three objectives of this research:

    i.   To identify the components or elements to design and develop mobile digital games specifically for older adults based on the interaction and experience using andragogical perspectives.

    ii.   To construct a guideline to design and develop mobile digital games for older adults.

    iii.   To evaluate the effectiveness of the guideline on design and develop mobile digital games using a prototype (digital game) on how older adults'