

E-Learning Technology Adoption in the Philippines: An Investigation of Factors Affecting Filipino College Students' Acceptance of Learning Management Systems

 Manuel B. Garcia

Doctor in Information Technology Student,
Graduate Studies, University of the East
Program Head, STI College Taft
www.manuelgarcia.info
hi@manuelgarcia.info

ABSTRACT

When combined, education and technology can build dynamic teaching and learning experiences that are tailored to developing and transforming the educators and learners needed to power the digital economy. For some reasons, however, there is still a big chunk of people especially students who aren't ready yet to embrace the technological change in the field of education. This study aims to determine the factors affecting students' e-learning technology acceptance particularly on Learning Management Systems (LMS) in the Filipino context. A conceptual model was proposed based on the Technology Acceptance Model (TAM) which was extended through the inclusion of Internet Connectivity Experience (ICE), Social Media Influence (SMI), Integrated Multimedia Instruction (IMI), System Interactivity (SI) and Perceived Quality Work of Life (PQWL) as additional predictor values. The constructs were determined according to the three-tier use model (3-TUM) which was characterized to explore users' attitudes towards IT at three levels. The target population in this research was Filipino students from colleges that are considered as promoters of e-learning integration in the educational sphere in the Philippines. The collected data from 629 Filipino college students were analyzed using structural equation modeling (SEM) technique based on AMOS methods. Finally, a path model was created to examine the relationships between the factors to explain students' adoption of e-learning technology from the information systems acceptance point of view. As a result, it provided practical and technical implications applicable for local and global school environments that could help educational leaders, educational technologists, educators and learners in their development, implementation, and acceptance of e-learning technology like LMS.

KEYWORDS

Structural Equation Modeling, Filipino College Students, Technology Acceptance Model, E-Learning

INTRODUCTION

The education sphere in the Philippines has been beleaguered with the same issues and difficulties particularly on its logistics from the deficiency of instructional resources, facilities and even schools to underpaid but overworked teachers. Nevertheless, Filipino culture still places a high value on education; in fact, it is generally viewed as the great equalizer of opportunities. The rapid progression of information and communications technology (ICT) brought significant changes in the field of education from empowering new ways for people to learn and work together (e-learning technology for instance) to transforming teaching and learning processes. While e-learning environment in the Philippines is still in its embryonic stage, it has already adopted and still spearheaded by prominent universities such as University of the Philippines for their UP Open University (UPOU), University of Sto. Tomas for their e-Learning Access Program (e-LeAP), De La Salle University for their integration of Sakai educational software platform and other academic institutions that offer some form of online courses. By proliferating and integrating e-learning technology in the Philippine education system, the transformation of teaching and learning process increases the academic achievements of Filipino college students [1].

NOMENCLATURE

LMS – Learning Management System
TAM – Technology Acceptance Model
3-TUM – Three-Tier Use Model
SEM – Structural Equation Modeling

IMI – Integrated Multimedia Instruction
PQWL – Perceived Quality Work of Life
PEOU – Perceived Ease of Use
ICE – Internet Connectivity Experience

SI – System Interactivity
PU – Perceived Usefulness
BI – Behavioral Intention
SMI – Social Media Influence

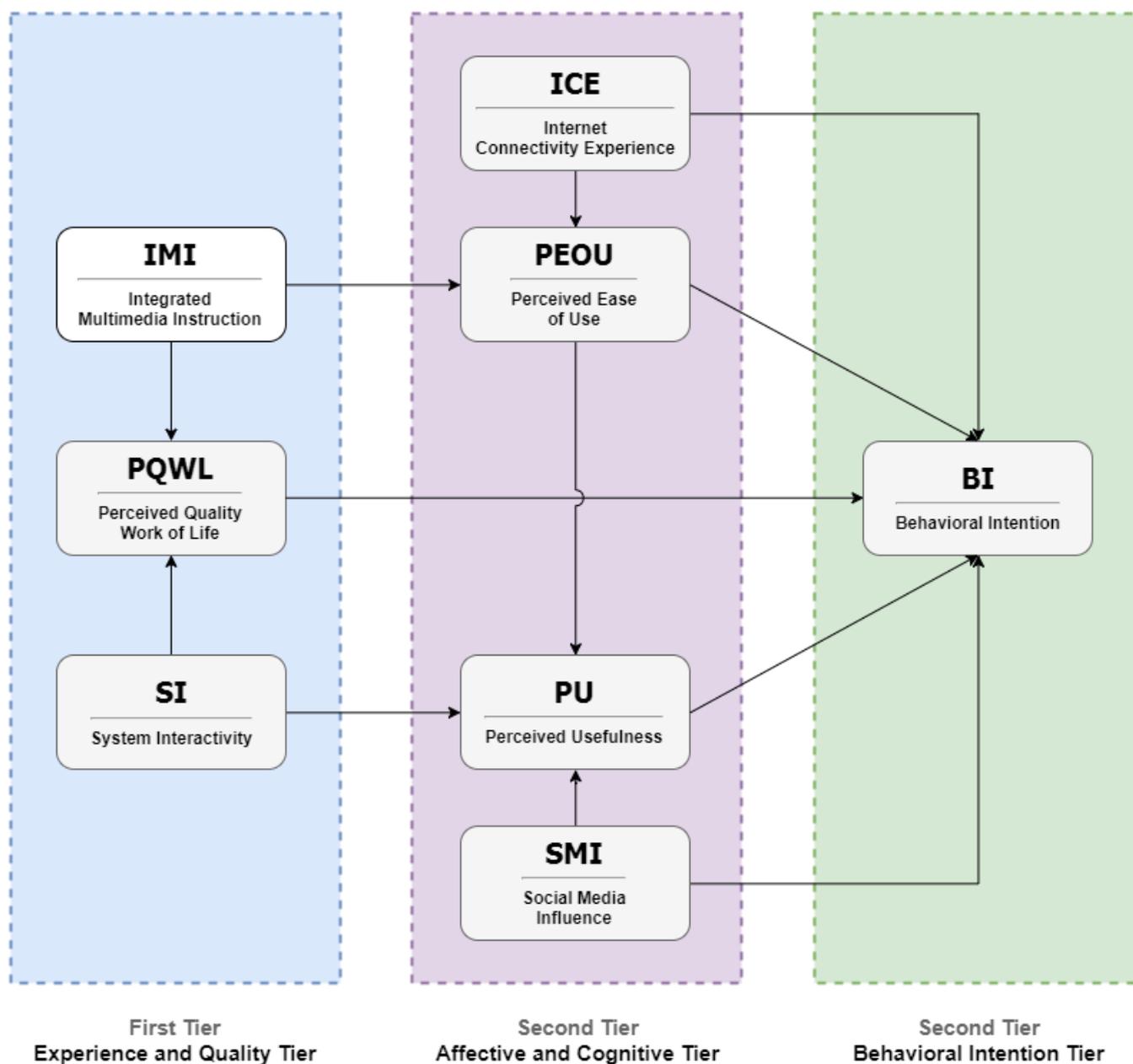


Figure 1. Theoretical Framework of the Study based on TAM and 3-TUM.

In view of all this, the global education sector has been attempting to gather more and more information on aspects that persuade students not just to incorporate e-learning into their educational journey but also confidently warrant consideration in shaping future e-learning developments [2-4]. With the Internet getting more powerful day by day and along with it are the e-learning environments as one of the direct beneficiaries, researchers and academicians have been extending their studies into advanced courses and fields such as Engineering [5], Mathematics [6], Economics [7], Physics [8], Medicine [9] and many more just to dive deeper into students' perceptions. Apart from these,

there are also a lot of research papers that extensively studied factors that affect e-learning technology readiness and acceptance in different setting from neighboring countries such as Malaysia [10-11], Thailand [12-13], Indonesia [14-15] to a not so much outside Asia like Turkey [16] and Sri Lanka [17] up to other continents like Africa [18] and America [19].

Everything considered, this paper aimed to examine the factors of the Filipino college students' behavioral intention to use LMS as part of their education journey from the constructs of integrated multimedia instruction, perceived quality work of life, system interactivity, internet

connectivity experience, perceived ease of use, perceived usefulness, and social media influence. With the help of this study, researchers and software vendors could have a targeted and comprehensive understanding about Filipino students' perceptions on the use of LMS that can result to a better system delivery. As little research has been done in the Philippine setting, this study intends to contribute to the literature and provide a baseline for researchers who will conduct similar research in the future.

THEORETICAL FRAMEWORK

This paper proposes a conceptual model of e-learning technology adoption particularly Learning Management Systems (LMS) in the Filipino context based on the Technology Acceptance Model (TAM) which adopted the belief-attitude-intention-behavior relationship to prototypical one's aptitude to embrace technology in an online environment [20-21] as well as a basis for tracing the influence of external factors on attitudes, intentions and internal beliefs [22]. The researcher extended the TAM through the inclusion of Internet Connectivity Experience (ICE), Social Media Influence (SMI), Integrated Multimedia Instruction (IMI), System Interactivity (SI) and Perceived Quality Work of Life (PQWL) as additional predictor values drawing from various literature that used TAM in an educational context both in Philippines and in other countries. The constructs were then arranged according to the three-tier use model (3-TUM) proposed by [23] which was characterized to investigate users' attitudes towards IT at three levels: (a) individual experiences and system quality; (b) affective and cognitive reactions; and (c) behavioral intentions.

A. Internet Connectivity Experience (ICE)

In this paper, ICE was described by the researcher as "the performance of the internet connection in terms of its speed and reliability that affects user's experience". ICE was considered as a determinant of BI instead of internet access since the Philippines has now over 60 million Filipinos - from 47 million internet users on 2016 - who have access to the internet [24]. However, ICE has not been

previously considered in any aforementioned literature mainly because internet speed is not an issue in their respective countries. According to Akamai's State of the Internet report [25], Philippines has the slowest internet speed in the world with an average internet connection speed of 4.5 Mbps during the fourth quarter of 2016. Therefore, if the internet is the lifeblood of e-applications then its speed is the heart that makes the blood flows. In a study conducted by [26], the adoption of e-activities is directly linked to the speed of the internet as people are more likely to undertake such technology acceptance when the connection speed is fast. For this reason, the following hypotheses are proposed:

H1: Internet connectivity experience will have a significant effect on the perceived ease of use in the perspective of Filipino college students in using learning management system.

H2: Internet connectivity experience will have a significant effect on the behavioral intention towards learning management system acceptance of Filipino college students.

B. Perceived Usefulness (PU)

According to Davis [27], PU can be defined as "the degree to which a person believes that using a particular system will enhance his or her job performance." and is considered as one of the key determinants of IT usage. A study conducted by Subramanian [28] revealed that PU had significant correlation towards behavioral intention of users particularly in adopting e-learning technology which was later confirmed by other researchers such as Fu, Farn & Chao [29], Norazah, Ramayah & Norbayah [30], Tarhini, Hone & Liu [31] and Cigdem & Ozturk [16] whereas their studies, conducted in different educational settings and programs, shown that BI was largely driven by PU. Another case in Nigeria that used PU to model Learning Information System (LIS) students' intention to adopt e-learning technology revealed that PU is one of the strongest predictors with empirical support in determining whether a student will accept the e-learning technology or not [32]. Since PU is clearly a determinant of BI as proven by an extensive body of literature in the IS community, it is hypothesized that:

H3: Perceived usefulness will have a significant effect on the behavioral intention towards learning management system acceptance of Filipino college students.

C. Social Media Influence (SMI)

In this paper, SMI was described by the researcher as “the degree to which social networking sites (SNS) influence the use of other internet technologies”. In the Philippines alone, there are an estimated 40 million social network users this year [33] and another survey revealed that Filipinos spend more time on social media than anyone else in the world with an average 4.17 hours daily making the Philippines as one of the top users of SNS [34]. Just like ICE, SMI hasn't been considered in other literature perhaps because the number of SNS users in their respective countries isn't high enough to make a noticeable effect in the e-learning adoption. However, there is still a lot of debate whether SNS could act as a formal e-learning platform as an alternative to LMS which convinced the researcher to consider SMI as a determinant of BI. Another reason is the fact that the usage of social media website like Facebook can cause a shift in student's attention [35] which made them spend time in SNS rather than in LMS. Apart from this, SMI is considered to have an effect on PU as well since there are features of LMS specifically in terms of building social connections among learners and educators that are based on SNS. Therefore, the following hypotheses are proposed:

H4: Social media influence will have a significant effect on the perceived usefulness in the perspective of Filipino college students in using learning management system.

H5: Social media influence will have a significant effect on the behavioral intention towards learning management system acceptance of Filipino college students.

D. Perceived Ease of Use (PEOU)

According to Davis [27], PEOU can be defined as “the degree to which a person believes that using a particular system would be free from

effort.” Just like PU, PEOU also takes a big and important part in shaping the user behaviour in using e-learning technology [36]. A study conducted by Koufaris [37] exposed that PEOU has a direct and positive influence towards the intention to use the system which was later supported by Chang & Tung [38] and Amoako-Gyampah [39] in their respective studies. Reviewing various literature, several studies are in concert when it comes to the fact that when users perceive an e-learning tool to be easy to use (PEOU), they would also perceive the tool to be useful (PU). Therefore, the following hypotheses are proposed:

H6: Perceived ease of use will have a significant effect on the perceived usefulness in the perspective of Filipino college students in using learning management system.

H7: Perceived ease of use will have a significant effect on the behavioral intention towards learning management system acceptance of Filipino college students.

E. System Interactivity (SI)

According to Abbad, Morris, & Nahlik [40], SI refers to students' perceptions of the system's ability to provide interactive communication between instructor and students and among students. Interactivity is not simply a function of a computer-based transaction but a fundamental success factor for teaching and learning in an online environment as well [41]. The interactivity between LMS users within the realm of its system enables learners to explore and play with the course materials [42] and therefore becomes as a decisive element for improving students' positive feelings such as perceived satisfaction [43] and perceived usefulness [23]. A well-designed LMS that has an interactive bridge between and among instructors, the learners, and the instructional contents (learner-instructor, learner-learner, and learner-content) is believed to have a positive effect to its users and the possibility of online learning adoption. Albeit the result of the study conducted by Abbad, Morris, & Nahlik [40] revealed that there is no evidence to which system interactivity affects students' adoption of e-learning technology, the researcher would like

to have a follow-up using this construct to verify and test it in the Philippine setting. For this reason, the following hypotheses are proposed:

H8: System interactivity will have a significant effect on the perceived usefulness in the perspective of Filipino college students in using learning management system.

H9: System interactivity will have a significant effect on the perceived quality work of life in the perspective of Filipino college students in using learning management system.

F. Perceived Quality Work of Life (PQWL)

In this paper, PQWL was described by the researcher as “the degree to which a system enables its users to participate more actively while enhancing the productivity.” While PQWL has not been considered within an educational context, various researchers such as Srite & Karahanna [44], Zakour [45] and Kripanont [46] have used this construct in their respective empirical studies. The importance attributed to

PQWL in determining and predicting work condition varies across individual’s environment, culture and even country. This extension of TAM enables a better apprehension of the cultural influence on the acceptance of IT. Therefore, it is hypothesized that:

H10: Perceived quality work of life will have a significant effect on the behavioral intention towards learning management system acceptance of Filipino college students.

G. Integrated Multimedia Instruction (IMI)

In this paper, IMI was described by the researcher as “the degree to which the presentation of course materials is modeled based on multimedia-based learning”. There has been an extensive review of literature that integrated multimedia instruction in the development of e-learning. Al Saiyd and Al Sayed [47] examined how users perceive the effectiveness of online course when the system integrates the multimedia contents of the study material. There was also an experiment by

Table 1. Construct Definition and Basis for Questionnaire.

Constructs	Definition	Items	Sources
Internet Connectivity Experience (ICE)	The performance of the internet connection in terms of its speed and reliability that affects user’s experience (UX).	5 Items [ICE1, ICE2, ICE3, ICE4, ICE5]	[26]
Perceived Usefulness (PU)	The degree to which a person believes that using a particular system would enhance his or her job performance.	4 Items [PU1, PU2, PU3, PU4]	[22], [51], [52], [68]
Social Media Influence (SMI)	The degree to which social networking sites (SNS) influence the usage of other internet technologies.	5 Items [SMI1, SMI2, SMI3, SMI4, SMI5]	[31], [51]
Perceived Ease of Use (PEOU)	The degree to which a person believes that using a particular system would be free from effort.	4 Items [PEOU1, PEOU2, PEOU3, PEOU4]	[22], [51], [52], [68]
System Interactivity (SI)	Users’ perceptions of the system’s ability to provide interactive communication between its users.	3 Items [SI1, SI2, SI3]	[27], [40]
Perceived Quality Work of Life (PQWL)	The degree to which a system enables its users to participate more actively while enhancing the productivity.	4 Items [PQWL1, PQWL2, PQWL3, PQWL4]	[31], [44], [46], [51]
Integrated Multimedia Instruction (IMI)	The degree to which the presentation of course materials are modeled based from multimedia-based learning.	4 Items [IMI1, IMI2, IMI3, IMI4]	[47], [48], [69]
Behavioral Intention (BI)	The degree to which a user accepts and uses the e-learning technology as part of the learning process.	3 Items [BI1, BI2, BI3]	[32], [64], [70]

Zhang [48] that compared the effectiveness of multimedia-based e-learning and a less interactive e-learning environment. Overall, the integration of multimedia component in the delivery of the system gave a positive result in the users' educational experience. For this reason, the following hypotheses are proposed:

H11: Integrated multimedia instruction will have a significant effect on the perceived ease of use in the perspective of Filipino college students in using learning management system.

H12: Integrated multimedia instruction will have a significant effect on the perceived quality work of life in the perspective of Filipino college students in using learning management system.

RESEARCH METHODOLOGY

The study used quantitative research design. It followed the same three-stage approach used by Abbad, Morris, and Nahlik [40] to identify the major factors affecting students' adoption of an e-learning system in a university in Jordan. The first step was to build an initial model based on the combination of the extended TAM and 3-TUM. The connection of the constructs was formed based from the literature review presented in the previous section. Secondly, a survey consisting of seven sections (ICE, PU, SMI, PEOU, SI, PQWL, IMI & BI; see Table 1) was created to provide measures of the identified factors followed by a confirmatory factor analysis (CFA) to further develop the said measures. The CFA was used by the researcher as the first step of the two-step sequence of the identification of the measurement model. Based on the general guidelines suggested by MacCallum [49] and Anderson and Gerbing [50], revisions to the model were made whereas the modifications were done individually to avoid unnecessary effects on the solution. The CFA was then conducted using AMOS.

It is very important to mention that the baseline used for the survey instrument was based on various researchers like the e-learning readiness assessment tool [51] specifically created for Philippine higher education institutions, influence of system characteristics on e-learning use [52] and other similar papers under the

education field from other countries. Lastly, a structural model was estimated using structural equation modeling (SEM) techniques which have been widely used in determining user's technology acceptance [53], [40], [31].

Sampling and Data Collection

The target population in this research was college students from the Philippines who use Learning Management System (LMS) as part of their education. The researcher focused on colleges that are considered as promoters of e-learning integration in the educational sphere in the Philippines. The questionnaires were administered through the learning management system used by the schools whereas only registered Filipino college students chosen using non-probability convenience sampling technique could answer the online questionnaire. With the help of teachers in their respective schools, a total of 800 students were invited to the LMS group where the questionnaire could be answered. The questionnaire was available on the LMS from November 6 to 10, 2017. The number of answered questionnaires during the time frame given was 629 indicating 78.6% response rate. Since all of the questions are required to be answered, there is no incomplete questionnaire, hence, all 629 answers are considered as valid preliminary data.

Profile of the Schools

There were 10 colleges containing 100 students per each invited to participate in the survey. These schools are considered as valid adopters of e-learning technology due to the fact that the use of LMS both inside and outside of the school is part of their curriculum. With the help of the professors of each college, the information has been disseminated to the students easily.

Data Analysis

The statistical tools used in this research are SPSS 22 and AMOS 18. Both software helps the researcher in their own way to determine the characteristics of the respondents, information about the goodness-of-fit model and relationship among the hypothesis, variable reliability, factor analysis, path model creation, etc.

Table 2. Summary of Demographic Characteristics of Research Participants.

Variables	Category	f	%
Gender	Male	439	69.8
	Female	190	30.2
Age	Younger < 18	341	54.2
	Older >= 18	288	45.8
Year Level	1st Year	111	17.7
	2nd Year	194	30.8
	3rd Year	252	40.1
	4th Year	72	11.4
	5th Year	0	0
Program	Bachelor of Science in Information Technology	259	41.2
	Bachelor of Science in Tourism Management	85	13.5
	Bachelor of Science in Hotel and Restaurant Management	129	20.5
	Bachelor of Science in Accounting Technology	24	3.8
	Bachelor of Science in Computer Science	43	6.8
	Bachelor of Science in Computer Engineering	60	9.5
	Bachelor of Science in Business Management	29	4.6
Availability of Computer at Home	Yes	412	65.5
	No	217	34.5
Internet Access at Home	Yes	528	83.9
	No	101	16.1
Computer Skill	Novice	120	19.1
	Intermediate	344	54.7
	Expert	165	26.2
Internet Function	Academic	69	11.0
	Commercial	32	5.1
	Entertainment	120	19.1
	Communication	385	61.2
	Others	23	3.7

RESULTS AND DISCUSSIONS

The research was conducted to determine the factors that affect the acceptance of e-learning technology specifically LMS as a reinforcement of the teaching and learning process by college students in the Philippine setting. Presented in the Table 3 are the descriptive statistics which indicate that the majority of the Filipino college students showed positive responses to the

constructs and the Cronbach's alpha which showed that the alpha for the subscales ranged from .73 to .88 indicating that all the constructs revealed reasonable levels of reliability (.70 or higher, according to Hair et al., [54]) which makes all the constructs suitable to measure the concepts employed in the study. On a side note, it is very worth mentioning that SMI and ICE got the first and second highest mean which are additional constructs purposely added in the

Table 3. Reliability Coefficient and Descriptive Statistics of the Constructs

Constructs	No. of Items	Item Deleted	Mean	Standard Deviation	Cronbach α
ICE	5	ICE3	4.65	0.764	0.867
PU	4	-	4.18	0.621	0.843
SMI	5	SMI2, SMI5	4.97	0.726	0.882
PEOU	4	-	4.02	0.717	0.823
SI	3	-	3.82	0.738	0.806
PQWL	4	PQWL1	3.89	0.684	0.809
IMI	4	-	3.76	0.666	0.733
BI	3	-	4.12	0.811	0.789

Philippine setting. The third column shows the items deleted during the exploratory factor analysis (EFA) for two possible reasons encountered during the process: (1) there was a cross loading or (2) the variables were unqualified for the factor loading of more than 0.4 based on a statistics book [54].

As shown in Table 4, the factor correlation coefficients are ranging from 0.509 to 0.821

indicating that all of the constructs employed in the study were positively correlated construct, hence, providing a strong evidence of discriminant validity or simply that the statistical constructs or latent variables are distinct from each other allowing a measure to capture some phenomenon that other measures do not. Since there is no cross-factor correlation of 0.85 or higher on the result, it is safe to say that there are no factors that measure the same construct.

Table 4. Factor Correlations.

Factors	ICE	PU	SMI	PEOU	SI	PQWL	IMI	BI
ICE	-							
PU	0.721	-						
SMI	0.576	0.685	-					
PEOU	0.711	0.759	0.510	-				
SI	0.721	0.678	0.509	0.700	-			
PQWL	0.698	0.657	0.521	0.699	0.531	-		
IMI	0.521	0.624	0.602	0.663	0.592	0.606	-	
BI	0.811	0.769	0.821	0.701	0.652	0.532	0.578	-

Table 5. Evaluation of SEM with Goodness of fit Measure.

Type of Measure	Goodness of Fit Measures	Research Result	Desired Range
Absolute fit Measures	Chi-Square Test	421.212	
	Degree of Freedom	212	
	Chi-square/Degree of Freedom	2.426	2-5
	Goodness-of-fit Index	0.898	>.90
	Root Mean Square Error of Approximation	0.061	<.08
Incremental Fit Measures	Adjusted Good-of-Fit Index	0.886	>.90
	Tucker-Lewis Index	0.922	>.90
	Normed Fit Index	0.905	>.90
	Comparative Fit Index	0.948	>.90
Parsimonious Fit Measures	Parsimonious Normed Fit Index	0.429	>.50
	Parsimonious Good-of-Fit Index	0.507	>.50

Table 6. Summary of Path Test Result.

H#	Proposed Relationship	Path Coefficient	P	Result
H1	ICE → PEOU	0.519	***	S
H2	ICE → BI	0.923	**	S
H3	PU → BI	0.892	***	S
H4	SMI → PU	0.622	***	S
H5	SMI → BI	0.970	**	S
H6	PEOU → PU	0.458	***	S
H7	PEOU → BI	0.461	***	S
H8	SI → PU	0.638	***	S
H9	SU → PQWL	0.553	0.358	NS
H10	PQWL → BI	0.572	0.106	NS
H11	IMI → PEOU	0.431	***	S
H12	IMI → PQWL	0.572	0.237	NS

Note: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10; S=Significant; NS=Not Significant

Table 5 shows the data analysis using structural equation modeling with AMOS 18 where all measures are within the desired range values indicating a good model fit [55-57]. On the Table 6, it can be seen the path coefficient of the e-learning technology acceptance of Filipino college students whereas it showed a significant effect among constructs such as ICE to PEOU ($\beta = .519, p < .01$), ICE to BI ($\beta = .923, p < .05$), PU to BI ($\beta = .892, p < .01$), SMI to PU ($\beta = .622, p < .01$), SMI to BI ($\beta = .970, p < .05$), PEOU to PU ($\beta = .458, p < .01$), PEOU to BI ($\beta = .461, p < .01$), SI to PU ($\beta = .638, p < .01$), and IMI to PEOU ($\beta = .431, p < .01$).

The current study found that internet connectivity experience has a positive relationship with perceived ease of use ($\beta = .519, p < .01$) and behavioral intention ($\beta = .923, p < .05$) supporting H1 and H2 respectively. With regards to the relationship between ICE and PEOU, students can obviously notice the ease of using the LMS when the internet connection is fast. Moreover, they are more likely to adopt and use the system given the high-speed internet which is consistent with the result of the study conducted by Peltier and Youssef [26]. Both educational institutions and software vendor can clearly help with the internet speed issue. First of all, colleges and universities may opt with enhancing their IT infrastructure, increasing the Internet bandwidth and offering consistent and reliable Wi-Fi connection for those who are going to access the LMS outside the computer laboratory. In the case of the software vendors, reducing the load time of web pages is the key especially that most people expect a web page to load in two seconds or less. This can be done by minimizing HTTP requests, reducing server response time, enabling compression, activating browser caching, minifying resources, optimizing images, reducing redirects and many more. Since the Philippines has the slowest internet speed in the world, ICE will clearly play an important role in the e-learning technology adoption of Filipino college students and maybe to other settings with a slow internet connection.

Social media influence, as hypothesized in H4 and H5, has also an effect to perceived usefulness ($\beta = .622, p < .01$) and behavioral intention ($\beta = .970, p < .05$). These relationships,

SMI to PU and SMI to BI, although with a separate relationship, have a connection in between. Filipino college students couldn't appreciate the usefulness of LMS simply because that the things that they accomplish on the system can actually be done in SNS like sharing files such as learning materials and documents, socializing with other users and creating a group (class) to name some; hence, the debate whether SNS can act as LMS. Due to the lack of appreciation of the usefulness of LMS, the BI in adopting it is affected. For a country like the Philippines that is considered as a promoter of social media usage, educational institutions must find a way to make LMS stand out from SNS. When there is a fine line between LMS and SNS, students will be able to appreciate LMS more as a cutting-edge pedagogy purposely created for education.

The results also show that system interactivity has a positive relationship with perceived usefulness ($\beta = .638, p < .01$) as hypothesized in H8 but there is no strong evidence that it also influences the perceived quality work of life contrary to H9. The relationship between SI and PU clearly revealed the thoughts of Filipino college students in terms of how they appreciate the usefulness of a system. The interaction within the system (learner-interface, learner-tool, learner-task, learner-content, learner-instructor, and learner-student) undoubtedly resolves one of the established weaknesses of e-learning which is the absence of face-to-face interaction. SI, as an exogenous variable, showing a positive influence towards PU is similar to past studies of Wu & Wu [58] and Lee, Hsieh & Chen [59]. On the other hand, the lack of evidence between the relationship of SI and PQWL only shows that Filipino college students will actively participate, or not, in the platform regardless of the interaction the system has to offer perhaps because the will and motivation of their participation relies on personal characteristics and cultural setup [60]. Nonetheless, SI is still an important construct as it influences PU which influences BI.

Aside from the lack of evidence in the relationship of perceived quality work of life and system interactivity, the same thing can be said with perceived quality work of life and

CONCLUSION

The study has empirically investigated the behavioral intention to use e-learning technology of Filipino college students using the TAM with additional predictor values (internet connectivity experience, social media influence, integrated multimedia instruction, system interactivity and perceived quality work of life) modeled using 3-TUM. In the context of Philippines, the aforementioned additional predictors, except perceived quality work of life, together with the original TAM predictors play a critical role in the Filipino college students' acceptance towards e-learning technology. From the theory-testing perspective, the results of this study primarily serve as a contribution towards the extension and validation of the research results from the literature. While doing so, it provided practical and technical implications to colleges and universities in the Philippines (which might be applicable as well in international setting) that may help to convince the students in their acceptance of e-learning technology like LMS as discussed in the previous section.

While the study has successfully looked into the factors that might possibly affect Filipino college students' behavioral intention to use LMS, it has certain limitations. Firstly, self-reported data were gathered from various colleges and universities through an online questionnaire. With regards to the sampling and factors, the current study was assessed in the Philippine context (Filipino college students), thus, the applicability and generalizability of the findings are limited. Notwithstanding, future researchers can also validate the results of this study by using the same proposed model in primary and secondary education. Furthermore, the additional predictors purposely added in the Philippine context offers more future research possibilities. If similar studies are replicated in other countries for further investigations, findings could be discussed through a comparative analysis. Other factors may be explored as well such as group influence, cultural lineage and other influences that could overcome the limitation of not using cross-sectional data. Finally, future researchers could also carry out similar research in other e-learning practices. As this study focused on LMS which has been used as a tool in a blended

learning environment, researchers may conduct similar studies that deal with pure online environments, online courses and so on.

With the convergence of technology comes the pedagogical challenges associated with e-learning implementation; hence, educational leaders should not worry anymore about the elements that stimulate participation across diversity that determine the e-learning acceptance rate, educational technologists should already know how to attack the development of the digital environment to ensure pedagogically sound learning experience, and educators and learners with different academic, industry and support needs should be in concert in maximizing the benefits of using the educational technology that can lead learners to global certification. While these were the derivations why the researcher conducted the study, the results are also meant to serve as one of the pioneers that offer information on e-learning acceptance in the Philippines.

REFERENCES

1. Firat, M. (2016). Determining the Effects of LMS Learning Behaviors on Academic Achievement in a Learning Analytic Perspective. *Journal of Information Technology Education: Research*, 15, 75-87.
2. Paris, P. G. (2004). E-Learning: A study on Secondary Students' Attitudes towards Online Web Assisted Learning. *International Education Journal*, 5(1), 98-112.
3. Alexander, S. and Golja, T. (2007). Using Students' Experiences to Derive Quality in an e-Learning System: An Institution's Perspective. *Educational Technology & Society*, 10 (2), 17-33.
4. O'Donnell, E. & Sharp, M. (2012). Students' Views of E-Learning: The Impact of Technologies on Learning in Higher Education in Ireland. *School of Management, Dublin Institute of Technology*.
5. Rhema, A., & Miliszewska, I. (2014). Analysis of Student Attitudes towards E-learning: The Case of Engineering Students in Libya. *Issues in Informing Science and Information Technology*, 11, 169 - 190.
6. Umoh, J. B., & Akpan, E. T. (2014). Challenges of Blended E-Learning Tools in Mathematics: Students' Perspectives University of Uyo. *Journal of Education and Learning*, 3(4). doi:10.5539/jel.v3n4p60
7. Svoboda, R., Jarkovská, M., Šrédl, K., Severová, L., & Kopecká, L. (2016). Using E-Learning in Teaching Economics at Universities of the Czech Republic. *Smart Education and e-Learning 2016*, 281-290.
8. Eldy, E.F. & Sulaiman F. (2015). E-Learning in Physics Courses: A Preliminary of Students' Acceptance. *International Journal of Technical Research and Applications*, Special Issue 30, 21-23.

9. Kebaetse, M. B., Nkomazana, O., & Haverkamp, C. (2014). Integrating eLearning to Support Medical Education at the New University of Botswana School of Medicine. *The Electronic Journal of e-Learning*, 12(1), pp43-51.
10. Alias, N., Zakariah, Z., Ismail, N. Z., & Aziz, M. N. (2012). E-Learning Successful Elements for Higher Learning Institution in Malaysia. *Procedia - Social and Behavioral Sciences*, 67, 484-489.
11. Al-rahmi, W. M., Othman, M. S., & Mi Yusuf, L. (2015). The Effectiveness of Using E-Learning in Malaysian Higher Education: A Case Study Universiti Teknologi Malaysia. *Mediterranean Journal of Social Sciences*. doi:10.5901/mjss.2015.v6n5s2p625
12. Ngampornchai, A., & Adams, J. (2016). Students' Acceptance and Readiness for E-learning in Northeastern Thailand. *International Journal of Educational Technology in Higher Education*, 13(1), 1-13. doi: 10.1186/s41239-016-0034-x
13. Vicheanpanya, J. (2014). E-Learning Management System Model for Thai Society. *International Journal of Information and Education Technology*, 67-70.
14. Tanduklangi, A. (2017). Determinants of User Intention in Using e-Learning Technology in Indonesian Context: An Empirical Study. *Mediterranean Journal of Social Sciences*, 8(3).
15. Rivai, H. A. (2016). Factors Determining Students' Intention to Adopt E-Learning: An Evidence from Indonesia Higher Education Context. *Journal of Education and Social Sciences*, 5(2).
16. Cigdem, H., & Ozturk, M. (2016). Factors Affecting Students' Behavioral Intention to Use LMS at a Turkish Post-Secondary Vocational School. *The International Review of Research in Open and Distributed Learning*, 17(3).
17. Perera, M. A. (2014). Problems faced by undergraduates in the learning environment: some evidences from a Sri Lanka university. *Sri Lanka Journal of Advanced Social Studies*, 3(1).
18. Odunayo S., Otito O. & Otito G. (2013). The Reality and Challenges of E-Learning Education in Africa: The Nigeria Experience. *International Journal of Humanities and Management Sciences (IJHMS)* 1(3).
19. E-learning in higher education in Latin America. (2015). *Development Centre Studies*, 39-64.
20. Riemenschneider, C. K. & McKinney, V. R. (2001). Assessing belief differences in small business adopters and non-adopters of web-based E-commerce. *Journal of Computer Information Systems*, 42(2), 101-107.
21. Di Benedetto, C. A., Calantone, R. J., & Zhang, C. (2003). International technology transfer. *International Marketing Review*, 20(4), 446-462.
22. Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, 13(3), 319.
23. Liaw, S.-S., & Huang, H.-M. (2007). Developing a collaborative e-learning system based on users' perceptions. *Computer supported cooperative work in design III* (pp. 751-759). Berlin, Germany: Springer.
24. Subido, L. K. (2017, January 23). Growing 27% in 2016, PH Now Has 60 Million Internet Users. Retrieved from <https://www.entrepreneur.com.ph/news-and-events/ph-now-has-60-million-internet-users-growing-27-in-2016-a36-20170124>
25. Akamai (2016). State of the Internet Q4 2016 Report. Akamai Content Delivery Network. Retrieved from <https://www.akamai.com/kr/ko/multimedia/documents/state-of-the-internet/q4-2016-state-of-the-internet-connectivity-report.pdf>
26. Peltier, L. B. & Youssef, A. B. (2014) Does Internet Speed Matter? Impact of Internet Speed on E-Applications Adoption by Firms in Luxembourg. University of Nice Sophia-Antipolis.
27. Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science*, 35(8), 982-1003. doi:10.1287/mnsc.35.8.982
28. Subramanian, G. H. (1994). A Replication of Perceived Usefulness and Perceived Ease of Use Measurement. *Decision Sciences*, 25(5-6), 863-874. doi:10.1111/j.1540-5915.1994.tb01873.x
29. Fu, J. H., Farn, C., & Chao, W. (2006). Acceptance of electronic tax filing: A study of taxpayer intentions. *Information & Management*, 43(1), 109-126. doi:10.1016/j.im.2005.04.001
30. Norazah Mohd Suki, T. Ramayah, Norbayah Mohd Suki, (2008) "Internet shopping acceptance: Examining the influence of intrinsic versus extrinsic motivations", *Direct Marketing: An International Journal*, Vol. 2 Issue: 2, pp.97-110, <https://doi.org/10.1108/17505930810881752>
31. Tarhini, A., Hone, K., & Liu, X. (2013). Factors Affecting Students' Acceptance of e-Learning Environments in Developing Countries: A Structural Equation Modeling Approach. *International Journal of Information and Education Technology*, 54-59. doi:10.7763/ijiet.2013.v3.233
32. Eke, H. N. (2011). Modeling LIS Students' Intention to Adopt E-learning: A Case from University of Nigeria, Nsukka. *Library Philosophy and Practice (e-journal)*. Paper 478
33. Statista, 2017. Number of social network users in the Philippines from 2015 to 2022 (in millions). Statista. Retrieved from <https://www.statista.com/statistics/489180/number-of-social-network-users-in-philippines/>
34. We are social & Hootsuite, 2017. Digital in 2017: Global Overview. We are social & Hootsuite. Retrieved from <https://wearesocial.com/sg/blog/2017/01/digital-in-2017-global-overview>
35. Friedman, H.H., & Friedman, L.W. (2011). Crises in education: Online learning as a solution. *Creative Education*, 2, 156-163.
36. Chatzoglou, P., Vraimaki, E., Diamantidis, A., & Sarigiannidis, L. (2010). Computer Acceptance in Greek SMEs. *Journal of Small Business and Enterprise Development*, 17 (1), 78-101.
37. Koufaris, M. (2002). Applying the Technology Acceptance Model and Flow Theory to Online Consumer Behavior. *Information Systems Research*, 13(2), 205-223. doi:10.1287/isre.13.2.205.83
38. Chang, S., & Tung, F. (2007). An empirical investigation of students behavioural intentions to use

- the online learning course websites. *British Journal of Educational Technology*, 0(0).
39. Amoako-Gyampah, K. (2007). Perceived usefulness, user involvement and behavioral intention: an empirical study of ERP implementation. *Computers in Human Behavior*, 23(3), 1232-1248.
 40. Abbad, M. M., Morris, D. J., & De Nahlik, C. (2009). Looking under the Bonnet: Factors Affecting Student Adoption of E-Learning Systems in Jordan. *The International Review of Research in Open and Distributed Learning*, 10(2).
 41. Sims, R., Dobbs, G., and Hand, T. (2002). Enhancing quality in online learning: Scaffolding planning and design through proactive evaluation. *Distance Education* 23 (2): 135–148.
 42. Michailidou, A., & Economides, A. (2003). E-learn: Towards a collaborative educational virtual environment. *Journal of Information Technology Education*, 2, 131–152. Retrieved from <http://jite.org/documents/Vol2/v2p131-152-92.pdf>
 43. Yukselturk, E., & Yildirim, Z. (2008). Investigation of interaction, online support, course structure and flexibility as the contributing factors to students' satisfaction in an online certificate program. *Educational Technology & Society*, 11(4), 51–65.
 44. Srite, M. & Karahanna, E. (2000). "A Cross-Cultural Model of Technology Acceptance," presented at the Annual Diffusion of Innovations Group in Information Technology, Charlotte, NC.
 45. Zakour, A. B., (2004). Cultural Differences and Information Technology Acceptance. SAIS 2004 Proceedings. 26.
 46. Kripanont, N. (2007). Examining a technology acceptance model of internet usage by academics within Thai business schools, Victoria University Melbourne, Australia.
 47. Al Saiyd N.A., Al Sayed I.A. (2011) Multimedia Distance E-Learning System for Higher Education Students. In: Snasel V., Platos J., El-Qawasmeh E. (eds) *Digital Information Processing and Communications. Communications in Computer and Information Science*, vol 188. Springer, Berlin, Heidelberg
 48. Zhang, D. (2005). Interactive Multimedia-Based E-Learning: A Study of Effectiveness. *The American Journal of Distance Education*, 19(3), 149–162
 49. MacCallum, R.C. (1986). Specification searches in covariance structure modeling. *Psychological Bulletin*, 101(1), 107-120
 50. Anderson, J.C. & Gerbing, D.W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin*, 103(3), 411- 423.
 51. Doculan, J. A. (2016). E-Learning Readiness Assessment Tool for Philippine Higher Education Institutions. *International Journal on Integrating Technology in Education*, 5(2), 33-43.
 52. Pituch, K. A., & Lee, Y. (2006). The influence of system characteristics on e-learning use. *Computers & Education*, 47(2), 222-244.
 53. Venkatesh, Morris, Davis, & Davis. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly*, 27(3), 425.
 54. Hair, J. F. Jr., Anderson, R.E., Tatham, R.L., & Black, W.C. (1998). *Multivariate Data Analysis*, (5th Edition). Upper Saddle River, NJ: Prentice Hall.
 55. Bollen, K. A. (1989), *Structural Equations with Latent Variables*, New York: John Wiley & Sons.
 56. Arbuckle, J. L. & Wothke, W. (1999) *AMOS 4.0 User's Guide*. Chicago: Smallwaters.
 57. Byrne, B. M. (2001). *Structural Equation Modeling with AMOS: Basic Concepts, Applications and Programming*. Lawrence Erlbaum Associates, Inc.
 58. Wu, G., & Wu, G. (2006). Conceptualizing and Measuring the Perceived Interactivity of Websites. *Journal of Current Issues & Research in Advertising*, 28(1), 87-104. doi:10.1080/10641734.2006.10505193
 59. Lee, Y., Hsieh, Y., & Chen, Y. (2013). An investigation of employees use of e-learning systems: applying the technology acceptance model. *Behaviour & Information Technology*, 32(2), 173-189.
 60. Rodgers, T. (2008). Student Engagement in the E-Learning Process and the Impact on Their Grades. *International Journal of Cyber Society and Education*, 1(2), 143-156.
 61. Aloraini, S. (2012). The impact of using multimedia on students' academic achievement in the College of Education at King Saud University. *Journal of King Saud University - Languages and Translation*, 24(2).
 62. Tudor, S. L. (2013). The Role of Multimedia Strategies in Educational Process. *Procedia - Social and Behavioral Sciences*, 78, 682-686.
 63. Lee, Y., Hsiao, C., & Ho, C. (2014). The effects of various multimedia instructional materials on students' learning responses and outcomes: A comparative experimental study. *Computers in Human Behavior*, 40, 119-132.
 64. Venkatesh, V., & Davis, F. D. (2000). A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. *Management Science*, 46(2), 186-204. doi:10.1287/mnsc.46.2.186.11926
 65. Moon, J., & Kim, Y. (2001). Extending the TAM for a World-Wide-Web context. *Information & Management*, 38(4), 217-230.
 66. Hong, S., & Tam, K. Y. (2006). Understanding the Adoption of Multipurpose Information Appliances: The Case of Mobile Data Services. *Information Systems Research*, 17(2), 162-179.
 67. Chan, H. C., & Teo, H. (2007). Evaluating the Boundary Conditions of the Technology Acceptance Model: An Exploratory Investigation. *ACM Transactions on Computer-Human Interaction*, 14(2), 1-22.
 68. Agarwal, R., & Karahanna, E. (2000). Time Flies When You're Having Fun: Cognitive Absorption and Beliefs about Information Technology Usage. *MIS Quarterly*, 24(4), 665. doi:10.2307/3250951
 69. Alsadhan, A., Alhomod, S., & Shafi, M. (2014). Multimedia Based E-learning: Design and Integration of Multimedia Content in E-learning. *International Journal of Emerging Technologies in Learning (IJET)*, 9(3), pp. 26-30.
 70. Schepers, J., & Wetzels, M. (2007). A meta-analysis of the technology acceptance model: Investigating subjective norm and moderation effects. *Information & Management*, 44(1), 90-103.