Learning Management System Adoption in Higher Education Using the Extended Technology Acceptance Model

Marissa R. Fearnley
De La Salle-College of Saint Benilde Manila
Philippines

Johnny T. Amora
De La Salle-College of Saint Benilde Manila
Philippines

Abstract

A learning management system is capable of enriching instruction and acceptance of this learning technology by users is crucial to its successful application in higher education. This study investigated factors that influenced adoption of a learning management system by higher education teachers using the technology acceptance model which incorporates three external constructs: system quality, perceived self-efficacy and facilitating conditions. Data collected from faculty respondents (n=127) through an online survey were examined by employing partial least squares-structural equation modeling. While several relationships were confirmed, others were not supported by this research. Results showed that both system quality and perceived self-efficacy strongly influenced perceived usefulness, which in turn indirectly affected attitudes towards the technology and behavioral intention. Additionally, system quality directly affected perceived ease of use and attitudes toward technology use. The strong and direct influence of perceived self-efficacy on perceived usefulness and perceived ease of use suggests that faculty with positive beliefs about their ability to use the learning management system will regard it as both useful and easy to use. Facilitating conditions, on the other hand, affected neither perceived ease of use nor attitudes. Implications for practice, policy and potential research directions are likewise presented.

Keywords: higher education, learning management system, technology acceptance model, facilitating conditions, perceived self-efficacy, system quality

Emerging technologies in education are driving colleges and universities to progressively infuse their use in higher education (Rodriguez & Anicete, 2010; Alharbi & Drew, 2014; Bermúdez-Hernández et al., 2017). Given their incontestable importance (Revythi & Tselios, 2019), instructors are challenged to incorporate them as a means to complement conventional learning environments (Lee et al., 2009; Rhode et al., 2017), enhance learners' experiences, and improve academic outcomes (Parkman et al., 2018).

A learning management system (LMS) is a web-based application capable of transforming face-to-face sessions by offering students a space for online learning (Wichadee, 2015). Using a LMS is an effective way of delivering instruction to students by offering 24/7 access to course content, while enabling convenient course creation and management for teachers (Bousbahi & Alrazgan, 2015). Despite the perceived benefits of using LMSs, many faculty members remain hesitant to adopt them as a teaching tool (Wichadee, 2015; Zanjani et al., 2016). Moreover, teachers tend to underutilize this educational technology despite its widespread availability in higher education settings (Fathema & Sutton, 2013; Bousbahi & Alrazgan, 2015). The variables that affect faculty adoption of the technology include teachers' perceptions, self-efficacy beliefs and instructional goals, as well as the availability of resources, support services, and time (Baturay et al., 2017; Siyam, 2019).

Teachers play an important role in carrying out any innovation in the classroom (Alharbi & Drew, 2014). This is why determining the variables that motivate teachers to provide a technology-supported learning environment to their students is essential (Teo et al., 2012). This paper aims to assess the factors that affect how teachers accept and adopt a learning management system. Additionally, it seeks to confirm whether the technology acceptance model (TAM) in its extended version is applicable in a local higher education context.

Literature Review

Learning Management Systems

Learning management systems are platforms that offer a variety of integrated tools for delivering and managing online instruction. Whether open source (e.g., Moodle, Sakai) or commercial (e.g., Blackboard, Brightspace D2L), most LMSs are flexible, easy to use, accessible and user-friendly (Kasim & Khalid, 2016).

With a LMS, an instructor can create online course content and subsequently manage that course to enhance critical thinking abilities and promote collaboration among university students (Zanjani et al., 2016). LMSs offer many tools such as online group chats, discussion threads, video conferencing, lecture materials, learning modules, grading and course evaluations, all of which may be customized to suit specific instructional needs (Fathema et al., 2015; Walker et al., 2016). According to Anshari et al. (2017), non-traditional forms of learning supported by online approaches to instruction positively affect both teachers and learners. Some of the benefits provided by a LMS include organized course content, enhanced student engagement, improved autonomy among learners, convenient submission of requirements and immediate feedback (Adzharuddin et al., 2013; Cavus, 2015; Alenezi, 2018).

The utilization of LMSs to aid in educational initiatives has become widespread among colleges and universities over the years (Walker et al., 2016). Higher education institutions use them to supplement face-to-face learning sessions, as well as support blended instruction and distance learning (Klobas & McGill, 2010). Their significant contribution to instructional delivery notwithstanding, financial investment and technical demands are critical factors in the selection of a particular LMS (Kasim & Khalid, 2016). In addition, hindrances to LMS utilization reported by teachers include: (1) deficient computer units and inadequate computer competence; (2) problematic integration of technology into the curriculum; and (3) a lack of supervisory and technical personnel (Li, 2007; Baturay et al., 2017). Other concerns that impede the delivery of technology-supported instruction in higher education are system infrastructure, effort from faculty, and satisfaction with the system (Surry et al., 2005).

Technology Acceptance Model

Before an innovation, such as a new LMS, can be implemented, it has to be accepted (Rogers, 2003). Investigating technology acceptance helps determine the purpose of teachers' technology use (Scherer et al., 2019). Of the many theories and models that attempt to describe how users accept and adopt a given technology (Ahmad et al., 2010; Shih-Chih et al., 2011), one of the most prominent is the Technology Acceptance Model (TAM) (Park, 2009; Scherer et al., 2019). Introduced by Davis (1989), the TAM has been implemented in different domains of information technology and information systems (Shih-Chih et al., 2011), and has become a useful model in exploring adoption behavior of a particular technology in various contexts (Fathema & Sutton, 2013).

The model (Figure 1) shows how perceived usefulness and perceived ease of use are strong determinants of attitudes towards technology use (Siyam, 2019). Perceived usefulness represents users' views on the degree to which a technology facilitates improvement in job performance, while perceived ease of use indicates users' expectations that use of a technology is easy and effortless (Davis, 1989; Lai & Savage, 2013). Both determinants influence users' attitudes toward technology use (Baturay et al., 2017), and are themselves influenced by external variables (Shih-Chih et al., 2011). These external variables include subjective norm, job relevance, output quality, and result demonstrability (Venkatesh & Davis, 2000), among others. Users' attitudes configure their behavioral intention, which in turn defines actual technology use (Alharbi & Drew, 2014; Revythi & Tselios, 2019).

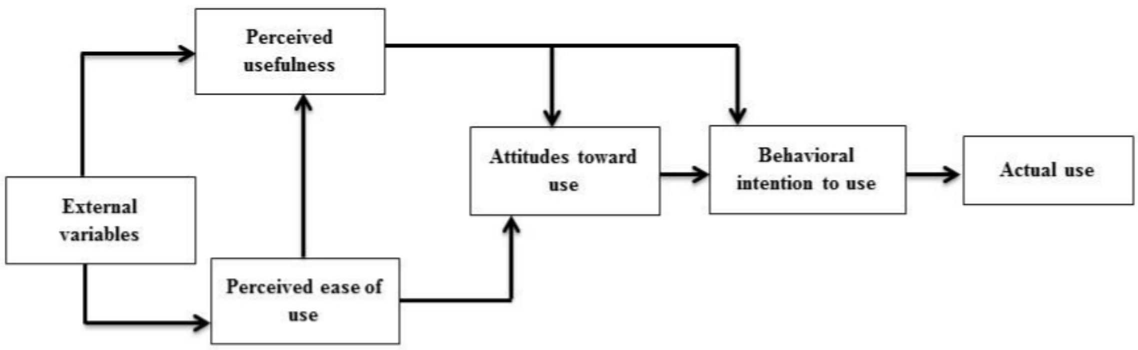

Figure 1: Original technology acceptance model by Davis et al. (1989)

Over the years, different versions of the TAM have been employed in many empirical studies (Scherer et al., 2019). Other parameters that have been linked to the TAM are system quality, computer self-efficacy and facilitating conditions (Fathema et al., 2015; Salloum et al., 2019), as well as personal innovativeness (Mazman Akar, 2019) and access to technology and planning time (Siyam, 2019).

The model proposed by Siyam (2019) consisted of the following external variables: job relevance, access to technology, self-efficacy and planning time. Of the four factors studied, only self-efficacy and planning time were found to be significant and positive determinants of technology acceptance among special education teachers. A related study conducted by Parkman et al. (2018) in the United Arab Emirates sought to determine how 82 female pre-service teachers accepted environments that were adequately supported by technology. This investigation utilized the original TAM constructs and two external variables, namely perceived user resources and computer self-efficacy, as predictors of behavioral intention. Results showed that behavioral intention was strongly correlated with perceived usefulness, perceived ease of use and computer self-efficacy. Between the two variables used to extend the TAM, computer self-efficacy was found to have a greater predictive power than perceived user resources. In Turkey, 476 pre-service university teachers were surveyed by Baturay et al. (2017) to investigate the relationship among competence in computer use, attitude towards computer-assisted instruction and intention to use technology, and whether these external constructs may be determined by four factors: gender; computer ownership; access to the Internet; and daily computer usage. Findings revealed that the correlations among three of the constructs were statistically significant. Of the four factors examined, however, only daily computer use was found to positively affect computer competence. The studies described above highlight the importance of competence in computer use or computer self-efficacy in the adoption of a particular technology. In the context of this paper, the same construct is expressed as perceived self-efficacy.

In Serbia, knowledge of mathematics, subjective norm and facilitating conditions were used by Teo and Milutinovic (2015) in their version of the TAM to assess factors that affect technology use in mathematics teaching among 313 pre-service teachers. Their findings revealed that attitude towards technology use was the only variable with a direct effect on behavioral intention. The TAM was also used by Fathema et al. (2015) to explore the determinants of technology acceptance among 560 university teachers and teaching assistants in the United States whose LMS use was non-mandatory. Structural equation modeling revealed that system quality, perceived self-efficacy and facilitating conditions were useful determinants of attitudes toward use. Another study among 487 Turkish pre-service teachers revealed that perceived usefulness, attitudes toward use and computer self-efficacy directly affect behavioral intention.Perceived ease of use, facilitating conditions and technological complexity indirectly influence technology acceptance and perceived usefulness is a powerful determinant of intention to use a particular technology (Teo et al., 2012).

While previous studies conducted by Teo and Milutinovic (2015), Fathema, et al. (2015), and Teo et al. (2012), incorporated facilitating conditions as an external variable of the TAM, only the work of Fathema et al. (2015) explained how system quality affects technology acceptance. A more recent study by Salloum et al. (2019) revealed that among university students, system quality is a significant predictor of perceived ease of use but not perceived usefulness. Thus, the inclusion of system quality as an external variable was deemed an important factor in the context of using a commercial LMS.

Research Framework and Hypotheses

The current study adopted the extended technology acceptance model proposed by Fathema et al. (2015) which integrated system quality, perceived self-efficacy, and facilitating conditions as factors that influence adoption and implementation of a LMS by faculty. Additionally, the effect of system quality on perceived ease of use was included in this investigation. A total of fourteen (14) hypotheses were formulated to test this study’s model (Figure 2).

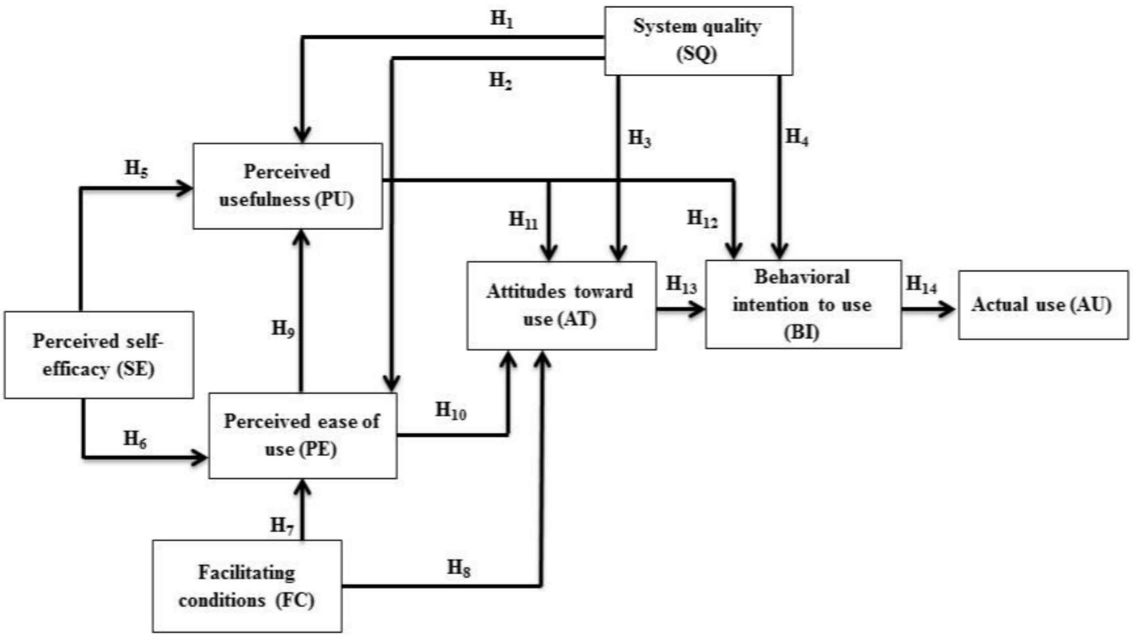

Figure 2: Extended technology acceptance model for learning management systems by Fathema et al. (2015)

System quality (SQ) characterizes desirability of the system (i.e., the LMS) in terms of functions, speed, features, content, and interaction capability (Delone & Mclean, 2003; Fathema et al., 2015). If the LMS is desirable, teachers will find it useful, view it positively, and use it intentionally. Another significant factor in adopting an information system is perceived self-efficacy (SE), or self-assessment of one's capability to carry out the tasks needed to accomplish a set of outcomes (Bandura, 1993; Gong et al., 2004; Nikou & Economides, 2019). In this study, SE indicates how confident a faculty member is in his or her ability to operate, navigate, and work with the LMS. Lastly, facilitating conditions (FC) are factors that can positively or negatively affect how easy or difficult it is for an individual to accomplish a particular job (Teo, 2010). In terms of LMS use, FC is measured by the availability of technical support, capacity building opportunities, and related resources. If FC are present, faculty members are expected to show high perceived ease of use and positive attitudes towards LMS use.

The first eight (8) hypotheses address the effects of the external variables SQ, SE and FC on the original TAM constructs. These are:

H_1: System quality directly affects PU.
H_2: System quality directly affects PE.
H_3: System quality directly affects AT.
H_4: System quality directly affects BI.
H_5: Perceived self-efficacy directly affects PU.
H_6: Perceived self-efficacy directly affects PE.
H_7: Facilitating conditions directly affect PE.
H_8: Facilitating conditions directly affect AT.

The other six (6) hypotheses examine the relationships among the original TAM variables namely, PE, PU, AT and BI.

H_9: Perceived ease of use directly affects PU.
H_{10}: Perceived ease of use directly affects AT.
H_{11}: Perceived usefulness directly affects AT.
H_{12}: Perceived usefulness directly affects BI.
H_{13}: Attitude toward LMS use directly affects BI.
H_{14}: Behavioral intention directly affects AU.

As educational technologies are being integrated into teaching and learning practices, the examination of factors that are vital to user adoption becomes increasingly important (Rhode et al., 2017). This investigation is aimed at confirming the applicability of the extended TAM (Fathema et al., 2015), with a focus on the effects of system quality, perceived self-efficacy and facilitating conditions.

Methods

Participants of the Study

This research explored the acceptance and adoption of Brightspace, a learning management system being utilized by faculty members at a private college in Manila, Philippines. Brightspace is a commercial LMS designed by the Desire2Learn (D2L) Corporation (Moseley & Ajani, 2015). It is a cloud-based platform with a suite of tools for delivering flexible instruction and facilitating engaged learning.

A total of 127 out of 250 (51%) served as the study sample. These teachers had experience using the LMS for at least one academic term (i.e., 14 weeks) for purposes beyond downloading class lists and uploading course syllabi. Hair et al. (2012) recommended that the minimum sample for a partial least squares-path model be equal to the number of structural paths for the construct with the greatest complexity multiplied by 10, which, in this case, would require a minimum sample of 40 participants. Thus, the study's actual sample of 127, which is more than three times the minimum requirement, is deemed adequate for the purposes of this investigation. Table 1 presents demographic data related to the sample group.

The respondents in this study comprised of 51% male and 49% female teachers who use some, or all, of the available features of the LMS. A majority (75%) of the respondents were part-time faculty, and 98% (125 out of 127) were current users of the LMS at the time the data were collected. Three of the respondents were teachers with administrative positions (i.e., other faculty) who were given teaching loads. A great majority (73%) of the faculty had completed graduate education, and about 44% (56 out of 127) had a minimum of four years of teaching experience in the institution.

Table 1: Demographic profile of respondents (n = 127)

Variables	**n**	**%**
Sex		
Female	62	48.82
Male	65	51.18
Education		
BA/BS	34	26.77
Doctorate/Post-doctorate	18	14.17
Master’s	75	59.06
Classification		
Full-Time Teaching Faculty	29	22.83
Part-Time Teaching Faculty	95	74.80
Other Faculty	3	2.36
Current LMS users		
Yes	125	98.43
No	2	1.57
No. of years of teaching in the institution		
Below 5	56	44.09
5 to 9	24	18.90
10 to 14	24	18.90
15 to 19	19	14.96
20 & above	4	3.15
Total	127	100.00

Research Instrument

The research instrument used for data collection was an online survey that consisted of three parts: the first part described the objectives of the study and sought informed consent from the respondents; the second part asked about the respondents’ gender, education, faculty classification, current LMS use, and number of years of teaching at the institution; the third part consisted of survey items related to LMS adoption. The TAM-related survey items were adopted from Fathema et al. (2015) and were re-worded to align with the context of this research. A total of 28 statements were used to assess the eight constructs: SQ (4 items), SE (3 items), FC (3 items), PE (4 items), PU (4 items), AT (4 items), BI (3 items), and AU (3 items). All items were measured on a four-point Likert scale with 1 = strongly disagree, 2 = disagree, 3 = agree, and 4 = strongly agree.

Data Gathering Procedure

A web-based survey created using Google Forms was sent to faculty members through their official email addresses in the College. Data collection was done in the middle of the academic year, approximately one year after the college shifted to Brightspace from an open source LMS.

Conducting this study was supported and monitored by the institutional research office. Compliance with prescribed ethical guidelines was ensured through informed consent from the respondents by requiring them to signify understanding of the nature and purposes of the study, offering no rewards for participation, and providing an option to be excluded from the study in case they change their mind. Personal identifiable information of the respondents (i.e., email address) were accessible only to the researcher who analyzed the data.

Data Analysis
This is a quantitative study that applied partial least squares-structural equation modeling (PLS-SEM) to determine the association among eight constructs related to TAM (PU, PE, AT, BI, AU, SQ, FC, and SE). This technique enables estimation of complex models with several constructs (Revythi & Tselios, 2019) but requires less stringent assumptions on sample size, distribution and normality (Hair et al., 2019).

Findings

This section follows the stages of PLS-SEM model analysis and interpretation suggested by Hulland (1999). The first part presents the results generated from the tests of reliability and validity, and the second part shows the tests of hypotheses related to the structural model.

Reliability and Validity
Construct reliability evaluates the degree of consistency between the reflective item and the intended measure (Roldan & Sanchez-Franco, 2012; Kock, 2015; Amora et al., 2016). Construct reliability is deemed adequate when composite reliability (CR) and Cronbach's alpha (CA) are at least 0.70 (Fornell & Larcker, 1981; Nunnaly & Bernstein, 1994; Kock, 2015). Convergent validity assesses whether the level of understanding by the respondents on the items associated with each variable matches the intention of the designer of the instrument. In PLS-SEM, there are two methods used to test convergent validity. First, item loadings related to the variable should be at least 0.50 in value, and statistically significant ($p < 0.5$). Item loading indicates the correlation between the item and the variable. Next, average variance extracted (AVE) should be at least 0.50 (Hair et al., 2012; Kock, 2015; Amora et al., 2016). AVE measures the overall dispersion attributed to the construct against that of observational error (Fornell & Larcker, 1981).

The values in Table 2 indicate that all eight constructs were above the recommended 0.70 guideline for construct validity. Likewise, convergent validity of the constructs in the structural model were deemed sufficient with item loadings and AVE values recorded well above 0.50.

Table 2: Item loadings, AVE, and reliability of the constructs

Constructs	No. of items	Item loadings***	AVE	CA	CR
1. Actual Use (AU)	3	.77-.96	.78	.86	.92
2. Behavioral Intention (BI)	3	.91-94	.85	.91	.95
3. Perceived Usefulness (PU)	4	.91-.95	.88	.95	.97
4. Perceived Ease of Use (PE)	4	.81-.91	.73	.88	.92
5. Attitude Towards Using (AT)	4	.87-.91	.81	.92	.95
6. Facilitating Conditions (FC)	3	.86-.92	.81	.88	.93
7. Perceived Self-Efficacy (SE)	3	.90-.94	.85	.91	.95
8. System Quality (SQ)	4	.73-.85	.68	.84	.90

***$p < .001$.

Discriminant validity is present when respondents do not confuse the items of a particular variable with those of other variables in the instrument, particularly in terms of meaning (Kock, 2015). If the $\sqrt{\text{AVE}}$ of a variable (i.e., any of the diagonal values) is greater than the coefficients (i.e., off-diagonal values) for any combination of this variable with another, then the items in that variable have a strong correlation (Teo, 2010). In this case, all diagonal values are higher than the related off-diagonal values which shows acceptable discriminant validity for all constructs (see Table 3).

Table 3: Correlation coefficients and AVE of the constructs

Constructs	1	2	3	4	5	6	7	8
1. Actual Use (AU)	**0.89**							
2. Behavioral Intention (BI)	0.62	**0.92**						
3. Perceived Usefulness (PU)	0.60	0.79	**0.94**					
4. Perceived Ease of Use (PE)	0.49	0.64	0.72	**0.86**				
5. Attitude Towards Using (AT)	0.61	0.87	0.84	0.72	**0.90**			
6. Facilitating Conditions (FC)	0.30	0.55	0.57	0.65	0.56	**0.90**		
7. Perceived Self-Efficacy (SE)	0.55	0.67	0.68	0.81	0.72	0.64	**0.92**	
8. System Quality (SQ)	0.39	0.66	0.72	0.79	0.74	0.69	0.73	**0.83**

Note. Diagonal values represent the square root of AVE of constructs ($\sqrt{\text{AVE}}$), while the off-diagonal values are the correlation among the constructs.

Tests of convergent validity, discriminant validity and reliability satisfied the conditions for estimating the structural model: average path coefficient (APC) = 0.304 ($p < .001$), average R-squared (ARS) = 0.656, $p < .001$; average adjusted R-squared (AARS) = 0.649, $p < .001$; average block VIF (AVIF) = 3.073 (acceptable if ≤5, ideally ≤ 3.3); average full collinearity VIF (AFVIF) = 3.773 (acceptable if ≤ 5, ideally ≤ 3.3); and Tenenhaus goodness of fit (GoF) = 0.726 (large ≥ 0.36) (Kock, 2015). Overall, the fit and quality indices of the structural model in the present study fell within acceptable limits.

Test of Structural Model

Table 4 presents the parameter estimates and outcomes for proposed relationships in the extended TAM. Of the fourteen (14) hypotheses, only 10 were supported by the data.

Table 4: Parameter estimates of the extended technology acceptance model for LMS

Hypotheses	Path	β	p-value	f^2	Results
H_1	SQ →PU	.340	.000	.082	Supported**
H_2	SQ → PE	.390	.000	.081	Supported**
H_3	SQ → AT	.237	.003	.084	Supported*
H_4	SQ → BI	.016	.428	.088	Not supported
H_5	SE → PU	.226	.004	.159	Supported*
H_6	SE → PE	.470	.000	.380	Supported**
H_7	FC → PE	.081	.177	.053	Not supported
H_8	FC → AT	.005	.476	.003	Not supported
H_9	PE → PU	.278	.000	.205	Supported**
H_{10}	PE→ AT	.108	.108	.080	Not supported
H_{11}	PU → AT	.590	.000	.499	Supported**
H_{12}	PU → BI	.219	.005	.173	Supported*
H_{13}	AT → BI	.666	.000	.574	Supported**
H_{14}	BI → AU	.633	.000	.401	Supported**

Note. f^2 is Cohen's effect size: .02=small, .15=moderate, .35=large; β=path coefficient
$*p < .05$, $**p < .01$

In terms of system quality, results of the structural model revealed that SQ directly affected PU, PE, and AT. Positive β values (i.e., path coefficients) indicated that high SQ led to high PU, PE and AT. Additionally, SQ significantly affected BI. For perceived self-efficacy, it can be noted that SE significantly affected PU and PE. Moreover, the extent of the effect of SE can be described as large on perceived ease of use ($f^2 = .380$) and moderate on perceived usefulness ($f^2 = .159$). FC did not have a significant effect on PE and AT.

PE had a positive and significant effect on PU, but no statistically significant effect on AT. The positive β value of PE on PU suggested that when teachers reported ease of LMS usage, they also perceived the LMS to be useful. Moreover, PU had a more dominant effect on AT ($f^2 = .499$) than BI ($f^2 = .173$). The data also offered evidence that faculty who found the LMS useful would have positive attitudes and strong intentions to use the LMS.

AT positively and significantly affected BI, and in turn, BI directly affected AU. This means that teachers with favorable attitudes toward LMS usage were likely to have stronger behavioral intentions which led to actual technology use. Similar to the effect of AT on BI ($f^2 = .574$), behavioral intention influenced AU to a large extent ($f^2 = .401$).

Discussion

This research sought to confirm the applicability of the extended TAM (Fathema et al., 2015) in a local higher education context. While it confirmed several relationships from the model, four hypotheses were not supported by this research. More specifically, the effects of SQ on BI, FC on PE and AT, and PE on AT were all not statistically significant. Findings from this study expand the existing body of knowledge on TAM by reinforcing a new dimension to the relationships that exist between SQ and PE.

Effects of External Variables

System quality is a significant external variable that affects users' attitudes towards technology usage (Fathema & Sutton, 2013). Aligned with the work of Fathema et al. (2015) and Salloum et al. (2019), this study revealed that SQ positively and significantly affects PU and PE. This means that a high-performing LMS in terms of quality will be perceived by teachers as both useful and easy to use. Consistent with the finding of Fathema et al. (2015), SQ has a significant effect on AT but not BI. This means that the characteristics of a LMS, although desirable, do not assure its consequent utilization by faculty.

Teachers' perceived self-efficacy has a significant influence on PU and PE, which confirms previous findings that self-efficacy is a critical factor in assessing whether technology use will be successful or not (Ahmad et al., 2010; Teo et al., 2012; Fathema et al., 2015). This result suggests that teachers with high SE also have high levels of comfort and confidence that using the LMS will help them achieve their goals at work. Based on previous research, high SE among teachers translates to improved perceptions and stronger intentions to use the LMS (Baturay et al., 2017; Parkman et al., 2018).

The provision of technical support for technology use is rated by faculty as an enabler (Siyam, 2019), and its absence is a barrier to technology integration in the classroom (Lim & Khine, 2006). According to Fathema et al. (2015), teachers are likely to develop more approving attitudes toward the technology when facilitating conditions (i.e., training, tutorials, support, etc.) are present. In terms of FC, the results of this study were not in agreement with earlier work by Teo (2010) and Fathema et al. (2015) which reported FC to have a significant effect on PE. It could be possible that adequate facilitating conditions were not fully in place at the time of data collection, which made the effects of FC on PE weak and insignificant. Alternatively, SQ and SE may be quite high such that teachers do not feel the need for FC, and the lack of facilitating conditions presented no significant effect on PE. Consistent with one of the findings of this research, however, are related studies that found no significant association between FC and AT (Teo et al., 2012; Teo & Milutinovic, 2015).

Effects of Original TAM Constructs

The findings of this research are generally consistent with previous TAM-related work that reported strong relationships between PE and PU, and PU and AT (Teo, 2010; Teo et al., 2012; Fathema et al., 2015, Teo & Milutinovic, 2015; Stockless, 2018; Siyam, 2019). Between PU and PE, PU is a stronger predictor of AT compared to PE. Contrary to the researchers' expectation, this investigation showed that PE does not significantly predict AT. This suggests that faculty who perceive the LMS to be easy to use do not necessarily possess positive attitudes towards the LMS. This may be explained by the high perceived self-efficacy reported by teachers which could strongly affect how easy it is for them to work with the LMS. When teachers feel confident in their abilities to use a technology and find no difficulty in its utilization, their attitudes towards it may likely be unaffected. Thus, PE had no significant effect on AT. As noted earlier, SE has the largest influence on PE compared to SQ and FC, thus, lending further support to the above explanation. The positive effect of AT on behavioral intention, and the similar effect of BI on actual use are all in agreement with previous work by Fathema et al. (2015), Teo (2010), and Ahmad et al. (2010).

Conclusion and Recommendation

The technology acceptance model has been modified numerous times based on emerging technologies (Benbasat & Barki, 2007), and these various modifications may provide some explanation as to why there is no single model that is unanimously accepted by the research community (Stockless, 2018). This may be attributed to differences in educational context, characteristics of respondents, and emphasis as regards to the external variables utilized in the investigation (Wu & Liu, 2015). While the study results provide an acceptable level of support for the TAM and its extended version, the relationships among constructs that were not confirmed by this research (i.e., the effects of SQ on BI, FC on PE and AT, and PE on AT) merit further examination.

Among the three external variables included in this investigation, perceived self-efficacy has the strongest influence on PU and PE. As such, there is further evidence that teachers with positive beliefs about their capacity for technology will find a LMS both useful and easy to use. This research also confirms the desirability of the learning management system being utilized in the college, because system quality positively and significantly affects PU, PE and AT.

The current study provides an empirical validation of the extended TAM proposed by Fathema et al. (2015). It offers practical implications in terms of practice, policy and future related work. For practitioners, self-confidence in their ability (i.e., perceived self-efficacy) to use a technology is an essential element of acceptance and adoption. Moreover, faculty with high SE may be recruited as partners in promoting LMS use or engaged as mentors for other teachers who are at the early stages of LMS integration. For policy makers who make decisions on the procurement of educational technologies by their respective institutions, system quality should be considered as an important selection criterion. By assessing system quality, administrators can prioritize the kind of institutional support to be put in place for users of the technology (Rhode et al., 2017). For researchers, succeeding studies on the TAM may seek to further explore the effects of other external variables including personal innovativeness and technology access (Mazman Akar, 2019), job relevance and planning time (Siyam, 2019), management support (Ayele & Birhanie, 2018), subjective norm (Teo, 2010) and computer anxiety (Venkatesh & Bala, 2008), among others. While the single method of data collection used in this study limits generalizing the findings to other populations, this research provides a better understanding of how higher education teachers accept, adopt, and use technology in the Philippine context. Replication studies may also consider a mixed-method approach to generate qualitative data that can enrich the explanatory power of the different TAM constructs.

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Corresponding author: Marissa R. Fearnley
Contact email: marissa.fearnley@benilde.edu.ph