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The Adoption of Students' Hedonic Motivation System Model to Gamified Learning Environment

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Abstract

The acceptance of gamified learning environment is rapidly becoming inevitable in educational learning environment. This gives a widespread popularity by deploying Gamification in to present day curriculum as part of a new educational technology tool. This study addresses perception and usage of gamified learning environment from hedonic motivation perspective through incorporating the Hedonic-Motivation System Adoption Model to Gamified Learning Environment. In this study, a model was developed and tested using a Structure Equation Modelling technique. The results show that perceived usefulness, perceived ease of use, enjoyment and control all have a significant positive relationship with behavioural intention of use and focused immersion which indicates that the acceptance of Gamified Learning Environment could serve as a new educational tool to expedite the improvement of pedagogical and instructional technology. Also, increases students' motivation and engagement in learning. On the contrary, we also found a negative relationship exists between enjoyment and focused Immersion. Possible research on the effect of enjoyment on focused immersion in gamification could be another area of concentration. In this study, aside from the introduction, the literature explains the adoption of the gamified learning environment and the hedonic motivation model at the end, the analysis and interpretation of our methodology were discussed.

Keywords: Educational technology, Gamified learning environment, Gamification, Hedonic motivation, Motivation, Learning outcomes

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1 Introduction

The world is changing, organization, institutions, health-care, transportation and others are migrating to the digital technology age which referred to as digital immigration [28]. Mapping educational technology to education and training is a way of transition giving digital immigration autonomy in learning and training. Scholars try to use cutting edge technologies to increase learning by migrating fully to digital technology, through mapping technological tools in education and training. There are no denials that web 2.0 technologies - video and photo sharing, chatting and gaming via the internet are part of the proofs of educational technology increases learning [35].

Educational technology is described as the use of technology to enhance learning or training performance. E-learning is learning through the internet, while information and communication technology is universally an acceptable means of connecting or networking all devices with the purpose of bridging the gap of communication [25]. However, the enchancement of technological and information tools provides interaction abilities which when mined create engagement [43]. Gaming online, video on demand, websites, and emails connects people and when people come together in a controlled environment, creates an online community experience. This creates an unconscious collaborative community experience that motivates student's participation and engagement in learning and training.

The use of supportive ICT connectedness in learning triggers learners' motivation within a learning environment [23], [10]. By creating an online interactive learning environment alone is not enough to keep students motivated. Though mapping an online interactive environment (which is termed as edutainment) with pleasantries such as game elements triggers student's behavioural intention, assessment and monitoring of students learning.

This is where gamification serves as the new mainstream in the online learning community. In assigning points, badges and other game elements to learning activities. Game elements implementation in learning activities has to be in line with the stated goal and within an online learning environment in order to provide an evidence of engagement with the learning materials. This is because student logs in a gamified learning environment do not mean he/she studied the learning materials. It is evidential that involving game mechanics such as time spent, clicks and scrolls on a given activity create game elements which provide assessment and monitory system, self-assessment as well as competitiveness in learning and training.

Current studies pointed out some limitation on increasing students or trainee performance, engagement and motivation in learning and training [4], [10], [44]. The adoption of gamification in learning and training gives room for increasing classroom engagement [35] as mentioned earlier. Therefore, this study aimed at using Gametize online application to gamify learning and training for undergraduate students of Cyprus International University. The Gametize gamification environment provided an acceptable gamified environment that results in an evidential increase in student's motivation and engagement in learning.

This paper is organised as follows: The next section is the literature reviews - adoption of motivation model to the gamified learning environment, hedonic - motivation system adoption model (HMSAM) and adoption of the gamified learning environment are discussed. Second, we discuss the applied research methods. Third, we report on the analysis, results and detailed discussion on the development of the research framework. Fourth, we discuss the implication and application of HMSAM to the Gamified Learning environment. Finally, we conclude on general reviews and discussion on future research.

2 Literature Review

The literature section proposes research framework, the relevant theory and the different constructs adopted in the study, and hypothesizing relationships among these variables.

2.1 The Adoption of Motivation Model to the Gamified Learning Environment

Gamified Learning Environment (GLE) or gamification is a process or an application of game mechanisms to the non-game environment to improve and motivate student learning behaviours [14], [23], [29], [39]. According to the Horizon Report of Higher Education 2017 Edition which described gamification as part of new technological innovations that educational institutions need to adopt in order to improve student learning performance [7]. The report added that gamification is the future form of increase students' engagement and participation in learning. Many research and analysis have examined student motivation towards gamification [6], [27], [32]. In an attempt to acclimatize to moving trends in educational technology, the adoption of gamification to increase motivation is a new essential practical application to assist educational stakeholders in creating a user-friendly learning environment that will meet educational needs [4], [7], [16].

In an empirical study on exploring the impact of intrinsic and extrinsic motivation on the undergraduate students' participation and performance in an online gamified learning intervention. [9], [35] found out that gamification practices have a positive impact on student learning. Their results show a positive impact on student participation and motivation.

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[9], [35] also stated that students' motivation depends on the what triggers their motivation which could be created based on the game element such as badge, points, leaderboard, and progress bar. Other related studies on student motivation on the use of gamification in online learning environment have shown positive results in learning and training with gamified educational platforms, methodologies and theories in different learning circumstances such as - gamified pedagogy, classroom live, collaboration, self-regulated learning and diversifying of ideas, concepts of scaffolding and self-reflection among students [12], [13], [19].

According to [16], the use of gamified pedagogy for gamification help students to improve self-motivated learning, participation with course content and collaboration. In addition, [39] stated that proper implementation of gamification in e-learning platform increase students' motivation, satisfaction, engagement, effectiveness and efficiency. Currently, only a few studies on student motivation on the use of gamification in online learning environment have been worked upon [4], [31]. Studying students' motivation with a simultaneous study of student's acceptance on the use of GLE for learning and training provide convincing thinking approach of studies on the adoption of GLE in education [4], [44]. However, no attempt on use of student's hedonic motivation, as an acceptable means of studying student's motivation in a gamified learning environment has been addressed. Therefore, this study adopts the hedonic motivation model to study the motivational factor based on the intention to use gamified learning environment.

2.2 Hedonic - Motivation System Adoption Model (HMSAM)

Technology acceptance model (TAM) is the most used model for the acceptance of information technology and information system [29]. However, TAM is limited in addressing intrinsic motivation especially cognitive absorption - an individual's sensory/cognitive curiosity, control, fun and enjoyable, engagement and temporal dissociation. HMSAM [30] is an HMS (Hedonic - motivation System) acceptance model grounded as an alternative to other theoretical perspectives such as TAM (Technology Acceptance Model) and unified theory of acceptance and use of technology (UTAUT) [3], [41], [46]. HMSAM was developed to address users' underlying intrinsic motivations in a process-oriented context most especially in online gaming, virtual worlds, social networking and gamified learning environment [31]. The HMSAM generally [3], is the combination of hedonic Motivation system (HMS) [31], perceived ease of use (PEOU) and behavioural intentions to use (BIU) where HMS serves as the key mediator for the technology acceptance model with a concurrent study on user motivation [41], [46].

The HMS constructs are well defined as follows [3], [31], [45]:

Main dependent constructs which include:

- Behavioural intention to use - (individual's intention to perform a behaviour which can be attitude,
- Subjective norm and perceived) and immersion - the experience of total engagement where other attentional demands are in essence.

The independent constructs are:

- Perceived usefulness - the degree to which a user believes that using technology will increase his/her performance;
- Perceived ease of use - the degree to which a user believes that using technology is free of effort;
- Curiosity - the extent to which the user's experience arouses his or her sensory and cognitive curiosity;
- Joy - the pleasurable aspects of the interaction described as being fun and enjoyable;
- Control - the user's perception of being in charge of the interaction and
- Temporal dissociation - the inability to register the passage of time while engaged in an interaction.

From HMSAM (see Figure 1), perceived usefulness and perceived ease of use are stronger mediators when using joy as a direct influence towards technology [11], [31]. HMSAM has been validated by many studies and found that it plays a significant role in technology adoption [3], [45], in e-learning [40], [46] and story-boarding [31]

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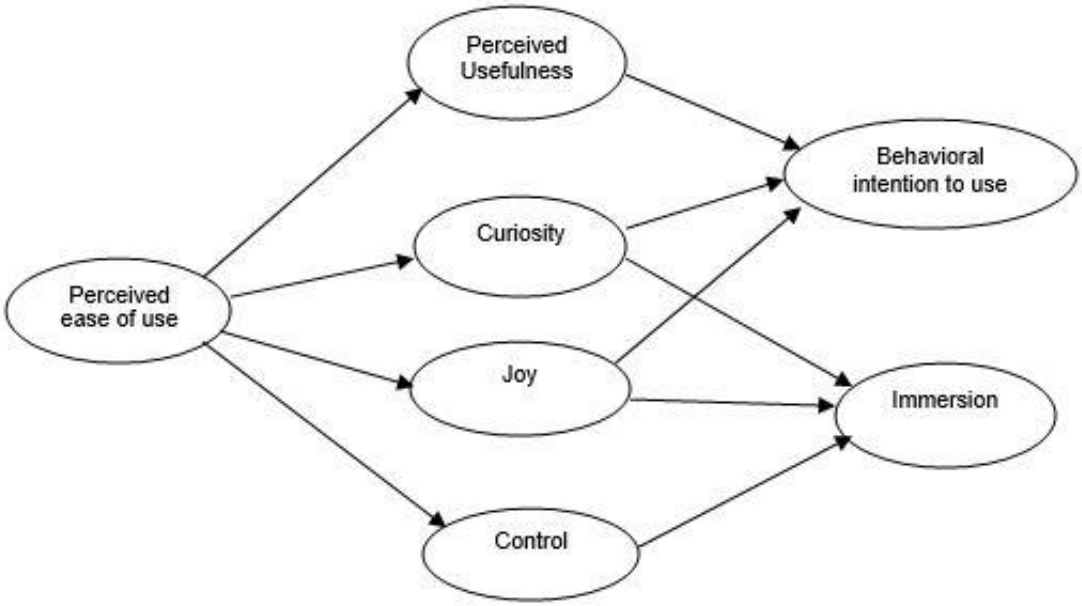

Figure 1: HMSAM (adopted from [31])

2.3 The literature on Adoption of Gamified Learning Environment (GLE)

There is a paucity of literature on users' behavioural intentions or focused immersion that investigated GLE adoption in education. One of the limited literature [26] examined the incorporating of intrinsic motivation into TAM and the study attempted to explain students' behavioural intention by using the e-learning system from a motivational perspective through the quantitative method and the results show that both perceived usefulness and enjoyment have a significant impact on students' intention to use.

In another study on GLE adoption and acceptance, [37] developed a policy on the framework for implementation of gamification through scientific investigation of combine principles of the TAM and Technology-Organisation-Environment (TOE) framework. The methodology used comprises of seven stages of interpretive paradigm and a mixed-methods research design was used and they proposed the integration of academic users' acceptance of macro-level factors.

Based on the existing literature mentioned in section 2.1 and 2.2, there are limited studies on the use of HMSAM to assess undergraduate students' behavioural intention and immersion on the use of GL environment, and this study attempts to address the gap in the literature.

The research questions of this study are as follows:

1. What are the relationships among perceived ease of use, perceived usefulness, joy, curiosity and control towards the use of GLE among undergraduate students?

2. What are the students' hedonic motivational impacts on the use of GLE for learning?

Based on the literature that was reviewed and research objectives. We propose a research model which comprises ten hypotheses that established the relationships among the HMS constructs which are as follows:

H1: Perceived ease of use will have a positive influence on perceived usefulness.

H2: Perceived ease of use will have a significant influence on curiosity.

H3: Perceived ease will have a significant influence on the joy

H4: Perceived ease will have a significant influence on control over GLE.

H5: perceived usefulness will have a significant influence on the intention to use.

H6: Curiosity will have a significant influence on intention to use

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H7: Curiosity will have a significant influence on Focused immersion

H8: Joy will have a significant influence on the intention to use

H9: Joy will have a significant influence on Focused immersion

H10: Control will have a significant influence on Focused immersion

3 Research Methods

To address factors of the hedonic motivational impact of students' behavioural intention and focused immersion on GLE. We used data analysis to address and also to answer the research questions. In this study, data were drawn from the quantitative components of the questionnaire.

3.1 Participants and Procedures

A total of 150 first-year undergraduate students in Cyprus international university, Northern Cyprus were asked to participate in a training course and the participants were asked to participate in Gamified Learning Environment which was developed on Gametize gamification platform. Both Gametize mobile and the desktop platform were used for the training. Gametize is a gamification mechanics that is used for interactive challenges from quizzes, photo prediction student's engagement through storytelling, badges and levels in order to create competition, collaboration among teams and also to motivate clients/student with points and amazing rewards [1]. We used Gametize (mobile and desktop platform) to create an application in form of GLE. This application was demonstrated and presented to the participants with weekly instructions on multi-choice challenges quiz over a period of five weeks. The purpose was to improve their knowledge of educational technology, create interest and made them engaged with the gamified learning environment. The GLE exposed the student to real-life issues, create critical – thinking skills, participate, motivation and collaborate with others.

Gametize platform was made available at the beginning of every week for participants to have enough time to participate in the activity. Every week participants were giving multi-choice quiz challenges that prompted them to engage with topics related to mobile technology in our society. This included quiz challenge on insecurity aspect of mobile technology, ethics and privacy issue on m-technology, new trends on m-technology and personal view on m-technology. Upon the completion of every stage of the quiz, points were awarded and also, students receive rewards (Gold tag for the highest point, silver tag for second and below average will take the quiz again) after completion and earned points for participating. Also, the ranking was done according to Gametize leader-board as determined by the number of points they received after completing their tasks. Participants were also allowed to use the application anywhere as long as the participant complete the task before the end of the week.

An online questionnaire was sent to each participant after the 5th week of training with instructions. The participants were briefed on the purpose of the study and were informed that their participation is strictly voluntary. The participants also had the right to not participate or withdraw from the study at any time. Participants were also informed that no credit would be given for participating in the study and their responses would not have an effect on their academics.

3.2 Instrument

The items employed in the questionnaire comprised validated items adapted from empirical studies on HMSAM [31], [38]. These items comprise 27 open-ended question as follows - four items on perceived ease of use; four items on perceived usefulness; four items on behavioural intention toward use; four on enjoyment; three items on curiosity; four items on control; and four items on focused immersion. Participants were asked to give their responses to each of the questions on a 5-point Likert scale, alternating from 1 (strongly disagree) to 5 (strongly agree). The respondents were asked to answer the open-ended questions on the learning experience while using the GLE.

4 Data Analysis and Results

A measurement model and structural equation model were used for data analysis [5], [17]. In other to verify the validity and reliability of data, the first approach called the Measurement model was assessed based on the Confirmatory factor analysis (CFA). Secondly, the structural equation model based on latent constructs was used to assess the model by testing the hypothesis among the constructs.

4.1 Measurement Model Analysis

The section addresses data analysis based model measurements, Goodness of fit of the model and results of the experiment conducted in the study.

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4.1.1 Confirmatory Factor Analysis (CFA)

Confirmatory factor analysis CFA is a measurement model that validate the reliability of a questionnaire. This started by item cleansing using factor analysis that is all the factor loadings must greater than or equal to 0.7 as an acceptable value for structural equation modelling technique as shown in Table 1. Principal component analysis (PCA) was also applied in order to analyse all the items. As shown in Table 1, the reliability test for Cronbach's alpha values was found to be higher than 0.7 which indicates a good reliability scale as also mentioned by [16], [18]. Other results such as a test of convergent validity were implied by the use of average variance extracted (AVE) and composite reliability values(CR) when higher than 0.7 which also indicated that all proposed items were sufficient to represent their main constructs [17], [42]. The AVE values exceeded 0.5 which indicated that the constructs passed the test for convergent validity [16].

Table 1: Confirmatory factor analysis

Constructs	Indicators	Items	Factor Loadings	Cronbach 's alpha	Average variance extracted (AVE)	Composite reliability (CR)
Perceived ease of use (PE)	PE1	I find GLE easy to use.	0.939	0.962	0.866	0.963
	PE2	My interaction with LMS is clear and understandable.	0.888			
	PE3	I find it easy to get GLE to do what I want them to do.	0.974			
	PE4	Interacting with GLE does not require a lot of mental effort.	0.919			
Perceived usefulness (PU)	PU1	Using GLE improve my learning.	0.950	0.944	0.824	0.948
	PU2	Using GLE enhance my effectiveness.	0.974			
	PU3	Using GLE enhance my productivity.	0.704			
	PU4	I find GLE a useful tool in my learning.	0.974			
Behavioural intention towards use of GLE (AT)	AT1	GLE makes learning more interesting.	0.952	0.975	0.906	0.975
	AT2	I look forward to lessons that require me to use GLE.	0.954			
	AT3	Working with GLE is fun.	0.954			
	AT4	I like the idea of using GLE.	0.947			
Joy of using GLE (JOY)	JOY1	I found playing the game on GLE to be enjoyable.	0.963	0.939	0.809	0.944
	JOY2	I had fun using GLE for the game.	0.892			
	JOY3	Using the GLE was boring.	0.956			
	JOY4	The GLE left me unsatisfied.	0.774			
Control over GLE (CTL)	CTL1	I had a lot of control of GLE.	0.939	0.971	0.896	0.972
	CTL2	I was in control of GLE.	0.980			
	CTL3	I had no control over my interaction with GLE.	0.968			

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Table 1: continuation						
	CTL4	I was allowed to control my interaction on GLE	0.896			
Focused Immersion on GLE (FI)	FI1	I was able to block out most other distractions	0.957	0.981	0.929	0.981
	FI2	I was absorbed in what I was doing.	0.955			
	FI3	I was immersed in the use of GLE.	0.972			
	FI4	I was distracted by other attentions very easily.	0.972			
Curiosity on GLE (CUR)	CUR1	This experience excited my curiosity.	-0.879	0.759	0.622	0.738
	CUR2	This experience made me curious.	1.124			
	CUR3	This experience aroused my imagination.	0.544			

Discriminant validity was carried out to test the extent to which a construct is absolutely distinct from other constructs [17]. Discriminant validity was assessed by comparing the square root of the AVE for the given construct with the correlations between that construct and all other constructs. As shown in Table 2, the square root of the AVEs was higher compared with the cross-wise values in the rows and columns in the matrix. However, this suggested that the construct is strongly correlated with its items than with other constructs in the model. Hence, the discriminant validity of all the items and constructs were acceptable and deemed adequately for further analyses.

Table 2: Discriminant validity for the measurement model

Construct	**PE**	**PU**	**CUR**	**JOY**	**CTL**	**AT**	**FI**
PE	**0.8989**						
PU	0.7614	**0.8593**					
CUR	0.1239	0.1152	**0.6093**				
JOY	0.6591	0.8353	0.1125	**0.8515**			
CTL	0.5121	0.7500	0.1171	0.8320	**0.9210**		
AT	0.8246	0.8005	0.0680	0.7264	0.8724	**0.9298**	
FI	0.7378	0.8591	0.1265	0.7438	0.8819	0.9077	**0.9468**

Note- Crosswise elements are the square root of the variance extracted. Off-diagonal elements are the correlations among constructs.

4.1.2 Measurement of Structural Equation Model

The structural equation model was tested using ADANCO 2.0 software [15]. The purpose of [15] is to evaluate the model structural fitness of the constructs. We also examined the significance level of hypothesis path of the structural equation modelling (SEM). The purpose of SEM is subjected to its multivariate technique that combines factor analysis and multiple regressions to simultaneously examine a series of interrelated dependence relationships among measured variables and latent variables as well as several latent constructs [17]. However, a variety of indices such as Standardized Root Mean Square Residual (SRMR), Goodness of Model Fit (GOMF), and Normed Fit Index (NFI) were used to test the overall fitness of the model. These fit indices are usually used to signify multiple categories of model fitness that measure the level of Partial least squares (PLS) fitness and estimated value.

The Standardized Root Mean Square Residual value (SRMR) is 0.077 (< 0.08) and the Normed Fit Index (NFI) is 0.976 (> 0.90) and the d_ULS(squared Euclidean distance) of saturated model < bootstrapped HI 95% of dULS estimated model and d_G (geodesic distance) of saturated model < bootstrapped 95% of dG of estimated model which indicated that the data fits the model well. The model finds good fitness in light of previous recommended or accepted values [8], [17], [20], [36]. Therefore, it was concluded that the measurement and structural model are acceptable.

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Table 3: Measurement indices

		Results	
Measurements	**Criterions**	**Saturated Model**	**Estimated Model**
SRMR(GOMF)	< 0.08	0.077	0.079
d_ULS		1.673	1.942
d_G1		11.320	13.287
d_G2		9.437	10.827
NFI	> 0.90	0.976	0.985

Furthermore, the proposed hypotheses were tested and the result of the path coefficients of the structural model as shown in Figure 2. The result indicated that Perceived ease of use (β=0.986, t=548.57, p<.001) has a significant positive relationship on Perceived usefulness; Perceived ease of use (β= -0.226, t=-5.35, p<.001) also has a significant positive relationship with Curiosity; Perceived ease of use (β= 0.979, t=462.59, p<.001) has a significant positive relationship with Joy; Perceived ease of use (β= 0.955, t=232.52, p<.001) has a significant positive relationship with Curiosity; These findings support H1, H2, H3, and H4, respectively. The Perceived usefulness of GLE, it was found that Perceived usefulness has a significant relationship with the Behavioural intention (β=0.275, t=6.525, p<.001) which supports H5. Also, Behavioural intention (β=0.0538, t=4.068, p<.001), has a positive significant relationship with Curiosity which supports H6.

For the seventh hypothesis, there was a negative relationship found between Focused Immersion and Curiosity (β=-0.0174, t=-2.725 with non-significant value p<.0065) as shown in Figure 2. Hypotheses 8 and 9 showed that Behavioural intention (β=0.711, t=16.770, p<.001) and Focused Immersion (β=0.215, t=6.979, p<.001) have a significant positive relationship with Joy. Hypothesis 10 suggested a significant positive relationship between Control and Focused Immersion which was also supported with (β=0.780, t=25.542, p<.001). All results indicate that the proposed hypothesis was supported except H7 as shown in Table 4.

Table 4: Hypothesis testing results

Effect	**Original coefficient**	**Standard bootstrap results**				
		Mean value (β)	**Standard error**	**t-value (t)**	**p-value (2-sided)**	**p-value (1-sided)**
PE -> PU	0.9804	0.9803	0.0018	548.4487	0.0000	0.0000
PE -> CUR	-0.2258	-0.2236	0.0422	-5.3526	0.0000	0.0000
PE -> JOY	0.9793	0.9793	0.0021	462.5901	0.0000	0.0000
PE -> CTL	0.9549	0.9550	0.0041	232.5227	0.0000	0.0000
PU -> AT	0.2746	0.2723	0.0421	6.5255	0.0000	0.0000
CUR -> AT	0.0538	0.0533	0.0132	4.0679	0.0001	0.0000
CUR -> FI	-0.0175	-0.0174	0.0064	-2.7247	0.0065	0.0033
JOY -> AT	0.7084	0.7107	0.0422	16.7697	0.0000	0.0000
JOY -> FI	0.2151	0.2145	0.0308	6.9786	0.0000	0.0000
CTL -> FI	0.7796	0.7802	0.0305	25.5419	0.0000	0.0000

5 Discussions

This study sought to apply the HMSAM to examine undergraduate students' behavioural intention and focused immersion toward the use of GL environment. Specifically, the survey examined the influences of six constructs, namely, perceived usefulness, control, curiosity, joy, attitude and focused immersion towards GL tool. Ten hypotheses of HMS model constructs were used and were all supported successfully except hypothesis seven.

The results showed that six constructs explained 93.4% & 98% of the total variance in students' behavioural intention and focused immersion on the use of GLE respectively. Hence, the HMSAM is a valid and efficient model to explain participants' intention and focused immersion on the use of GLE which also correlates with previous research [31].

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It is, however, shown from the result that Perceived ease of use (PE) is the strongest predictor of Perceived usefulness (PU) in the HMSAM same as in the Technology Acceptance Model [21], [22]. This result suggested that with the use of GLE, students are likely to comprehend its usefulness since the GLE does not need serious instructions or preparations to understand. Likewise, it also confirmed that PE and PU have an influence on Behavioural intention (AT) pertaining to the use of GLE. And then, it is better concluded that PE is stronger than other predictors as mentioned in previous studies [31]. In accordance with HMSAM model, PE's effects on AT and Focused Immersion on GLE (FI) are fully mediated by curiosity, control, PU, and JOY [31]. That is the PE has a significant effect on other variables that influence the use of GLE due to ease of use, students' interest and its usefulness.

Similarly, it was found that a there is a positive relationship between JOY and Focused immersion; Control over GLE (CTL) and Focused immersion. Prior to the studies, suggested that enjoyment can have an indirect impact on behavioural intention through other variables [34], [44]. The results of this study indicated that the student derives enjoyment from the use of the GLE which directly facilitates behavioural intention through the variety of intrinsic factors of GLE such as improvement of different game elements available on the platform. Also, these results supported the study of Van der Heijden [41] that perceived enjoyment is part of the determining factors for the technological behavioural intention to use. Therefore, the enjoyment or fun created by the expectation of an internal psychological reward is enough to motivate and sustain the behavioural use of the GLE. In turn, these interactions relating to a gamified learning environment further reinforce desirable to improve student experience and engagement. According to [31] control increases immersion also in our study control has shown a significant effect on Focused immersion that is participants developed positive feelings about the control over the use of GLE which helped them to be more engaged with it, with that more and new knowledge is acquired. Therefore, CTL over GLE contributes to the experienced participant would gain during the period of engaging with the GLE and thereafter.

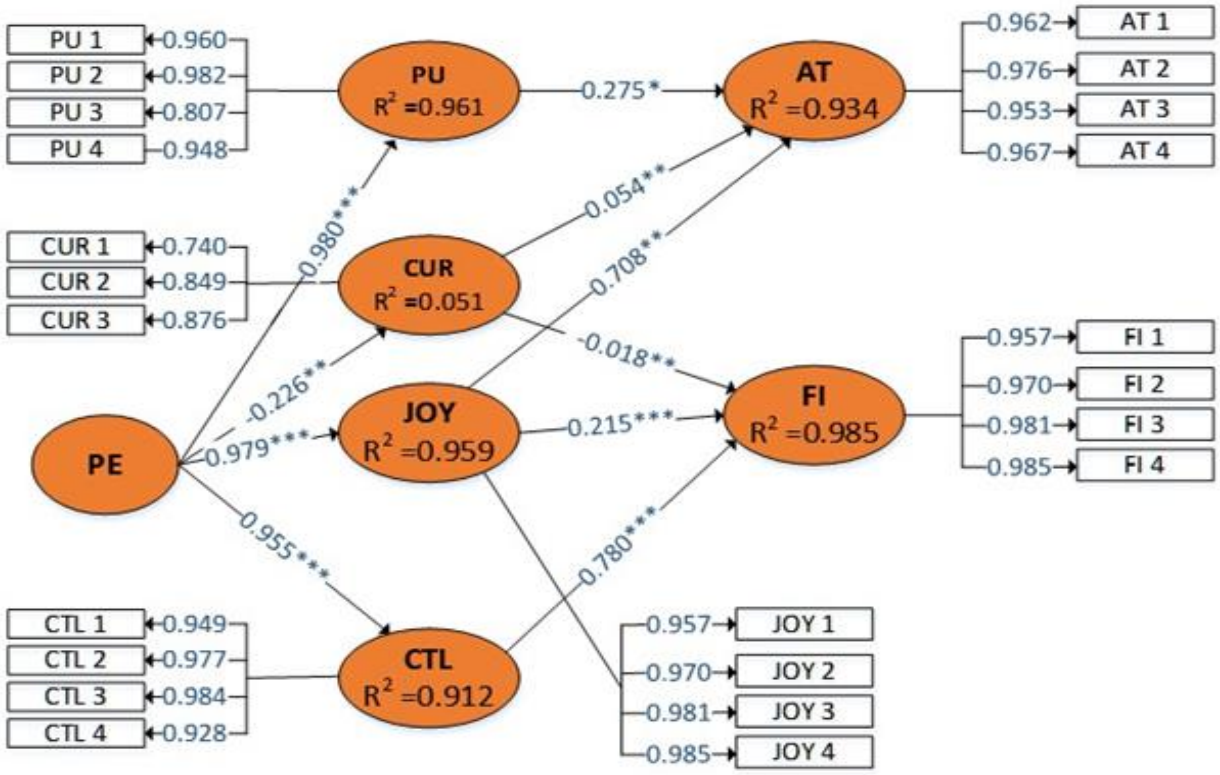

Figure 2: Levels of significance and results of the structural equation model

In this analysis, there was a positive effect found among the participants, the relationship between curiosity and focused immersion is not statistically significant. Though this finding is consistent with the finding of [24] that stated that immersion can not only be viewed as a positive experience, it could have negative factors such as negative emotions and uneasiness with the learning environment. Other possible reasons might be different from experience gained from the GLE. However, stakeholder could use GLE to improve their educational development with the aim of promoting student learning activities by engaging them with the use of GLE. The practical implication of this is that the higher the PE of GLE, the more JOY it gives them while using the application and the more they show their behavioural intention to use the platform. This study has shown that there are numerous benefits of using GLE to aid students' improvement on social learning, cognitive absorption level and experience. Ultimately, it is pertinent that educational stakeholders should promote the gamified ease of use through sensitization for positive acceptance in both classroom and online community in order to increase students' interests and usage.

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6 Conclusions and Future Research

This study sheds light on adoption of motivation model to the gamified learning environment, Hedonic - motivation system adoption model (HMSAM) and literature on Adoption of Gamified Learning Environment (GLE) that is the study attempts to address the gap in the literature based on the use of HMSAM to assess undergraduate students' behavioural intention and immersion on the use of the GL environment.

Firstly, the study employed a self-reported multi-choice questionnaire on participants' hedonic experience on the use of Gametize as a tool for the gamified learning environment. This training on gamification might be subjected to bias data on what they experienced during the training due to the fact that they were not subjected to any general supervision. Secondly, the four constructs in the HMSAM were used for the study. However, CA comprises five sub-construct leaving temporal dissociation unexplained in the study. Hence, a future study could focus on temporal dissociation as part of the construct to be included [2], [33]. The study was based on a training on gamification that lasted for five weeks, therefore other methods could as well be applied such as pre-test and post-test study on the students' perception on the use of GLE. Future study should also consider qualitative approach specifically interviews which would give a better result. Further research on gamification should consider whether GLE should be accepted as a new platform for educational development in the learning environment.

In addition to this study, no demographics was considered even though gender could be part of the factor in gamification attraction. We used a GLE, the data collected were from undergraduate participants only and were collected outside the platform. Future research might consider other GLEs and of course different university, and different geographic locations. Finally, this study suggested that the HMSAM is a promising and effective model to predict undergraduate students' acceptance of the GLE using Gametize platform. It was found that students' behaviour intention and focused immersion on the use of GLE correlate with previous research. Even though this study was conducted in the context of GLE using Gametize, the findings should also interest the stakeholders in adding gamification to school curriculum as a new educational tool to improve pedagogies and instructional with the aim of supporting students' learning.

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