International Journal of Education and Practice
2019 Vol. 7, No. 3, pp. 136-145
ISSN(e): 2310-3868
ISSN(p): 2311-6897
DOI: 10.18488/journal.61.2019.73.136.145

UNDERSTANDING THE IMPACT OF DETERMINANTS IN GAME LEARNING ACCEPTANCE: AN EMPIRICAL STUDY

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Article History
Received: 14 January 2019
Revised: 6 March 2019
Accepted: 12 April 2019
Published: 31 May 2019

Keywords
Game learning
Innovation diffusion theory
Expectation confirmation model
Student satisfaction
Student continuous intention
Habit
Triability
Compatibility.

ABSTRACT

This study aimed to integrate Innovation Diffusion Theory (IDT) and Expectation Confirmation Model (ECM) on user intention of game learning. This study framed 10 hypotheses to investigate the objectives of this study. The results of 8 hypotheses were positive and had a significant impact on students' behavior in the use of game learning. The method used in this research was empirical, with 164 valid respondents. The results found in this research was students' continued intention in the use of game learning (CI), which was directly influenced by student perceived usefulness (PU), student satisfaction (SAT) and student habitual (HAB) while student satisfaction (SAT) was influenced by student perceived usefulness (PU) and triability (TRA). In addition, the findings of this research were predicted to offer useful validation from the antecedents involved in the process of deciding the user continuous intention in game learning. This research also provided a theoretical framework and understanding of the field of user behavior intention for academia and practitioners, who will benefit from the findings of this study and develop applications/software for a more adequate and competent game learning.

Contribution/Originality: This study aimed to integrate IDT and ECM on user's intention of game learning. It assessed the impact of various theoretical determinants on customer's delight and continuous intentions of use of game learning and identified processes that made influences on them. Unlike the previous research which assessed ECM and IDT separately, this study has combined the two models in the context of game learning.

1. INTRODUCTION

Game learning has become a learning pattern whose demand has increased significantly. The use of media is considered more enjoyable in the dissemination of any kind of knowledge and information. In addition, gamelearning has acquired a new educational dimension giving it more academic value. With the development of information technology, game learning users are offered a wider range of choices (Chang *et al.*, 2017; Hariguna *et al.*, 2017; Huizenga *et al.*, 2017). Most of the data, information, and knowledge related to the gaming patterns and learning processes have been digitized, making learning games easily accessible and user friendly through various types of gadgets such as tablets, personal computers, notebooks, and smartphones.

Game learning is different from traditional learning patterns because it offers a rich-interactive audio-visual experience and a better digital alternative. There are several distinguishing features found in game learning such as user-friendliness, timeliness, fast access, endurance, entertainment, ready to be downloaded from websites and can

be played on mobile devices. Game learning also provides benefits as a supporting media for learning, become part of the evolution of new learning patterns that offer richer content, high interactivity, easier search, access, and storage. Users can easily use an application or the web browser to plan their studies online/offline or download needed study material.

Game learning has become popular among public because digitalization has become a global trend. Users have therefore changed their paradigm in learning by switching over to digitization. Although, conventional learning methods still apply, namely face-to-face classes or using reference books in paper form.

At present, Amazon Company has gained market share with the establishment of new industries and new research in the fields of hardware, software, and integrated content creation. Especially with the continuous development of the Internet, it has affected more and more people to begin to discover new experiences in learning, which they may not find in classrooms. By using digital media in game format, games learning becomes a new paradigm in learning that can provide cognitive experience for users. Next, with digital format game learning is distributed by electronic means. In it there are uses of scenarios, images, characters, videos, and audio files that include digital reproduction that comes from conventional learning processes distributed through virtual channels (Looy *et al.*, 2015; Hariguna and Akmal, 2019).

Discussions about game learning opportunities in the community from various industry perspectives pose problems such as how users feel and experience in the context of game learning and aspects that can facilitate further involvement (Looy *et al.*, 2016). Rogers (2003) promulgated the theory of diffusion of innovation which is a process in which ideas or practices are communicated through certain channels from time to time to members in a social system. Diffusion of innovation theory by Rogers (2003) states that users can only accept or reject innovative products or services in light of their convictions regarding this innovation. Hence, several theoretical frameworks can be built for the acceptance of varied game learning with Rogers' theory.

Several previous researches have evaluated the relevance of acceptance of Information System/Information Technology (IS/IT) and this research creates a new research framework for investigating and evaluating user justifications for game learning by integrating ECM and IDT. Hong *et al.* (2006) expressed that factors pertinent to the acknowledgment of IS/IT can be acquired from a few hypothetical structures to comprehend client user inside and out, as has been done in past investigations (eg (Thong *et al.*, 2006; Chen *et al.*, 2009; Lee, 2013; Chang *et al.*, 2016)). Numerous investigations concentrated on fulfillment have utilized IS, for example, Internet banking, web-based interfaces, e-Learning, and Web 2.0 (eg (Liao *et al.*, 2007; Limayem *et al.*, 2007; Sørebø *et al.*, 2009; Hung *et al.*, 2011; Lin, 2012; Chen *et al.*, 2013)). The continuous intention of users can assume a significant activity in its sustainable use, seeing how potential elements can influence the users' behavior and its sustainability (Looy *et al.*, 2016). The ECM model can reflect ongoing user intentions from the point of view of information systems because all the functions of games learning depend entirely on facilitation of information technology.

Hence, the purpose of this study is to assess the effect of various hypothetical determinants on user satisfaction and continuous intention on game learning and to recognize which determinants exert influence on it. Meanwhile existing research evaluates ECM and IDT separately. This study theoretically combines the two models in understanding the use of information technology in the context of game learning.

2. LITERATURE REVIEW

2.1. Theory Expectation-Confirmation Model for IT/IS Adoption

The Expectation Confirmation Theory was first promulgated by Oliver (1980) for research applications in the fields of consumer behavior and service marketing. The basic concept of ECT explains that decisions or intentions of consumers in determining attitudes toward products or services are the result of consumer expectations when using products or services. This theory suggests that before and after the facts occur, the user or customer makes a comparison of the expectations they want. Subsequently, when a fact is confirmed positively or negatively, it will

ultimately have an impact on their satisfaction. The theory also affirms that customer behavior patterns or their intention to buy are formed only before or after making a purchase of a product or service. When the execution of an item or administration like the purchase of a product or service surpasses the customers' expectations, positive affirmation happens, but when expectations are higher than realities, negative affirmation happens. These findings of comparisons of two paradigms tend to have an impact eventually on customer satisfaction.

Satisfaction is a variable that has a link between expectations, confirmation and performance, both directly and indirectly. Referrals to consumer attitudes when buying or using a service can be seen from consumer behavior prior to purchasing a product or service. When the performance of a product or service exceeds expectations, tremendous confirmation occurs. Conversely, when expectancies are better than real consequences, negative affirmation happens. The results of this comparison tend to affect satisfaction with consumers and users, consequently, have an impact on increasing the use of consumer intentions (Bhattacherjee, 2001; Hariguna and Berlilana, 2017; Berlilana *et al*., 2018).

Some of the weaknesses of ECT have been explained by Bhattacherjee (2001) who asserts that perfect expectations can alternate realistically over time and customers can realistically assess their expectancies throughout the confirmation phase. This is illustrated in the behavior of users of IS and IT, which are similar to their intention to repurchase a product.

In IS/IT, there are three stages of decision-making process first the use of IS/IT as application tools, second analysis of the results and the alternatives obtained and third, taking a final decision which can be different from other alternatives. Bhattacherjee (2001) revised the ECT theory and proposed instead the ECM, in order to search, evaluate, and make a more effective explanation of the continuing intentions of IS/IT users. The primary attention was located on post-attractiveness IS/IT behavior, and the pre-recognition conduct consequences covered as latent variables for the satisfaction variable. While ECT focused on pre-adoption expectations, Bhattacherjee (2001) emphasizes upon the importance of post-adoption expectancies by explaining that personal expectancies can change over the time, based on pleasures or satisfaction derived from them.

Recently, ECM is being applied to evaluate the behavior of ICT users and several versions of this theory have been developed (for example (Thong *et al*., 2006; Liao *et al*., 2007; Limayem *et al*., 2007; Sørebø *et al*., 2009; Hung *et al*., 2011; Lin, 2012; Chen *et al*., 2013; Looy *et al*., 2016)). In the context of the current study, the user acceptance theory of game learning can be considered to have a strong relationship for users. It proves to be an effective communication medium, and therefore it is necessary to build a well-designed and communicative interface for all users. However, results of empirical research using ECM and IDT regarding game learning have shown various weaknesses and gaps. To bridge this gap, this study aims to examine how to integrate IDT into ECM in order to evaluate and expect the elements associated with it. It is hoped that this will provide useful insights in the use of video games for learning purposes.

2.2. Innovation Diffusion Theory (IDT)

Rogers, (1995) used nine distinct fields to study the diffusion of innovations in order to gain meaningful consequences established in diverse factors. Using a dynamic system attitude, Rogers (2003) defines diffusion of innovation as a manner in which progressive concepts are transferred among participants of a social gadget via positive channels. It is also stated that individual selections about innovation are not available to users as single moves but in the form of a chain of moves with alternatives. As an end result, innovation, acceptance, and diffusion are closely associated with each other, and one cannot adopt innovation at any given time, even after a user understands the meaning of innovation. A user' level of recognition of innovation is decided with the kind of degree or diploma obtained by a user; in other words, if a user has an advanced degree or diploma, it will be easier and faster for the user to acquire innovation. After feeling the benefits of innovation, the user can develop his or her attitude towards innovation and eventually decide whether or not to accept this innovation.

In concurrence with Rogers, (1995) modern services and products are determined by five distinct characteristics (1) relative excellence, (2) conformity, (3) complexity, (4) testability, and (5) observability. This is evident from a situation when customers belong to an era of profitability, supported by their satisfaction and a positive behavior. Such customers who depend upon the trend in their generation, innovation can be less complicated to apply, easier to comprehend, and easier to test frequently. As an end result, it also turns out to be less conventional for the customers. However, a few studies consider IDT to be a great model for understanding IS/IT recognition, while others have advocated to combine IDT with other theories in order to overcome a rapid transformation into IS/IT paradigms (eg (Zhang *et al*., 2008; Agag and El-Masry, 2016; Chang *et al*., 2016; Shiau and Chau 2016)). Game learning has combined the advantages of e-learning and class training in its game-based products, creating a new learning methodology, while other studies have explained that ECM and IDT are frameworks that can be used to measure student behavior in e-learning cases.

3. RESEARCH METHODOLOGY

Bhattacherjee (2001) justifies a relationship between confirmation, and perceptions of benefits, delight, and persevered use of goals of ECM. A comparative analysis of the ECM reveals an impact of the confirmatory aspects on perceived usefulness (benefits) and the sustained (continuous) intentions on users' satisfaction (eg (Lin *et al*., 2005; Hong *et al*., 2006; Roca *et al*., 2006; Thong *et al*., 2006; Liao *et al*., 2007; Chen *et al*., 2013)).

Hence, based on the prior research, this study examined the following hypotheses:

H1. Student confirmation has impacted student perceived usefulness of game learning.

H2. Student confirmation has impacted th student satisfaction of game learning.

H3. Student perceived usefulness has impacted student satisfaction of game learning.

H4. Student perceived usefulness has impacted student continuous intention of game learning.

H5. Student satisfaction has impacted student continuous intention of game learning.

Rogers (2003) has emphasized upon conductng trials of modern technology or products and to examiine them prior to their adoption. If a user is capable of surviving a brand of new products or services, he or she may also be capable of seeing the shortcomings of the service or product. This can reduce the dearth of beliefs in services or products, and will increase the reputation of products or services and increase the customer delight. Joia *et al*. (2016) found a dating of compatibility with pride usng the e-broker system. Al-Gahtani (2004) found an effective dating between the capacity of trying out and compatibility with pride in computer customers. Additionally, Cheng (2015) offers another view that a user's behavior within the context indicates that the compatibility of customers affects the belief of advantages gained. Hence, based on prior studies, this study proposes another set of hypotheses:

H 6. System compatibility has impacted student perceived usefulness of game learning.

H 7. System compatibility has impacted the student satisfaction of game learning.

H 8. System trialability has impacted the student satisfaction of game learning.

According to Gefen (2004) if a user is accustomed to IS/IT and has a good knowledge of the field, it will be easier for him or her to understand new IS/IT, and its benefits as well. Therefore, their knowledge of IS/IT tends to influence the use of sustainable intentions.

Liao *et al*. (2006) found that user habits are one of the main determinants of continued use of intention in an e-commerce environment. Amoroso and Lim (2017) show that habits influence the relationship between satisfaction and sustainable use. Also, a few other previous studies have found evidence of the relationship between customer habits and intention to continue customers playing a positive role (Limayem *et al*., 2007; Huang *et al*., 2013). Based on this research, this study proposes the following hypotheses:

H9. Student satisfaction has impacted the student habit of game learning.

H10. Student habit has impacted student continuous intention of game learning.

To sum up, this study proposes to integrate ECM and IDT and identify factors that have an effect on using game learning. This study will also examine the correlation that exists among variables like consumer pride, consumer satisfaction, and perceived benefits. Overall, based on the highly credible theoretical frameworks found in previous literature, this study has identified seven elements, namely perceived benefits, confirmation, ability to test(triability), compatibility, habits, satisfaction and continuance intention. Overall, the research framework can be seen in Figure 1. All the constructs mentioned above are included in this model.

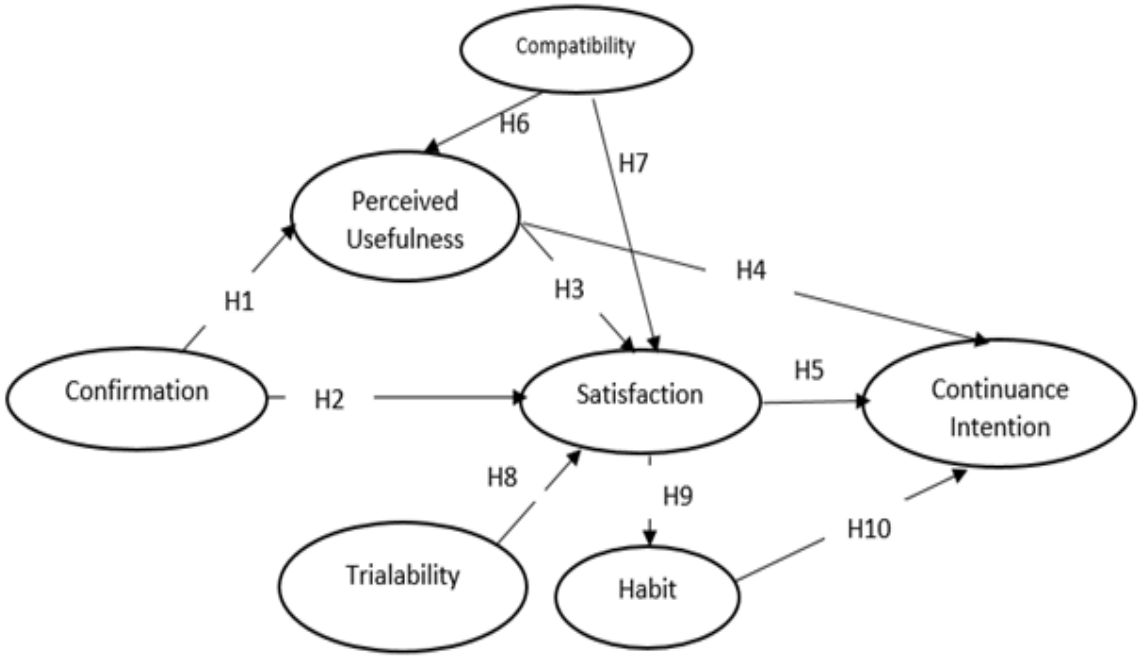

Figure-1. Research framework.

Source: Chen *et al.* (2018).

4. DATA ANALYSIS

A total of 172 questionnaires were collected in this research. After screening similar responses by same participants, the effective final sample size was of 164 responses. The number of male respondents (56 %) was greater than that of women (43.9 %). Most of the respondents were under 20 years old (43.9 %), between 21 and 30 years (24.3%), 31-40 years (18.9%), and 41 years or more (12.8 %). Regarding the level of education, a majority of respondents had a master degrees or above (20.1 %), a bachelor degrees (49.3 %), followed by respondents with high school degrees or below (30, 4%). The experience level was fewer than 5 years (21.3%), 5 to 10 years (29.2%) and more than 10 years (49.3%). This research established a two-step analysis based on structural equation models (SEM), containing structural model assessment and analysis models.

4.1. Measurement Model Analysis

The outer model was a correlation among indicators and latent constructs. In order to ensure that the constructs were reliable, the value of Cronbach α and composite reliability of each construct must be 0.7 or more. In the validity convergence test, this research applied the concepts suggested by Fornell and Larcker (1981). This requires the loading factor of each construct to show convergence validity if the factor containing the indicator is higher than 0.5, the number of average variance extracted (AVE) to be higher than 0.5 and composite reliability to be higher than 0. 7. Table 1 indicates all these constructs which are consistent with the recommendations proposed by Fornell and Larcker (1981). Also, it requires that the testing discriminant validity must use a benchmark of square root AVE, where the number of square root AVE must be greater than the construct correlation coefficient value tested, or measured from the cross loading value. Table 1, Table 2 and Table 3, present the constructs showing discriminant validity.

Table-1. Reliability analysis and convergent validity.

Construct	Measurement items	Factor loading/ Coefficient (t-value)	Composite reliability	AVE	Cronbach's α
Perceived Usefulness (PU)	PU1	0.92	0.92	0.8	0.88
	PU2	0.84			
	PU3	0.92			
Compatibility (COM)	COM1	0.92	0.93	0.82	0.89
	COM2	0.9			
	COM3	0.89			
Triability (TRA)	TRA1	0.93	0.94	0.85	0.91
	TRA2	0.88			
	TRA3	0.95			
Satisfaction (SAT)	SAT1	0.91	0.92	0.8	0.88
	SAT2	0.93			
	SAT3	0.84			
Confirmation (CF)	CF1	0.83	0.9	0.75	0.84
	CF2	0.88			
	CF3	0.89			
Habit (HAB)	HAB1	0.82	0.92	0.79	0.87
	HAB2	0.93			
	HAB3	0.92			
Continuance Intention (CI)	CI1	0.93	0.96	0.89	0.94
	CI2	0.96			
	CI3	0.95			

Note: Perceived Usefulness (PU); Compatibility (COM); Triability (TRA); Satisfaction (SAT); Confirmation (CF); Habit (HAB); Continuance Intention (CI).

Table-2. Correlation matrix.

Construct	CF	CI	COM	HAB	PU	SAT	TRA
CF	1						
CI	0.56	1					
COM	0.72	0.69	1				
HAB	0.65	0.87	0.73	1			
PU	0.79	0.62	0.84	0.71	1		
SAT	0.72	0.72	0.91	0.78	0.85	1	
TRA	0.68	0.70	0.97	0.72	0.79	0.92	1

Source: Statistic analysis.

Table-3. Cross loadings.

Construct/Items construct	CF	CI	COM	HAB	PU	SAT	TRA
CF1	0.83	0.39	0.48	0.51	0.62	0.54	0.43
CF2	0.88	0.50	0.59	0.54	0.60	0.58	0.58
CF3	0.89	0.56	0.76	0.62	0.80	0.73	0.73
CI1	0.53	0.93	0.59	0.81	0.53	0.62	0.60
CI2	0.50	0.96	0.67	0.82	0.59	0.71	0.69
CI3	0.55	0.95	0.70	0.83	0.62	0.71	0.70
COM1	0.72	0.66	0.92	0.69	0.82	0.83	0.82
COM2	0.65	0.65	0.90	0.69	0.72	0.85	0.83
COM3	0.57	0.56	0.89	0.59	0.73	0.78	0.88
HAB1	0.50	0.64	0.51	0.82	0.63	0.63	0.49
HAB2	0.65	0.82	0.72	0.93	0.68	0.75	0.73
HAB3	0.57	0.84	0.69	0.92	0.61	0.71	0.69
PU1	0.76	0.63	0.80	0.69	0.92	0.81	0.78
PU2	0.60	0.36	0.61	0.48	0.84	0.63	0.55
PU3	0.73	0.62	0.81	0.72	0.92	0.81	0.76
SAT1	0.66	0.71	0.89	0.71	0.73	0.91	0.85
SAT2	0.61	0.65	0.84	0.69	0.77	0.93	0.85
SAT3	0.67	0.57	0.71	0.71	0.78	0.84	0.66
TRA1	0.65	0.65	0.90	0.69	0.72	0.85	0.93
TRA2	0.57	0.56	0.89	0.59	0.73	0.78	0.88
TRA3	0.66	0.71	0.89	0.71	0.73	0.91	0.95

Note: Perceived Usefulness (PU); Satisfaction (SAT); Continuous Intention (CI); Confirmation (CF); Compatibility (COM); Triability (TRA); Habit (HAB).

The path structure between constructs in PLS is called the inner model. In this study, the value of the coefficient of t-value and the results of the hypothesis are explained in Table 4.

Table-4. Summary of hypotheses testing results.

Hypothesis	Path	Standardized path coefficient	t-value	Supported
H1	CF-PU	0.38*	7.04	Yes
H2	CF-SAT	0.04	0.83	No
H3	PU-SAT	0.31*	5.2	Yes
H4	PU-CI	0.13*	2.16	Yes
H5	SAT-CI	0.20*	2.54	Yes
H6	COM-PU	0.57*	11.46	Yes
H7	COM-SAT	0.15	1.17	No
H8	TRA-SAT	0.80*	7.46	Yes
H9	SAT-HAB	0.78*	24.67	Yes
H10	HAB-CI	0.80*	16.15	Yes

Note 1. Perceived Usefulness (PU); Satisfaction (SAT); Continuous Intention (CI); Confirmation (CF); Compatibility (COM); Triability (TRA); Habit (HAB).
Note 2. *p-value < 0.005.

5. DISCUSSION, CONCLUSION AND FUTURE WORK

5.1. Discussion

This research proposed 10 hypotheses, 8 (H1, H3 - H6, H8 - H10) of the 10 hypotheses were declared significant, and 2 (H2 and H7) from the hypothesis were declared as rejected. The results of the hypotheses showed that H3 (PU) and H8 (TRA) had a positive and significant impact on SAT while H2 (CF) and H7 (COM) did not impact directly on SAT but it did affect indirectly on PU. In addition, H1 (CF) and H6 (COM) had a positive and significant impact on PU, suggesting that the suitability of the technology used and students' experience in using game learning media greatly influenced students' confidence and that the learning games used were beneficial to them. On the other hand H4 (PU), H5 (SAT) and H10 (HAB) were positive and had a significant influence on CI. The experience felt by students in adopting game learning determined the degree of students' continuous intention, which was obtained from satisfaction in using games learning and students' perceived usefulness. Besides, students' habits in using game learning technology also influenced students' continuous intention. Furthermore, the habit construct was also influenced by students' satisfaction which was first used with H9 games learning (SAT-HAB).

The gaming learning industry is currently facing an important problem, namely finding possible ways to increase revenue. By increasing the frequency of using game learning, or building habits among users, and improving compatibility and testing of game learning, it can positively influence user satisfaction and the sustainability of their intentions in using it, and can also motivate users to continue to use services effectively. Students can act as individuals based on their habits and prefer to repeat with a more straight forward pattern.

This study explored the behavior of users of game learning by using a model that integrates the constructs of student satisfaction, sustained intention, perceived usefulness, triability, and compatibility. In view of specific characteristics of game learning, this study will deeply contribute to elucidate the determinants of the acceptance of game learning into concrete practice. The causal relationship can be taken into consideration by application of developers' game learning in order to build their business strategies in future. Furthermore, this study examined game learning as a technology product that can be played for fun, can be used to relax and to learn, and to record and strengthens the user's memories of knowledge theories that they had previously formally acquired. This application also allowed to be saved and accessed without limitation boundary.

5.2. Conclusion

An important contribution of this study is to test ECM and IDT in order to assess the antecedent impact of user continuous intention in game learning from two theoretical points of view. The values of this research were supposed to supply beneficial confirmation from the preceding research that would help in the process of deciding

which user continuous intention helps in game learning. This research also provided a theoretical framework and understanding in the field of user behavior intention for the academics and practitioners, which may be accepted as a beneficial input as a guidance in future to develop applications/software related to more adequate and competent game learning. The recommended design in this study was more extensive than any other concept models, and this study tried to figure out the complex relationship in the use of game learning behavior. Altogether, the model applied in this research was well supported by empirical data concerning two theoretical models, ECM and IDT, and the role of antecedents. Furthermore, this study explored the empirical role of using the concept of habits in influencing the relationship between satisfaction in users of game learning and the influence on continuous intention. Regarding constructing theory, this research tried to develop new structures with a foundation of relevant factors in the integration of two nomological studies of the model structure that were applicable in the derivation of the ECM and the IDT, and and could also be applied to them in a new context.

The output of this study can help to connect the gap of existing study among the continuing intention usage and empirical study of game learning adoption. Therefore, this study will prove to be a prominent contribution to the domain of game based learning research.

5.3. Research Limitations and Future Work

Notwithstanding the strict methods adopted to finish this research there are still some limitations of this study, that future studies can hopefully investigate. First, the sample taken from the case study of game learning comprised of users in Indonesia; hence the findings of this research are restricted to the Indonesian population and the Indonesian society. Second, in this study, no attempt was made to study the use of hardware/gadgets used by the user, while is it possible to study the variants of hardware/gadgets in game learning such as smartphones, tablets, notebook and a personal computer. Third, we also did not measure the impact of variables/ constructs among each other and the relative advantages of such interaction that could also be a good study.

Funding: This study received no specific financial support.
Competing Interests: The authors declare that they have no competing interests.
Contributors/Acknowledgement: All authors contributed equally to the conception and design of the study.

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