



Faculty of Computer Science and Information Technology

***EVALUATING THE USEFULNESS OF GAMIFIED ANTI-ANXIETY
MOBILE APPLICATION USING HEDONIC-MOTIVATION SYSTEM
ADOPTION MODEL (HMSAM)***

Nurul Asyikin Binti Abdullah Abu Bakar (72610)

Bachelor of Computer Science with Honours (Software Engineering)

2023

**EVALUATING THE USEFULNESS OF GAMIFIED ANTI-ANXIETY MOBILE
APPLICATION USING HEDONIC-MOTIVATION SYSTEM ADOPTION
MODEL (HMSAM)**

NURUL ASYIKIN BINTI ABDULLAH ABU BAKAR

This project is submitted in partial fulfilment of the requirements for the degree of Bachelor of
Computer Science and Information Technology

Faculty of Computer Science and Information Technology

UNIVERSITI MALAYSIA SARAWAK

2023

**MENILAI KEBERKESANAN APLIKASI MUDAH ALIH ANTI-
KEBIMBANGAN YANG DIKELOLA DENGAN SISTEM ADOPSI MOTIVASI
HEDONIK (HMSAM)**

NURUL ASYIKIN BINTI ABDULLAH ABU BAKAR

Projek ini merupakan salah satu keperluan untuk Ijazah Sarjana Muda Sains Komputer dan
Teknologi Maklumat

Fakulti Sains Komputer dan Teknologi Maklumat

UNIVERSITI MALAYSIA SARAWAK

2023

UNIVERSITI MALAYSIA SARAWAK

THESIS STATUS ENDORSEMENT FORM

TITLE EVALUATING THE USEFULNESS OF GAMIFIED ANTI-ANXIETY
MOBILE APPLICATION USING HEDONIC-MOTIVATION SYSTEM
ADOPTION MODEL (HMSAM)

ACADEMIC SESSION: 2022/2023

NURUL ASYIKIN BINTI ABDULLAH ABU BAKAR

(CAPITAL LETTERS)

hereby agree that this Thesis* shall be kept at the Centre for Academic Information Services, Universiti Malaysia Sarawak, subject to the following terms and conditions:

1. The Thesis is solely owned by Universiti Malaysia Sarawak
2. The Centre for Academic Information Services is given full rights to produce copies for educational purposes only
3. The Centre for Academic Information Services is given full rights to do digitization in order to develop local content database
4. The Centre for Academic Information Services is given full rights to produce copies of this Thesis as part of its exchange item program between Higher Learning Institutions [or for the purpose of interlibrary loan between HLI]
5. ** Please tick (✓)

CONFIDENTIAL (Contains classified information bounded by the OFFICIAL SECRETS ACT 1972)

RESTRICTED (Contains restricted information as dictated by the body or organization where the research was conducted)

/ UNRESTRICTED



(AUTHOR'S SIGNATURE)

Validated by



(SUPERVISOR'S SIGNATURE)

Permanent Address

43C, JALAN 2D, KAMPUNG PULAU
MELAYU, 98000 MIRI, SARAWAK

Date: 01/07/2023

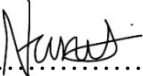
Date: 1 Aug2023

Note * Thesis refers to PhD, Master, and Bachelor Degree

** For Confidential or Restricted materials, please attach relevant documents from relevant organizations / authorities

DECLARATION

I hereby declare that the work entitled, Evaluating the Usefulness of Gamified Anti-Anxiety Mobile Application Using Hedonic-Motivation System Adoption Model (HMSAM) is my original work. I have not copied from any other students' work or any source except where due reference or acknowledgment is made explicitly in the text, nor has any part been written for me by another person.

.....

Nurul Asyikin Binti Abdullah Abu Bakar (72610)

Software Engineering

Faculty of Computer Science and Information Technology

Universiti Malaysia Sarawak

Date: 1 July 2023

ACKNOWLEDGEMENT

I would like to thank my supervisor, Prof. Dr. Jacey Lynn Minoi for giving me a lot of guidance and support from the start until the completion of this project. I would also like to express gratitude to my parents for giving me endless support throughout my journey in completing this project. Moreover, I would like to thank my friends for their help and encouragement along the process of completing this project. Lastly, I would like to thank my examiner, Ts. Syahrul Nizam for his guidance and constructive comments that has helped me improve my project.

ABSTRACT

Nowadays, anxiety has been one of the most common mental health issues affecting communities especially university students. A lot of mobile applications invented as interventions for various users to cope with their anxiety symptoms. This project aimed to evaluate the usefulness of a gamified mobile application for anxiety, 'Rootd' using Hedonic-Motivation System Adoption Model (HMSAM). In this study, the results were obtained from a survey which involved 30 participants from various universities and programmes. To observe the correlations between each HMSAM constructs, statistical data analysis was conducted including the reliability test using Cronbach's alpha and validity analysis using confirmatory factor analysis (CFA). The results show that perceived ease of use significantly affects perceived usefulness and perceived usefulness significantly affects behavioural intention to use the mobile application. However, some limitations of the study are identified whereby the study was conducted with a relatively small sample size of 30 respondents. Future study should consider increasing the number of participants in order to improve the reliability of findings. Besides, this project relies on self-reported measurements only for data collection which is through the questionnaire. Utilizing different approaches in data collection such as interview or observations can contribute more to the insight of user's interaction with the mobile application. Moreover, the study focuses on collecting data at a particular time instead of prolonged period of time. Future works should consider extending the data collection period to gain better insights on usage patterns of the mobile application and its long-term efficacy.

ABSTRAK

Pada masa kini, kebimbangan telah menjadi salah satu masalah kesihatan mental yang paling kerap melanda masyarakat terutamanya pelajar universiti. Oleh itu, banyak aplikasi mudah alih telah dicipta sebagai intervensi bagi pelbagai pengguna untuk mengatasi gejala kebimbangan mereka. Projek ini bertujuan untuk menilai kegunaan aplikasi mudah alih untuk kebimbangan yang berbentuk gamifikasi, 'Rootd', dengan menggunakan Model Penggunaan Sistem Motivasi Hedonik (HMSAM). Dalam projek ini, hasil kajian diperolehi daripada survei yang melibatkan 30 orang peserta dari pelbagai universiti dan program. Bagi melihat korelasi antara setiap konstruk HMSAM, analisis data statistik telah dijalankan termasuk ujian kebolehpercayaan menggunakan alfa Cronbach dan analisis kesahan menggunakan analisis faktor pengesahan (CFA). Hasil kajian menunjukkan bahawa persepsi kemudahan penggunaan memberi kesan yang signifikan terhadap persepsi kegunaan, dan persepsi kegunaan memberi kesan yang signifikan terhadap niat tingkah laku untuk menggunakan aplikasi mudah alih. Walau bagaimanapun, terdapat beberapa batasan kajian di mana kajian ini dilakukan dengan saiz sampel yang kecil, iaitu 30 responden. Kajian pada masa hadapan perlu mempertimbangkan untuk meningkatkan jumlah peserta bagi meningkatkan kebolehpercayaan hasil kajian. Selain itu, projek ini bergantung pada pengukuran laporan diri sahaja untuk pengumpulan data melalui soal selidik. Penggunaan pendekatan yang berbeza dalam pengumpulan data seperti temubual atau pemerhatian boleh memberi sumbangan lebih dalam memahami interaksi antara pengguna dengan aplikasi mudah alih tersebut. Tambahan pula, kajian ini memberi tumpuan kepada pengumpulan data pada satu masa tertentu sahaja dan tidak berpanjangan. Kajian pada masa hadapan harus mempertimbangkan untuk melanjutkan tempoh pengumpulan data bagi mendapatkan pandangan yang lebih baik mengenai corak penggunaan aplikasi mudah alih dan keberkesanannya dalam jangka masa panjang.

TABLE OF CONTENTS

DECLARATION	i
ACKNOWLEDGEMENT	ii
ABSTRACT.....	iii
ABSTRAK.....	iv
TABLE OF CONTENTS.....	v
LIST OF FIGURES	vii
LIST OF TABLES.....	viii
CHAPTER 1: INTRODUCTION.....	1
1.1 Introduction.....	1
1.2 Problem Statement	2
1.3 Scope.....	2
1.4 Aims and Objectives	2
1.5 Brief Methodology	2
1.5.1 Participants Selection	3
1.5.2 Questionnaire Design	3
1.5.3 Mobile Application Selection.....	4
1.5.4 Data collection.....	4
1.5.5. Data analysis.....	5
1.6 Significance of Project	5
1.7 Project Schedule.....	6
1.8 Expected Project Outcome	7
CHAPTER 2: LITERATURE REVIEW	8
2.1 Overview.....	8
2.2 Gamification.....	8
2.3 Hedonic-Motivation System Adoption Model (HMSAM)	9
2.4 Perceived Usefulness.....	13
2.5 Anxiety.....	14
2.6 Summary	15
CHAPTER 3: METHODOLOGY	16
3.1 Overview.....	16
3.2 Study Design	16

3.2.1 Participants Selection	16
3.2.2 Questionnaire Design	16
3.2.3 Mobile Application Selection.....	18
3.2.4 Data Collection.....	19
3.2.5 Data Analysis.....	19
3.3 Summary	21
CHAPTER 4: IMPLEMENTATION AND TESTING	22
4.1 Overview	22
4.2 Demographic Information of Participants.....	22
4.3 Data Analysis and Results.....	24
4.3.1 Reliability and Validity Analysis	24
4.3.2 Hypothesis Testing	29
4.4 Perceived Usefulness.....	31
4.5 Discussion	32
4.6 Summary	32
CHAPTER 5: CONCLUSION AND FUTURE WORKS.....	34
5.1 Overview	34
5.2 Project Achievements.....	34
5.3 Limitations	35
5.4 Future Works.....	35
5.5 Summary	36
REFERENCES	37

LIST OF FIGURES

Figure 1.1: Study Design	3
Figure 1.2: Framework of HMSAM Model.....	4
Figure 1.3: Gantt Chart of Project.....	7
Figure 2.1: Hedonic-Motivation System (HMS) Model.....	9
Figure 2.2: Extended Hedonic-Motivation System (HMS) Model.....	10
Figure 2.3: First Proposed Hedonic-Motivation System Adoption Model (HMSAM).....	11
Figure 2.4: Final Proposed Hedonic-Motivation System Adoption Model (HMSAM)	12
Figure 3.1: Study Design	16
Figure 3.2: Confirmatory Factor Analysis Steps	20
Figure 4.1 Bar Chart on Participants Age.....	22
Figure 4.2 Pie Chart on Participants University	23
Figure 4.3 Bar Chart on Participants Programmes	23
Figure 4.4: Graph of Questionnaire Results on Perceived Usefulness	31

LIST OF TABLES

Table 1: Project Schedule	6
Table 2: Questionnaire Design.....	17
Table 3: Relationship Between Constructs	21
Table 4: Reliability and Validity Analysis Results.....	25
Table 5: Discriminant Validity Results.....	29
Table 6: Path Analysis Results	30
Table 7: Objectives Achievements	34

CHAPTER 1: INTRODUCTION

1.1 Introduction

The term anxiety refers to uneasy feeling or concern about something negative that may occur (“Anxiety”, n.d.). In Psychology, anxiety refers to a mental health condition whereby someone is excessively worried about something to the point where it significantly interferes with one’s daily life (“Anxiety”, n.d.). There are many ways to cope with anxiety symptoms such as having a balanced diet, practice meditation, doing physical exercises and practice mindfulness (Doiphode et al., 2021). A lot of free mobile applications that can help users to keep track of the coping strategies can be found through the Google Play Store or Apple AppStore. Using mobile applications to aid users in coping with anxiety symptoms is also time-efficient compared to going to the clinics for counselling or face-to-face therapy session which takes longer time.

Another way to cope with anxiety symptoms is playing video games. A research review concludes that using interactive video games contributes to reducing anxiety level of caregivers for paediatric procedural children (Sajeev et al., 2021). Therefore, this project aims to evaluate the usefulness of gamified anti-anxiety mobile applications in order to achieve users’ goal. The term gamified here refers to the application of game design principles to a non-gaming system. Examples of the game design principles are points, leader boards, levels and badges (Lukas et al., 2021). The result of the evaluation is to be observed through Hedonic-Motivation System Adoption Model (HMSAM), focusing on perceived ease of use and perceived usefulness (Lowry et al., 2013). The basic skill requirements needed for this project are knowledge on Hedonic-Motivation System Adoption Model (HMSAM), data analysis and perceived usefulness.

1.2 Problem Statement

The problem that this research-based project addresses is the concern for the usefulness of gamified mental health mobile application such as anxiety relieve applications to help users achieve their goals. Due to the unforeseen spread of COVID-19 pandemic started in 2020, providing mental health care through contactless platform is beneficial in order to safely overcome the increasing rate of mental health issues among students. One way to do this is through mobile applications. However, the usefulness of such applications is not guaranteed. Hence, this project focuses on studying the usefulness of the application through HMSAM.

1.3 Scope

This project targets university students from various study programme to try using anti-anxiety mobile application to cope with their anxiety symptoms. This project will focus on their perceive of usefulness and ease of use of the mobile applications in terms of achieving their goals. The relation and scoring of these parameters will be observed using Hedonic-Motivation System Adoption Model (HMSAM).

1.4 Aims and Objectives

1. To evaluate the usefulness of Rootd application using Hedonic-Motivation System Adoption Model (HMSAM).
2. To analyse the ease of use of Rootd application using Hedonic-Motivation System Adoption Model (HMSAM).
3. To observe the effect of perceived ease of use to perceived usefulness.

1.5 Brief Methodology

For this project, there are five steps of methodology conducted in this study as shown below:



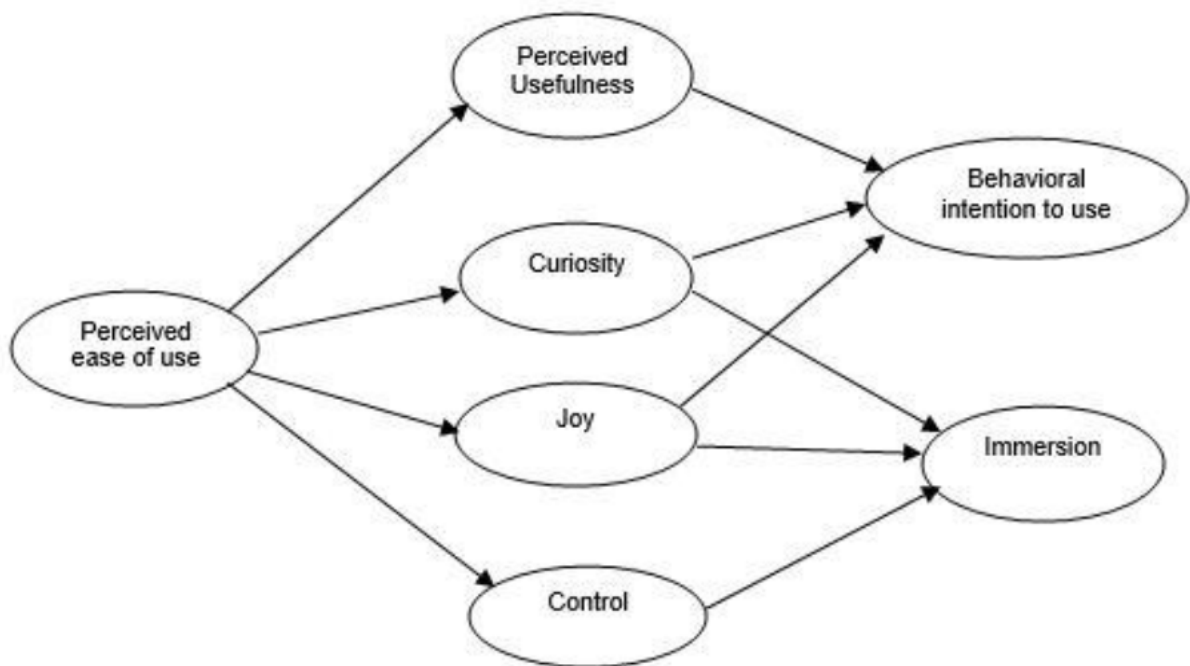
Figure 1.1: Study Design

1.5.1 Participants Selection

The participants for this project consist of university students from various study programme. This project will focus on gaining information from the participants such as on their perceived ease of use in using the selected mobile application to cope with their anxiety symptoms, the effectiveness of the application from their perspectives and their motivation to continue using the application in the future for the same purpose.

1.5.2 Questionnaire Design

The questionnaire will be designed based on Hedonic-Motivation System Adoption Model (HMSAM) constructs such as perceived ease-of-use, perceived usefulness, curiosity, joy, control, behavioural intention to use (BIU) and immersion. Below is HMSAM model and its constructs:



*Figure 1.2: Framework of HMSAM Model. Adapted from “The Adoption of Students’ Hedonic Motivation System Model to Gamified Learning Environment,” by D. Oluwajana et al., 2019, *Journal of Theoretical and Applied Electronic Commerce Research*, 14(3) p. 156-167. Copyright 2019 by the University of Talca, Chile.*

1.5.3 Mobile Application Selection

For this project, a gamified mobile application for anxiety relieve will be selected based on its functionality. In this case, Rootd is the application selected for this project since it is scientifically validated and has been featured in Women’s Health, Time Magazine, Healthline and Cosmopolitan. It also has high ratings in both Google Play Store and Apple App Store.

1.5.4 Data collection

A set of survey or questionnaire will be produced in order to collect data from the participants. The survey will be conducted online through a 5-point Likert Scale set of questions which will be distributed through social media such as WhatsApp, Facebook and Telegram. The purpose of doing online questionnaire is the convenience of distributing the questionnaire and collecting the answers from all of the participants. Moreover, conducting online survey is also time efficient.

1.5.5. Data analysis

After collection of data, the data will then be analysed through the points given by the participants from the Likert Scale. The result of the data will be analysed through factor analysis and reliability test. For factor analysis, confirmatory factor analysis will be used (CFA) while Cronbach's Alpha for reliability test. Both tests will be conducted using SPSS software since it is free and has a lot of resources.

1.6 Significance of Project

One of the benefits of this project is that the awareness on mental health issues can be spread among university students since the online questionnaire is distributed through social media. Besides, by assessing the effectiveness and user experience of a gamified mobile application for anxiety, the project contributes to the field of mental health technology and provides valuable insights for developers, researchers, and users. The project addresses the growing need for accessible and effective mental health interventions. By evaluating Rootd application, which specifically targets anxiety, the project offers insights into the potential benefits of gamification in promoting mental well-being and providing support for individuals experiencing anxiety-related challenges. The project's use of the HMSAM model adds to the existing body of knowledge on technology adoption and user experience. By applying this theoretical framework to assess the ease of use and perceived usefulness of the Rootd application, the project validates the HMSAM model's applicability in the context of gamified mental health interventions.

1.7 Project Schedule

Table 1: Project Schedule

Task	Start Date	End Date	Duration
Propose project title with supervisor	17/10/2022	22/10/2022	5
Identify and define study hypotheses	22/10/2022	1/11/2022	10
Conduct literature review	1/11/2022	29/11/2022	28
Plan study design	29/11/2022	6/12/2022	7
Select suitable mobile application for research	6/12/2022	13/12/2022	7
Select appropriate tools for research	13/12/2022	21/12/2022	8
Get feedback from supervisor	21/12/2022	25/12/2022	4
Write FYPI Report	25/12/2022	12/1/2023	18
Recruite participants for research survey	7/4/2023	17/4/2023	10
Distribute questionnaire and get feedback from participants	17/4/2023	27/4/2023	10
Analyze result using statistical analysis methods	27/4/2023	17/5/2023	20
Identify and analyze research weaknesses	17/5/2023	20/5/2023	3
Identify recommendations for future works	20/5/2023	24/5/2023	4
Get feedback from supervisor	24/5/2023	28/5/2023	4
Complete report writing	28/5/2023	17/6/2023	20
Refine report writing	17/6/2023	21/6/2023	4
Final review before submit	21/6/2023	24/6/2023	3

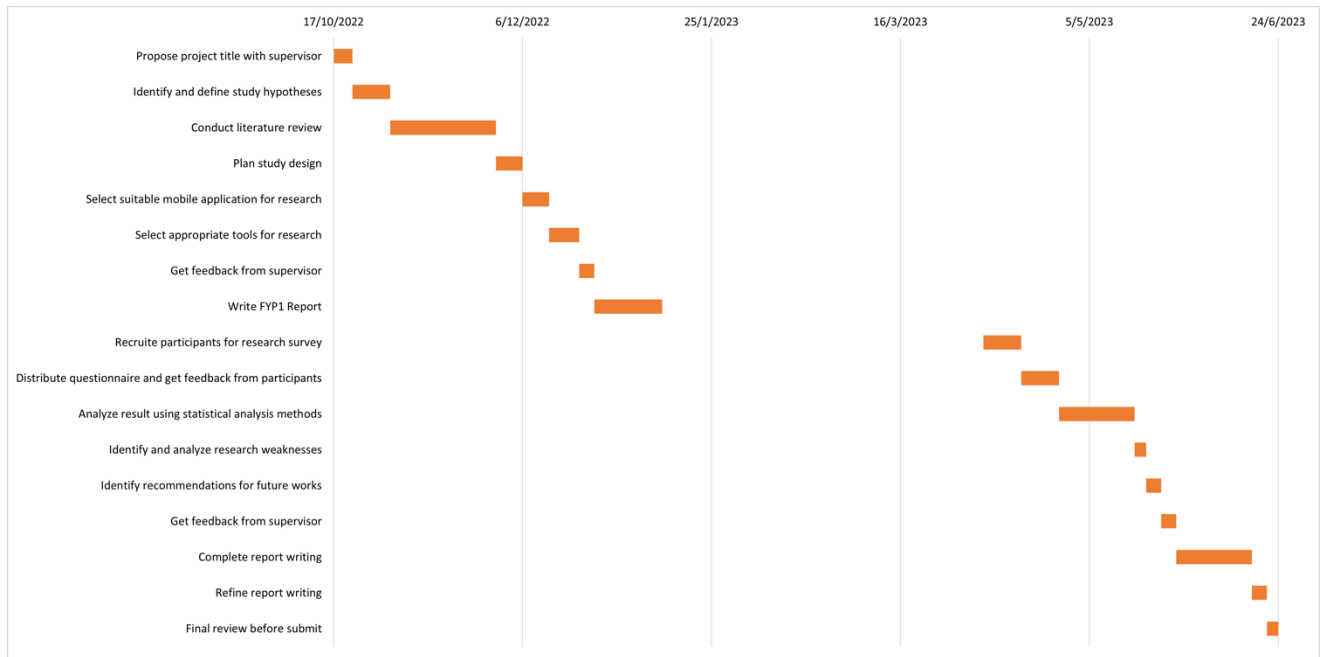


Figure 1.3: Gantt Chart of Project

1.8 Expected Project Outcome

The expected outcome for this project is that at the end of the project, the usefulness and ease of use for gamified mobile application for anxiety are successfully analysed through the Hedonic-Motivation System Adoption Model (HMSAM). Besides, the effect of perceived usefulness on users' behaviour intention to use is also observed.

CHAPTER 2: LITERATURE REVIEW

2.1 Overview

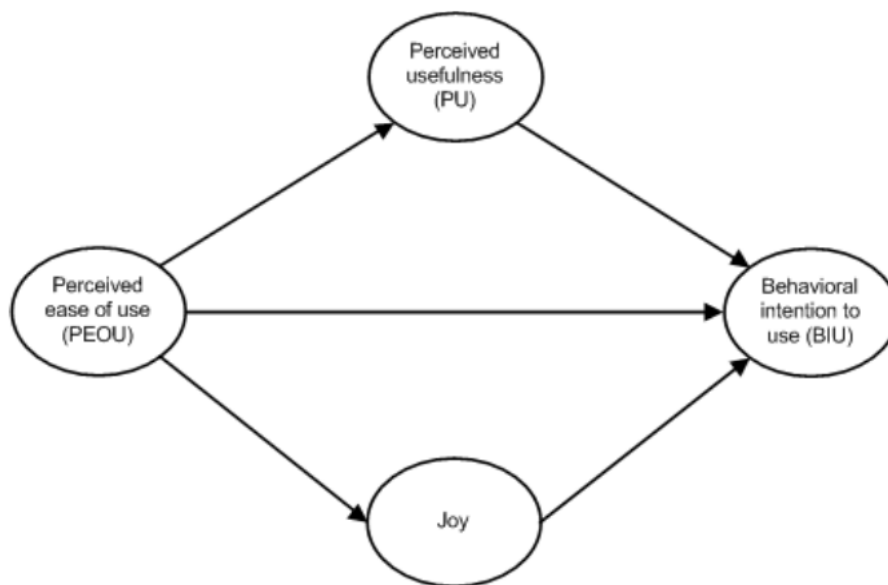
This chapter provides the literature review on the chosen domain including gamification, anxiety and perceived usefulness. The chapter also provides insights on the background of Hedonic-Motivation System Adoption Model (HMSAM) to be used in this study. In this chapter, the hypotheses for the study are also introduced.

2.2 Gamification

"Gamification" is defined as the implementation of game design elements into non-gaming scenarios (Deterding et al., 2011). This implementation is aimed to enhance user engagement and motivation. Gamification does not involve the use of game-based technology or full-fledged games, and can be used for various purposes in different contexts and media (Deterding et al., 2011). Examples of game elements used on a surface level include points, badges, meaningful stories, performance graphs, avatars, leaderboards, and teammates (Sailer et al., 2016). According to Marache-Francisco and Brangier (2013), designing interactions through gamification involves creating appropriate categories to enhance user engagement. A successful gamification process can help guide design choices, facilitate collaboration, prioritize goals and needs, streamline understanding of complex gaming scenarios, identify issues with unclear gamification proposals, and emphasize specific characteristics of interactions (Marache-Francisco & Brangier, 2013). A study by Townsend et al. (2022) proved that gaming interventions specifically created to address mental health issues have been found to be effective in reducing depressive symptoms in young individuals. McGonigal's study (2015) also proved her recovery from traumatic brain injury through gamification.

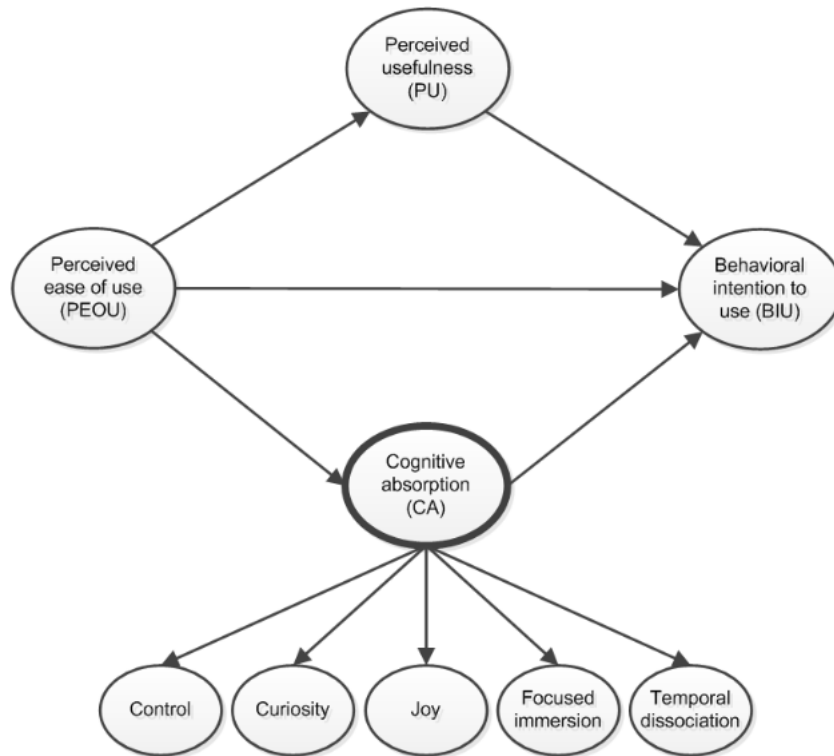
2.3 Hedonic-Motivation System Adoption Model (HMSAM)

Hedonic-Motivation System Adoption Model (HMSAM) is a model proposed as an alternative to Technology Acceptance Model (TAM) to include more intrinsic motivation factors as TAM provides limited inclusions of intrinsic motivation in the model (Lowry et al., 2013). According to Hamari and Koivisto (2015), extrinsic motivation comes from external factors such as rewards or incentives, while intrinsic motivation is driven by personal interest or enjoyment in the task itself. Hence, extrinsic motivation is when the source of motivation is from outside, while intrinsic motivation is when the source of motivation comes from within oneself. HMSAM model is also extended from Hedonic-Motivation System (HMS) model which is more specific compared to TAM model (Lowry et al., 2013). Below is the structure of HMS model.



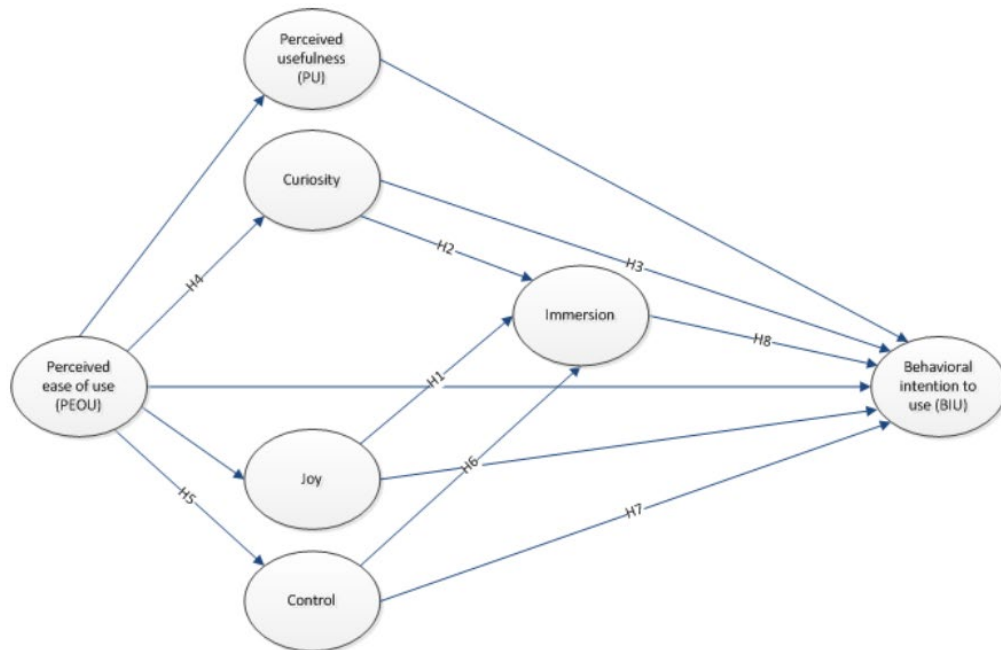
*Figure 2.1: Hedonic-Motivation System (HMS) Model. Adapted from “Taking “Fun and Games” Seriously: Proposing the Hedonic-Motivation System Adoption Model (HMSAM),” by P. Lowry et al., 2013, *Journal of the Association for Information Systems*, 14(11), p. 617-671.*

From the HMS model, the first extension involves the replacement of Joy with Cognitive Absorption (CA), as shown in the figure below (Lowry et al., 2013).



*Figure 2.2: Extended Hedonic-Motivation System (HMS) Model. Adapted from “Taking “Fun and Games” Seriously: Proposing the Hedonic-Motivation System Adoption Model (HMSAM),” by P. Lowry et al., 2013, *Journal of the Association for Information Systems*, 14(11), p. 617-671.*

The second extension involves using the CA sub-constructs individually to extend the HMSAM model rather than grouping them into one second-order construct (Lowry et al., 2013). Both extensions result in the proposed HMSAM model as shown below:

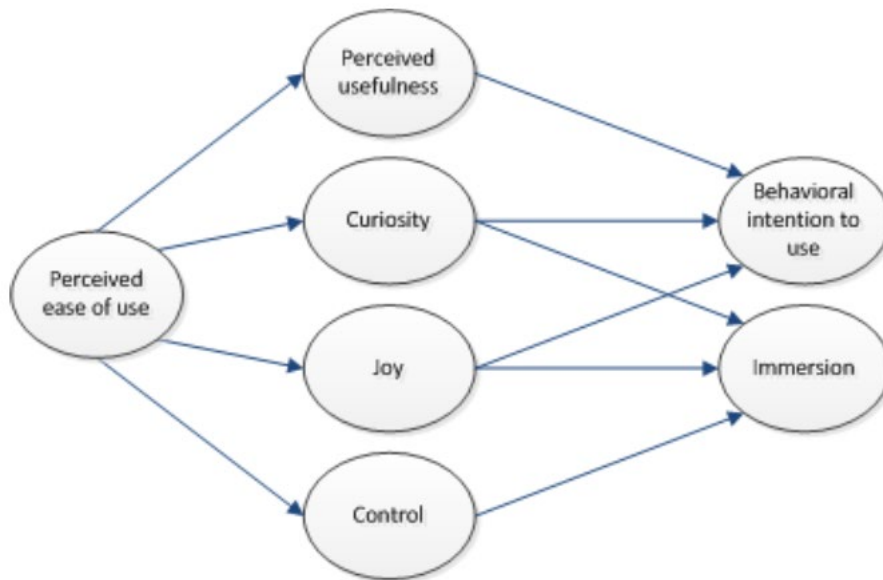


*Figure 2.3: First Proposed Hedonic-Motivation System Adoption Model (HMSAM). Adapted from “Taking “Fun and Games” Seriously: Proposing the Hedonic-Motivation System Adoption Model (HMSAM),” by P. Lowry et al., 2013, *Journal of the Association for Information Systems*, 14(11), p. 617-671.*

There are eight hypotheses being tested to get the final proposed model (Lowry et al., 2013):

1. Immersion will increase if joy increases.
2. Immersion will increase if curiosity increases.
3. Behavioural intention to use (BIU) increases if curiosity increases.
4. Curiosity increases if perceived ease of use (PEOU) increases.
5. Control increases if PEOU increases.
6. Increase in immersion is affected by the increase in control.
7. BIU increases if control increases.
8. BIU increases if immersion increases.

After tests and studies, the final proposed HMSAM model is as shown below.



*Figure 2.4: Final Proposed Hedonic-Motivation System Adoption Model (HMSAM). Adapted from “Taking “Fun and Games” Seriously: Proposing the Hedonic-Motivation System Adoption Model (HMSAM),” by P. Lowry et al., 2013, *Journal of the Association for Information Systems*, 14(11), p. 617-671.*

The final proposed HMSAM model consists of the main dependent constructs and the independent constructs (Oluwajana et al., 2019). There are two main dependent constructs which are behavioural intention to use and immersion. Behavioural intention to use (BIU) refers to the intention of an individual on engaging in a behaviour which might be influenced by attitude or subjective norm. Immersion is the state of being completely focused in doing something whereby the other things are ignored (Oluwajana et al., 2019).

There are four independent constructs (Oluwajana et al., 2019). The first independent construct is perceived usefulness which is the confidence level of the users that their performance can be improved by using the technology. The second independent construct is curiosity which is the degree to which the user’s sensory and cognitive curiosity is enhanced by his or her experience. The next one is joy or heightened enjoyment, whereby the enjoyable components of the interactivity are amusing and entertaining instead of mundane. Another independent construct is control which refers to the user’s sense of control over the interaction (Oluwajana et al., 2019).