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**JOHOR  
INNOVATION  
INVENTION  
COMPETITION  
AND  
SYMPOSIUM  
2023**



"Innovation Inspires a Society  
to be Critical and Creative"

# **JOHOR INNOVATION INVENTION COMPETITION AND SYMPOSIUM 2023**



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Critical and Creative"

**Editors-in-Chief**

**AHMAD KHUDZAIRI KHALID  
NUR INTAN SYAFINAZ AHMAD**



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Kampus Pasir Gudang**

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## **Preface**

**In the name of Allah, the Almighty who gives us the enlightenment, the truth, the knowledge and with regards to Prophet Muhammad (peace be upon him) for guiding us to the straight path. We thank to Allah for giving us guidance and strength to write this e-book.**

**This e-book compiles the extended abstracts that submitted to Johor Innovation Invention Competition and Symposium 2023 (JIICaS2023), where JIICaS2023 is a virtual platform for all creative minds to share and present their invention and innovation. The extended abstracts are divided into two categories, which are Category A (Higher Educational Student/ Any Recognized Institutional Students in Malaysia) and Category B (Primary/ Secondary School Students / Special Education School Students in Johor). Each abstract gives a brief background on the innovation or project.**

**We hope that this e-book will help the readers to get to know the innovation done by the students from both categories and get some ideas to develop future innovation products.**



## IMPROVING A GAMIFIED M-LEARNING APPLICATION BASED ON THE CONTINUANCE USAGE INTENTION INFLUENCING FACTORS

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### ABSTRACT

The inclusion of gamification technology can have a positive effect on the development of innovative mobile-learning (m-learning) application. It is difficult to maintain the students' retention in a m-learning tool, hence measures should be taken by the developers and researchers to keep the users interested in the tool. This study aims to utilise the knowledge gathered from a correlational survey research involving 140 first year Diploma of Information Technology respondents, to find the influencing factors of continuance usage intention towards a gamified e-quiz mobile application among Malaysian Higher Education students. Based on the result of the influencing factors; (i) perceived ease of use, (ii) perceived usefulness, (iii) social influence and (iv) perceived enjoyment, gamification items in the m-learning tool are linked with the constructs. Pearson Correlation Analysis showed that there is a positive relationship between perceived ease of use ( $r_s = .593^{**}$   $p > 0.05$ ), perceived usefulness ( $r_s = .694^{**}$   $p > 0.05$ ), social influence ( $r_s = .720^{**}$   $p > 0.05$ ) and perceived enjoyment ( $r_s = .700^{**}$   $p > 0.05$ ) with continuance usage intention. Further analysis using multiple regression shows that social influence and perceived enjoyment, influence the continuance usage intention among the students with a contribution of 35.1% ( $\beta = .351$ ) and 31.9% ( $\beta = .319$ ), respectively. Tool Improvement Plan (TIP) document can be produced based on the corresponding influential factors. This way, the m-learning tool developers can make wise judgement on important tool upgrades.

**Keywords:** mobile learning, gamification, continuance usage intention, e-quiz

### 1.0 INTRODUCTION

Gamification is referred to as using game design elements within non-game contexts. The main idea is to take the 'building blocks of games and implement these in real-world situations, to motivate specific behaviors within the gamified situation (Deterding et al., 2011). Many studies have highlighted gamification as a promising concept applied within various contexts (Werbach & Hunter, 2012, Zichermann & Cunningham, 2011, Zichermann & Linder, 2013). Hunicke et al. (2004) and Mora et al. (2017) split gamified solutions into three elements as follows; (i) rules (mechanics), (ii) system (dynamics), and (iii) fun (aesthetics), which represent as the MDA framework. The MDA framework acts as a formal structuralist approach to understanding games to bring design, development, criticism, and technical game research closer. Gamification in education is an approach that proposes dynamics in association with game design within the educational environment to stimulate direct interaction with students, allowing them to significantly develop their social, curricular, and cognitive competencies (Alsawaier, 2018).

In education, assessment is a critical phase that supports teaching and learning success, used to monitor the students' learning progress mathematically (Pitoyo et al., 2019). Various types of assessments can be done depending on the academic task given to the students, such as individual assignments, group assignments, midterms, quizzes, and final examinations. Incorporating quizzes and games may encourage long-term retention of material (Vinney et al., 2016), motivate self and peer assessment (Nadeem & Falig, 2020) as well as increase students' interest (Lim & Md Yunus, 2021). Formative assessment based on multiple-choice questions (MCQs) can aid students with different learning styles and prepare them for high-stakes exams (Einig, 2013). Moreover, completing gamified MCQs allows the learners to practice summative assessments in an engaging and motivational approach (Douglas & Ennis, 2012). With vast selections of existing gamified e-quizzes platforms and applications, educators are left with an important decision to select the best tool that suits their students and the teaching and learning requirement. Often, an educational institution will come up with its educational products to accommodate the needs of its students, educators, academic administrators, and management (Troussas et al., 2020; Zakaria et al., 2020).

Although the user acceptance of new technological product is a challenge, it is more strenuous to keep the existing users interested in using the accepted or adopted product for a long time. Hence, it becomes essential for a technological product to be evaluated from the users' perception. It will determine their intention towards its use which eventually affects the decision-makers on the necessity of maintenance and future upgrade of their 'in-house developed product. Research associated with continuance usage intention on product usage of e-learning (e.g., Muqtadiroh et al., 2019), massive open online course (MOOC) (e.g., Dai et al., 2020), learning management system (LMS) (e.g., Ashrafi et al., 2020) and mobile learning application (e.g., Tam et al., 2020) had been made. However, research on continuance usage intention specifically for a gamified e-quiz mobile application has not been explored much. Therefore, this study aims to investigate the factors related to an individual continuance usage intention to use a gamified e-quiz mobile application named Kingdom Quizzes (KQ), which are essential to any technology implementation, and to understand the reasons technologies discontinuance.

## **2.0 OBJECTIVE**

The study aimed to explore the influence of students' perceived ease of use, usefulness, enjoyment, and social influence on students' continuance usage intention in using a gamified e-quiz mobile application.

## **3.0 DESCRIPTION OF INNOVATION/METHODOLOGY**

This study implemented a correlational research design to predict factors influencing continuance usage intention in using gamified e-quiz mobile application among Malaysian Higher Education institution students. Data were collected among 140 first-year students from the Diploma of Information Technology program, Universiti Tun Hussein Onn Malaysia (UTHM) at one specific point of time conducted at the end of their study semester. These students are the registered users of the technological product named Kingdom Quizzes (Roslan et al., 2021). The students used Kingdom Quizzes application for one semester in their online learning session. The quizzes were executed using their own mobile devices starting from the second week of the semester. In the 12th week of the semester, the students were given a Google Form link for the questionnaire in which they were required to fill in during the virtual class session using Google Meet.

For the study, the researchers developed an instrument to collect the data. The questions were divided into two sections: Section A: Demography and Section B: Close Ended Questions. There are five variables in this study: four independent variables (perceived usefulness, perceived ease of use, perceived enjoyment, and social influence) and a dependent variable

(continuance usage intention). Eight items of perceived ease of use construct were adapted from Davis (1989), Sánchez and Huerous (2010), and Venkatesh et al. (2012). Meanwhile, eight items were used to measure the perceived usefulness construct adapted from Davis (1989), Sánchez and Hueros (2010), Bhattacharjee (2001), and Venkatesh et al. (2012). The next factor, social influences, consists of seven items adapted from Venkatesh et al., (2003, 2012) scales. The last element, perceived enjoyment, has six items, adapted from Thong et al. (2006) and Venkatesh et al. (2012) scales. Lastly, continuance usage intention, which will assess students voluntarily pursuing or continuing using the Kingdom Quizzes application, has seven items adapted from Bhattacharjee (2001) and Roca et al. (2006) scales.

All the dependent and independent variables were reliable instruments in measuring all the variables studied based on the Alpha Cronbach analysis. Values for the reliability test resulted as follows, perceived ease of use (0.76,) perceived usefulness (0.818), social influence (0.643), perceived enjoyment (0.756), and lastly, continuance usage intention (0.776). SPSS Statistics software was used in the analysis process, which involved all the 140 feedbacks received. The responses were free from missing or invalid data. The instrument was carefully prepared using the Google Form, which enforced the validation (compulsory input restriction) and selection from a drop-down list (scale) to avoid 'garbage' input data. Analyses done were based on inferential statistics (Pearson's correlation) to find relationships between all independent variables towards the dependent variable, regression and also multiple regression to find the level of contribution of all independent variable as predictors for continuance usage intention towards Kingdom Quizzes application.

#### 4.0 FINDINGS

The analysis of the study began with determining the relationships between the four factors with Kingdom Quizzes application continuance usage intention. There was a positive correlation between perceived ease of use ( $r = .593$ ;  $p < .001$ ), perceived usefulness ( $r = .694$ ;  $p < .001$ ), social influence ( $r = .720$ ,  $p < .001$ ) and perceived enjoyment ( $r = .700$ ;  $p < .001$ ) with students' continuance usage intention, as being displayed in Table 1.

Table 1: Correlation coefficients between the four variables with continuance usage intention

	<b>Perceived Ease of Use</b>	<b>Perceived Usefulness</b>	<b>Social Influence</b>	<b>Perceived Enjoyment</b>
Continuance Usage Intention	.593**	.694**	.720**	.700**

*\*\* Correlation is significant at the 0.01 level (2-tailed)*

Afterward, a regression analysis was also conducted to test the study's objective and identify the different factors influencing the students' intention to use the Kingdom Quizzes application. Table 2 shows the multiple correlation coefficients was 0.610, indicating approximately 61% of the variance of the students' continuance usage intention, accounted for by perceived ease of use, perceived usefulness, perceived enjoyment, and social influence.

Table 2: Model summary

<b>Model</b>	<b>R</b>	<b>R Square</b>	<b>Adjusted R Square</b>
1	.781	.610	.598

*a Predictors: (Constant), Perceived Enjoyment, Perceived Ease of Use, Social Influence, Perceived Usefulness*

Meanwhile, Table 3 indicated that the influencing factors were statistically significant at 0.05 level of significance ( $F(4,139) = 52.76, p = .000$ ). This showed that any factor listed could significantly predict the continuance intention to use the Kingdom Quizzes application.

Table 3: ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig
Regression	34.77	4	8.693	52.76	.000
Residual	22.24	135	.165		
Total	57.01	139			

*a Dependent Variable: Continuance Usage Intention*

*b Predictors: (Constant), Perceived Enjoyment, Perceived Ease of Use, Social Influence, Perceived Usefulness*

On the other hand, Table 4 illustrates the results of the multiple regression analysis which indicated that social influence and perceived enjoyment manage to influenced the students' continuance usage intention towards Kingdom Quizzes application. The relative order of preference of the predictive factors was based on beta values ( $\beta$ ) which are summarised as follows: social influence ( $\beta = .351$ ), and perceived enjoyment ( $\beta = .319$ ). In other words, social influence contributed 35.1% of the variance, and perceived enjoyment explained 31.9% in students' continuance intention to use the Kingdom Quizzes application.

Table 4: Model coefficients

Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig
	B	Std. Error	Beta		
Constant	.237	.292		-.809	.420
Perceived Ease of Use	.101	.098	.079	1.022	.308
Perceived Usefulness	.137	.111	.125	1.233	.220
Social Influence	.344	.091	.351	3.774	.000
Perceived Enjoyment	.407	.108	.319	3.793	.000

*a Dependent Variable: Continuance Usage Intention*

## 5.0 ADVANTAGE/IMPACT/RESULTS/NOVELTY

The results showed that users' continuance usage intention towards a gamified e-quiz mobile application is predicted by social influence and perceived enjoyment with beta values ( $\beta$ ) 0.351 and 0.319, respectively. Although all the four studied factors appeared to have positive relationships towards continuance usage intention, only social influence and perceived enjoyment ( $p = .000$ ) were defined as the predictors. In contrast to previous research (Tam et al., 2020; Singh 2020), which gave high regards on perceived usefulness and perceived ease of use factors towards influencing the continuance use intention of a technological product.

The strengths of those positive relationships between perceived ease of use, perceived usefulness, social influence, and perceived enjoyment with continuance intention were analyse based on the rule of thumb Guilford and Fruchter (1973). The result of  $r$  for perceived ease of use ( $r = .593; p < .001$ ) indicated moderate relationship with continuance usage intention. Meanwhile, perceived usefulness ( $r = .694; p < .001$ ) also showed a moderate relationship. However, social influence and perceived enjoyment showed high relationships with continuance usage intention based on  $r = .720$  and  $r = .700$ , respectively. The findings in this research highlighted the perceived enjoyment as a strong factor and has a high relationship towards continuance usage intention with 31.9% contribution. Meanwhile, social influence accounted for 35.1% of the variance, which serves as the highest contributor. These

factors explained a considerable 61% variance of continuous intention to use Kingdom Quizzes application.

The result revealed that an individuals' intention to continue using a gamified e-quiz mobile application is affected by the variables of perceived enjoyment and social influence. However, when comparing the results of this study with those of previous continuance use intention studies, it differs in terms of perceived usefulness and ease of use being significant predictors for continuance intention of a technological product. Firstly, to explain the inconsistency result of perceived usefulness and perceived ease of use, it may be because the second-semester students already have experienced other educational platforms (e-Learning) such as LMS, MOOC, and mobile applications products (M-learning) in their first semester of study, which means that they are already used to those products performing significant academic tasks successfully with ease, hence it has become somewhat of a norm for them, that a product will manage to fulfil its purpose effortlessly. Secondly, to explain the reason of perceived enjoyment appealed more in this study's finding, using an educational gamified mobile application product seemed to offer the students a new experience, perspective, and expectation. A gamified mobile application considers the theory of gamification in educational settings to provide content in an attractive mode to gain a higher level of attention from learners.

Contrary to the conventional educational product, for instance, mobile application or learning management system (LMS) that do not incorporate any gamification elements, the gamified mobile application was initially constructed to entice and motivate learners to perform academic tasks wherever they are. Thirdly, regarding the highest contributed factor for continuance intention, which is the social influence (35.1%), this result indicated that gamified e-quiz mobile application users were managed to be coerced, persuaded, and pressured into using the educational product whether from their circle of friends, family, peers, educator or even the institution itself. The feeling of being influenced will naturally affect their behavior. This notion has also been approved in previous research, such as in Lee (2010) and Chen et al. (2012) studies.

## **6.0 CONCLUSION**

Based on the results of this study, factors perceived enjoyment and social influence were proven to have strong influences toward continuance usage intention. This indicated that creating fun, interactive, and engaging educational content in a mobile application that helps connect educators, students, and their peers, are helpful activity for users' continuance intention. The gamification items that correspond to these significant predictors also indicate that the utilisation also had a significant effect. This shows that the construction of attractive and engaging gamification items will secure the effectiveness of the gamification-based, educational technological product. This should be taken rather seriously by the education institutions' management as it also determines the future direction of the painstakingly developed product, which should also be a worthy investment in the quest to populate their institutions' online learning resources. It can be summarised that constructing educational content through gamification techniques would be an impetus to students' continuance use intention (Hassan et al., 2019; Shi et al., 2019). Therefore, it is best for the developers or researchers to produce a tool improvement plan (TIP) document based on the findings for restructuring or upgrading the products' gamification items accordingly. This will act as a clear guideline for the technical team in conducting the products' maintenance and as a reference document for the stakeholders in making product upgrade decisions.

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