FACTORS INFLUENCING CONTINUANCE OF USAGE INTENTION TOWARDS A GAMIFIED E-QUIZ MOBILE APPLICATION AMONG MALAYSIAN HIGHER LEARNING STUDENTS

By

ROSFUZAH BINTI ROSLAN

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

September 2023

DEDICATION

All praise be to Almighty Allah for sparing my life to witness this day. I am dedicating this thesis to my beloved mother, father, sisters, brothers and my loving daughter, Dhiya Damia. My supervisory committee, Dr. Norliza Binti Ghazali and Dr. Nurul Nadwa Binti Zulkifli under the chairmanship of Prof. Dr. Ahmad Fauzi Bin Mohd Ayub, and all the staff of Faculty of Education, UPM. Finally, to Universiti Tun Hussein Onn Malaysia (UTHM) and friends who had supported and encouraged me throughout this research journey. Thank you and may Allah S.W.T reward them with Aljannatul Firdaus.

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

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Chairman : Professor Ahmad Fauzi bin Mohd Ayub, PhD
Faculty : Educational Studies

It is expected that gamification in education will be the luring factor and be able to sustain the interest of the current generation. Previous studies have identified various factors that influenced individuals' decisions when accepting mobile technology. However, studies related to factors influencing post-acceptance of a gamified mobile technology are scarce. Therefore, this study aims to produce a fitting structural model consisting of factors influencing the continuance usage intention among the Malaysian higher learning students towards a gamified e-quiz mobile application. The research integrated the Expectation Confirmation Model (ECM) with the Extended Unified Theory of Acceptance and Use of Technology (UTAUT2), along with two additional constructs, trust and consumer engagement that were derived from Mcknight et al.'s (2011) Trust in Technology Theory and Service-Dominant (S-D) Logic Theory, respectively. Following that, 10 variables were investigated in which eight are the exogenous variables namely, (i) confirmation of expectation, (ii) perceived enjoyment, (iii) perceived ease of use, (iv) social influence, (v) facilitating condition, (vi) consumer engagement and (vii) trust. On the other hand, the other three variables are the endogenous variables that comprises (i) satisfaction, (ii) perceived usefulness and (iii) continuance usage intention. Construct satisfaction, as a mediator towards continuance usage intention, between (i) trust, (ii) perceived usefulness and (iii) perceived enjoyment, was also investigated. The study implemented the correlational research design conducted on the Malaysian higher learning students. With the total population of 560 first-year students who are the existing users of the technological product, 269 sample sizes managed to be retained for further analysis. Based on the analysis conducted, the 'in-sample' predictive power (i.e., explanatory power) of the model indicates substantial predictive accuracy. More importantly, the model exhibits higher value (i.e., predictive power) by proving that it could predict future dataset (i.e., 'out-of-sample'). In conclusion, the significant integration was proven by some of UTAUT2 explanatory variables (i.e., perceived enjoyment, perceived ease of use and perceived usefulness), as well as construct trust derived from the Trust in Technology Theory, with the ECM

constructs (i.e., satisfaction, confirmation, perceived usefulness). In the end, the study managed to provide a theoretical basis in explaining the continuance use intention towards a gamified e-quiz mobile application. Additionally, these findings emphasise the importance of improving the gamification aspects of the technological product based on the factors studied, in order to secure the longevity of an educational application, produced by the higher learning institute.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

FAKTOR – FAKTOR YANG MEMPENGARUHI HASRAT PENGGUNAAN BERTERUSAN TERHADAP APLIKASI MUDAH ALIH E-KUIZ BERASASKAN GAMIFIKASI DI KALANGAN PELAJAR PENGAJIAN TINGGI MALAYSIA

Oleh

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Gamifikasi dalam pendidikan akan menjadi faktor tarikan dan akan mampu mengekalkan minat generasi kini. Kajian-kajian terdahulu membuktikan pelbagai faktor motivasi telah memberi impak terhadap penerimaan seseorang individu terhadap teknologi mudah alih (mobile). Walaubagaimanapun, kajian berkaitan faktor yang mempengaruhi pasca-penerimaan aplikasi mudah alih berasaskan gamifikasi yang berterusan adalah sukar ditemui. Maka, tujuan utama kajian ini adalah untuk menghasilkan model struktur yang mengandungi faktor-faktor yang mempengaruhi hasrat penggunaan berterusan di kalangan pelajar pengajian tinggi di Malaysia terhadap aplikasi mudah alih e-kuiz berasaskan gamifikasi. Kajian ini menintegrasikan Expectation Confirmation Model (ECM) dan Extended Unified Theory of Acceptance and Use of Technology (UTAUT2) bersama-sama dengan dua konstruk tambahan iaitu (i) kepercayaan, yang terbit daripada teori Mcknight et al. (2011) Trust in Technology, dan (ii) keterlibatan pengguna, yang terbit daripada teori Service-Dominant (S-D) Logic. Susulan dari itu, 10 pembolehubah dikaji, yang mana lapan daripadanya adalah pembolehubah exogenous iaitu, (i) pengesahan jangkaan, (ii) persepsi keseronokan, (iii) persepsi kemudahan dalam penggunaan, (iv) pengaruh sosial, (v) keadaan yang memudahkan, (vi) keterlibatan pengguna, dan (vii) kepercayaan. Sebaliknya, tiga lagi pembolehubah adalah berjenis endogenous yang terdiri daripada (i) kepuasan, (ii) persepsi kebergunaan, dan (iii) hasrat penggunaan berterusan. Konstruk kepuasan, sebagai perantara kepada hasrat penggunaan berterusan, antara tiga pembolehubah yang lainnya iaitu (i) kepercayaan, (ii) persepsi kebergunaan, dan (iii) persepsi keseronokan, turut dikaji. Kajian ini mengimplementasi rekabentuk kajian korelasi yang dijalankan terhadap pelajar pengajian tinggi di Malaysia. Dengan jumlah populasi seramai 560 pelajar tahun satu yang juga pengguna semasa produk teknologi kajian, hanya 269 data sampel berjaya dikekalkan bagi tujuan analisis selanjutnya. Berdasarkan analisis yang dijalankan, kekuatan ramalan 'dalam sampel' bagi model kajian ini menunjukkan ketepatan ramalan yang kuat. Paling utama adalah model kajian ini mempamerkan nilai

yang tinggi (kuasa ramalan) dengan pembuktian bahawa ia boleh meramalkan kumpulan data yang lain (baru) pada masa akan datang iaitu ramalan 'luar sampel'. Kesimpulannya, integrasi yang ketara dibuktikan oleh sebahagian dari pembolehubah UTAUT2 (persepsi keseronokkan, persepsi kemudahan dalam penggunaan dan persepsi kebergunaan), termasuk juga konsruk kepercayaan yang terbit daripada teori Trust in Technology, bersama konstruk-konstruk ECM (kepuasan, pengesahan, kemudahan dalam penggunaan). Pada akhirnya, kajian ini berhasil menyediakan teori dasar bagi menjelaskan hasrat penggunaan berterusan terhadap aplikasi mudah alih e-kuiz yang berasaskan gamifikasi. Hasil penemuan kajian juga menunjukkan penekanan terhadap kepentingan menambahbaik produk teknologi dari aspek gamifikasi berdasarkan faktor-faktor kajian, dalam memastikan aplikasi pembelajaran yang dihasilkan oleh sesebuah institut pengajian tinggi akan kekal lama.

ACKNOWLEDGEMENTS

First and foremost, I thank Almighty Allah for letting me live to see this research work through. I am forever indebted to my supervisory committee, Dr. Norliza Binti Ghazali and Dr. Nurul Nadwa Binti Zulkifli under the chairmanship of Prof. Dr. Ahmad Fauzi Bin Mohd Ayub for their unwavering assistance, support, encouragement and patience throughout this research work. I am very grateful to all the staff of Universiti Putra Malaysia (UPM) for their support and assistance and also to my colleagues in the Faculty of Education (FPP), UPM may Almighty Allah bless all of you. I owed so much to my whole family for their underlying support, especially my daughter, Dhiya Damia who was always praying for my success. I am also grateful to Universiti Tun Hussein Onn Malaysia (UTHM) and the Dean of the Centre for Diploma Studies (CeDS). Alhamdulillah.

I certify that a Thesis Examination Committee has met on 15 September 2023 to conduct the final examination of Rosfuzah binti Roslan on her thesis entitled "Factors Influencing Continuance of Usage Intention towards a Gamified E-Quiz Mobile Application among Malaysian Higher Learning Students" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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I hereby confirm that:

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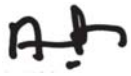
Signature: 
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LIST OF ABBREVIATIONS

IT	Information Technology
ICT	Information Communication &Technology
IS	Information System
M-Learning	Mobile Learning
D-Learning	Digital Learning
LMS	Learning Management System
MOOC	Massive Open Online Course
MALL	Mobile-Assisted Language Learning
MOHE	Ministry of Higher Education
HEI	Higher Education Institution
CeDS	Centre for Diploma Studies
UTHM	Universiti Tun Hussein Onn Malaysia
DAA	Diploma of Civil Engineering
DAT	Diploma of Information Technology
DAG	Diploma of Animation
JTM	Department of Information Technology
JSM	Department of Science & Mathematics
JKA	Department of Civil Engineering
TIP	Tool Improvement Plan
MCQs	Multiple-Choice Questions
ECT	Expectation Confirmation Theory
ECM	Expectation Confirmation Model
S-D Logic	Service-Dominant Logic
TAM	Technology Acceptance Model
UTAUT	Unified Theory of Acceptance and Use of Technology

UTAUT2	Extended Unified Theory of Acceptance and Use of Technology
CFA	Confirmatory Factor Analysis
EFA	Exploratory Factor Analysis
EDA	Exploratory Data Analysis
SPSS	Statistical Package for Social Science
MSA	Measure of Sampling Adequacy
KMO	Kaiser-Meyer-Olkin
IPMA	Importance-Performance Map Analysis
f^2	Effect Size
IV	Independent Variable
DV	Dependent Variable
Q^2	Predictive Relevance
R^2	Coefficient of Determination
SEM	Structural Equation Modeling
SD	Standard Deviation
VIF	Variance Inflantion Tolerance
HTMT	Hetortrait – Monotrait Ratio
AVE	Average Variance Extracted
CB-SEM	Co-variance Based Structural Equation Modeling
PLS-SEM	Partial Least Square Structural Equation Modeling
CI	Continuance Usage Intention
S	Satisfaction
C	Confirmation
PU	Perceived Usefulness
PEOU	Perceived Ease of Use
PENJ	Perceived Enjoyment
SI	Social Influence

FC	Facilitating Condition
T	Trust in Technology
CE	Consumer Engagement
e-Quiz	Electronic/Online Quiz
CR	Composite Reliability
CMV	Common Method Variance

CHAPTER 1

INTRODUCTION

1.1 Introduction

The purpose of this study is to investigate the factors that influence the gamified e-quiz mobile application continuance usage intention among Malaysian higher learning students. The first chapter starts by discussing the mobile learning based on Malaysian Educational Policy, infusion of gamification in teaching and learning tools, gamified mobile application usage among students of Malaysian higher education institutions, followed by an overview on influence to continuously use a technology. Next, the statement of the problems is discussed. Then, both research objectives and research hypotheses are developed based on the problem statement, followed by the significance and limitation of the study. Lastly, the definition of the terms is presented, organisation of the thesis and concludes with the summarization of this chapter.

1.2 Malaysian Educational Policy

The Fourth Industrial Revolution (4IR) has managed to trigger the Higher education community to upgrade its mastery of utilising digital technology. This has stimulated the development of e-learning modes such as Learning Management System (LMS), Massive Open Online Courses (MOOCs) as well as assessment tools to aid lecturers in conducting their classes. In the e-Learning Guideline for Malaysian Higher Education Institution, published by the Department of Higher Education, Ministry of Education Malaysia (MOE Publication, 2019), it highlighted the development of mobile learning content, as mobile and personal technology is increasingly being acknowledged as an important delivery platform. On the other hand, the Malaysian Communications and Multimedia Commission (MCMC) report shows that smartphones are the most popular devices to access the Internet due to the pandemic situation, showing a near saturation usage level at 98.7% in the year 2020 (MCMC, 2020). Meanwhile, The Internet Users Survey (IUS) which is an annual survey conducted by the MCMC in 2018, showed that 56.8% of Malaysia's population aged between 15-29 years old are smartphone users. The study proved that today's generation of learners are engaged with mobile applications as they are considered as 'tech-savvy'. Therefore, most students in the higher learning institute are familiar with technology and expect to use them as part of their learning process. In addition, studies by Teong and Ang, (2016) and Al-Emran et al. (2020b) agreed on the fact that Malaysian higher learning institute students spend a major portion of their time in accessing the Internet, for academic and extracurricular purposes.

The e-Learning Guideline for Malaysian Higher Education Institution (MOE Publication, 2019) encouraged the use of gamification as one of the contemporary approaches in the learning content development. Gamification in teaching and learning is one of the approaches to diversify the content and structure of the programme. This approach is also parallel with the governments' Policy in Malaysia Education Blueprint

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BIODATA OF STUDENT

Rosfuzah binti Roslan was born on the 04th of October 1984 in Selangor, Malaysia. She practically grew up and received her early education in Johor Bahru, Johor, Malaysia. In 2002, she started her diploma study in Computer Science (IT) at UTM, Kuala Lumpur City Campus. Then, she furthered her Bachelor Degree in 2005 at UTM, Skudai, Johor. Immediately after graduating in 2008, she pursued her Master Degree from the same higher education institution, focusing on Bioinformatics research. Having completed her research in June, 2009, she received a job opportunity as a System Analyst at the Malaysian Ministry of Education (MOE) in Putrajaya. She served at MOE for about three years and four months, in the system and application development unit related to the educational management of students and teachers. With that experience, she applied for a teaching position for diploma programme at Universiti Tun Hussein Onn Malaysia (UTHM) in 2013 and is still providing her service as an academician until present. In the end of 2020, she had the opportunity to pursue her PhD at Universiti Putra Malaysia (UPM) with the aim to gain knowledge in educational technology, so as to later apply it into her teaching and learning sessions.

LIST OF PUBLICATION & COPYRIGHT

NON – CIJ PUBLICATION

Proceedings

Roslan, R., Ayub, A. F. M., Ghazali, N., Zulkifli, N. N. M. & Hanifah, S. S. A. (2021). Stimulating students' self and peer assessment by incorporating e-Quiz and a strategy game in a gamified mobile application. In *Proceedings of the International University Carnival on e-Learning (IUCEL) 2021*, pp. 683 – 690. eISBN: 978-967-16241-3-5

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Malaysian pre-school animal education Virtual Reality (VR) application. In *Johor Innovation Invention Competition and Symposium 2023 (JIICaS 2023)*, UiTM, Pasir Gudang, Johor, Malaysia, (3rd Septembar 2023), pp. 105 – 115. e-ISBN: 978-967-0033-17-4

Book Chapter (related to the MDA Gamification Framework research)

Roslan, R., Ayub, A.F.M., Roslan, R. (2022). Blending gamification and virtual reality (VR) for Malaysian preschool animal education. In *Advancement in Learning and Instruction, Perspectives and Practices of Gamification* (pp. 113 – 136), Nova Science Publishers. https://doi.org/10.52305/WUPF8356.

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SCOPUS PUBLICATION

Journal

Roslan, R., Ayub, A. F. M., Ghazali, N., & Zulkifli, N. N. (2021). The influence of perceived ease of use, perceived usefulness, social influence, and perceived enjoyment towards continuance intention in using a gamified e-quiz mobile application. *Journal of Institutional Research South East Asia*, *19*(2), 283 – 310. http://www.seaairweb.info/journal/articles/JIRSEA_v19_n02/JIRSEA_v19_n02_All.pdf#page=275

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1. "Virtual Reality MiniZoo (VRMiniZoo)" with MyIPO notification number **CRLY2021J00697** – March 2021 (applying the MDA gamification elements in a VR educational product, established during the EDT5300: Diffusion of Innovation in Educational Technology course)

2. "Predictive Model for Factors Influencing Students' Continuance Usage Intention Towards a Gamified Mobile Application" with MyIPO notification number **CRLY2023M02235** – June 2023 (research model)

LIST OF COMPETITION & CONFERENCE

COMPETITIONS

1. International Putra Innocreative Carnival in Teaching and Learning 2020 (PiCTL 2020), 10th October 2020 - Organizer CADE, UPM (**GOLD Award**)

2. International Competition for Educational Innovation and Research (EduInnovation 2020), 2nd December 2020 – Organizer Faculty of Education, UKM (**SILVER Award**)

3. International University Carnival on E-Learning (IUCEL 2021), 15th – 16th June 2021 – Organizer UUM (**SILVER Award**)

4. 3rd Invention, Innovation and Technology Competition (ITeC 2021), 27th – 29th October 2021 – Organizer UiTM, Seremban, N. Sembilan Campus, Malaysia (**SPECIAL Award – DIAMOND**)

5. International Putra Innocreative Carnival in Teaching and Learning 2021 (PiCTL 2021), 28th October 2021 - Organizer CADE, UPM (**SILVER Award**)

6. Johor Innovation Invention Competition and Symposium 2023 (JIICaS 2023), 3rd Septembar 2023 – Organizer UiTM, Pasir Gudang, Johor, Malaysia (**2 GOLD Awards**, for two entries/projects)

CONFERENCES

1. International Innovation Arsvot Malaysia (IAM 2021) Conference – 10th April 2021

2. 2021 Conference SEAAIR: South East Asian Association for Institutional Research –23th – 24th November, 2021 (**Outstanding Paper Award**)

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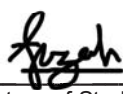

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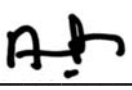

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