International Journal of Technology in Education and Science (IJTES)

www.ijtes.net

A Study on the Factors Influencing Students' Acceptance of Learning Management Systems (LMS): A Brunei Case Study

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To cite this article:

Hamid, M. A., Salleh, S. & Laxman, K. (2020). A study on the factors influencing students' acceptance of Learning Management Systems (LMS): A Brunei case study. *International Journal of Technology in Education and Science (IJTES), 4*(3), 203-217.

IJTES International Journal of Technology in Education and Science
Volume 4, Issue 3, Summer 2020 ISSN: 2651-5369

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Article Info

Article History

Received:
18 March 2020

Accepted:
11 June 2020

Keywords

Factors
Students' acceptance
Brunei
Learning Management Systems (LMS)

Abstract

The present study sought to explore and explain the factors influencing students' acceptance of the Learning Management Systems (LMS) as well as to explain the effectiveness of using LMS in teaching and learning in the School of Business. The research model employed the Technology Acceptance Model (TAM) as the theoretical framework and extends it by adding System Design, System Accessibility, Technical Support and Subjective Norm as external variables. The model was tested using responses from 98 students (n=98) taking Business Information Systems module through the data gathered by means of survey questionnaire. The analysis of the collected data supported all of the generated hypotheses and was found consistent with the TAM original findings on behavioral intention. The study also revealed that the Subjective Norm and System Design have significant influence on the students' LMS acceptance. Findings indicate that content delivery over the web portal helped to engage students and established viable interaction which allowed them to better understand and gain knowledge on each concept. Besides this, there are several key factors to consider when conducting educational process or activity over the technology such as originality of students' ideas, specificity of content, comments and feedback as well as class size. Theoretical and applied implications of the obtained results are discussed at the end of this report within the context of education.

Introduction

The national vision, Wawasan Brunei 2035, aims to make Brunei be internationally recognized 'for the accomplishments of its well-educated and highly skilled people, its quality of life, and its dynamic, sustainable economy in the world'. It was authorized and launched in January 2008 by His Majesty Sultan Haji Hassanal Bolkiah, Sultan and Yang Di-Pertuan of Brunei Darussalam (Ministry of Education, 2012). An initiative to realise the vision includes the establishment of a polytechnic as a higher technical educational institution in January 2012 to support the development of the technical education system in Brunei that began with The National Education System for the 21st Century, SPN21, in 2009 (Mun Tai, 2016). Being aware of the national aspiration to have well-educated and highly skilled people as well as a dynamic economy, the Ministry of Education (MOE) aligned its plans and operation to the Eight Outline Strategy Policy Directions, two of which include to strengthen students' and teachers' competency in ICT including its integration in teaching and learning as well as to adopt cost-effective methods of educating people through the use of technology (Ministry of Education, 2012). One of the ICT tools that is being increasingly incorporated into the education system in the nation today is the Learning Management System or popularly known as LMS. School of Business at the Politeknik Brunei launched its LMS in 2014; an e-learning platform that provides necessary tools to support its blended philosophy of teaching (integration of online and face-to-face modalities). The introduction of the learning system aims to create an innovative way of delivering knowledge in the schools that is used to provide quality teaching and learning through the intensive use of ICT.

Problem Statement and Significance of the Study

The success of LMS in an academic institution is initiated by lecturers' acceptance; however, the survival of the system depends on how students embrace and utilize it effectively. Lecturers and students at the institution are increasingly exposed to online learning but little is known of their acceptance. The School of Business has started investing in the LMS development project and is ready in terms of infrastructure. However, are lecturers and students ready to adopt ICT in their teaching and learning processes? As ICTs are expected to continuously transform the teaching and learning practices, demand to study the adoption and effectiveness is paramount.

Majority of existing research studies carried out in the Brunei sultanate concentrates on the capabilities of teachers using ICTs in their teaching (Lubis, Lampoh, Yunus, Shahar, Ishak & Muhamad, 2011; Salleh, 2005; Salleh & Lampoh, 2007). There is no or relatively little research on the investigation of the adoption of LMS by students, particularly in the higher technical education.

Moreover, most of the existing studies on attitudes of students on the adoption of ICT have been carried out in developed countries. The findings may not be valid to developing countries such as Brunei, where it is culturally unique compared to other countries. Thus, this study carries a rich significance as it will focus on Brunei's context in exploring and explaining the factors influencing students' acceptance of the LMS, as well as to explain the effectiveness of using LMS on students' learning in the Business Information Systems (BIS) module, of which a topic (i.e. System Development Life Cycle – SDLC) has been chosen for the purpose of this study.

Objectives of the Study

The specific objectives of this study are:

- To explore the factors and perceptions of students which may influence the students' acceptance of LMS in studying the topic of SDLC under BIS module in the School of Business
- To explain the effectiveness of teaching and learning SDLC using LMS platform.

Research Questions

The following research questions guide the design of this present study:

- How does students' perceptions of usefulness and ease of use predict and explain students' intention to use the LMS?
- To what extent does the subjective norm influence the perceived usefulness and students' intention to use the LMS?
- What is the relationship between students' system design with perceived usefulness and perceived ease of use of the LMS?
- How does system accessibility and technical support affect the students' intention to use and accept the LMS?

Literature Review

Influence of ICTs on Student Achievement and Performance

The effect of ICTs on students' academic achievement is continuously debated and reported in emergent literatures, albeit demonstrating inconsistent results; both positive and negative effects and relationships. A study conducted by Al-Hariri and Al-Hattami (2016) found out that the increased use of technology in students' learning helps to increase students' comprehension of content and development of skills such as analytical reasoning, problem solving, information evaluation and creative thinking. The justification of their findings are that course materials are centralized over the Blackboard, related links and supplementary resources are shared, and group email lists and an interactive discussion board are made available to students. With that said, students are becoming more engaged with technology and this makes learning physiology more meaningful than when it is not, hence, improving their academic achievement.

A study by Cheng, Len and She (2015) indicated that students' long term knowledge retention in a technology-based learning (also known as "serious educational games – SEG") consequently influenced their learning outcomes and outperformed those who are not exposed to technology enhanced classrooms. Moreover, the study by Fonseca, Marti, Redondo, Navarro and Sanchez (2014) found that technology has a significant correlation with academic performance wherein students were able to achieve a greater level of motivation and engagement with the content through the use of technology in their learning. In another study by Kulik (as cited in AlAmmary, 2012), it was found that students who received computer-based instructions led to a rise in student achievement gains and their examination scores increased from the 50th to the 64th percentile. Sivin-Kachala (as cited in AlAmmary, 2012) further reported students who are in technology-rich environments showed positive effects on their achievements in all subjects. Students develop more positive attitudes toward learning when computers were used as they are able to generate more ideas and build self-confidence.

Conversely, a number of literatures have reported the negative relationship between the usage of ICTs and academic performance. Recent research found that use of ICTs has diminished students' attainment in the classroom, as measured by their performance on a comprehension test (Sana, Wetson and Cepeda, 2013). Findings from another study by Jacobsen and Forste (2011) indicated that there was significant negative correlation between the uses of technology, including online games with academic performance amongst university students in the United States. Punie, Zinbauuer and Cabrera (2006) explained that despite the rapid advancement of computing in education, technology or ICTs are only used as tools to support and improve teaching and learning. Computers will never replace the power of human touch in the classroom. The fact that face-to-face classroom teaching remains central and the ways in which technology are used in teaching to foster student's learning is more important considerations. The above literatures show evidence that the results are inconsistent and confounding. Adzharuddin and Ling (2013) noted that it depends a great deal on how educators design the use of technologies in curriculum. It is the educators' responsibilities to know how to use technology effectively to make an impact on students' understanding and achievement.

Theoretical Framework

The present study utilized Davis's (1989) Technology Acceptance Model (TAM) as a theoretical framework to examine students' perception and usage of LMS in the school with selected constructs or variables such as their attitude, perceived usefulness, perceived ease of use, subjective norm, system design, system accessibility and technical support. Technology Acceptance Model, TAM in short, is a famous intention-based model (Abbad, Morris & Nahlik, 2009) introduced in 1989 by Fred Davis in his attempt to model user acceptance and use of information systems (ISs). TAM was formulated after the Theory of Reasoned Action (TRA) by Fishbein and Ajzen (1975) who theorized that beliefs influence attitudes, which lead to intentions and consequently generate behaviors. Davis (1989) refined his conceptual model, based on the TRA, to develop TAM and suggested that user's motivation can be explained further by three factors: i) Perceived Usefulness (PU), ii) Perceived Ease of Use (PEOU) and iii) Attitude towards using the system. He hypothesized that attitude of a user toward a system was a major determinant as to whether the user will actually use or reject the system. The attitude, on the other hand, was considered to be influenced by two major beliefs: PU and PEOU. Figure 1 presents the original TAM developed by Davis.

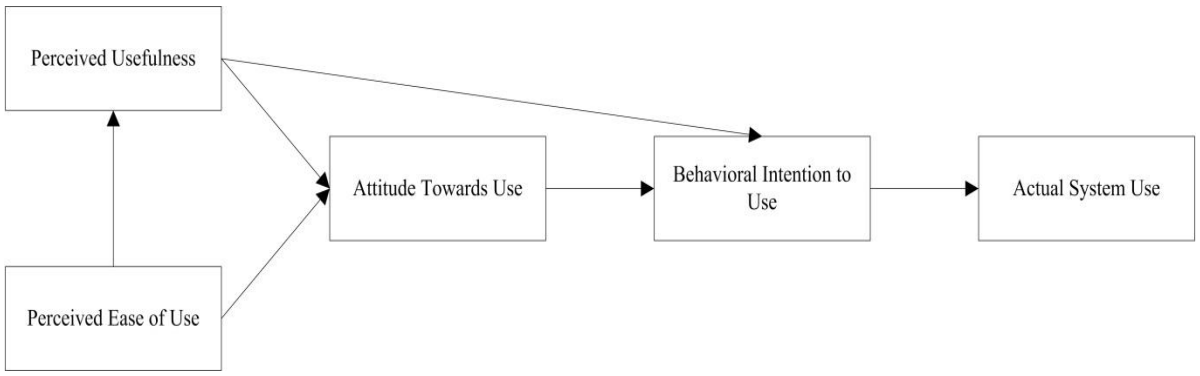

Figure 1. Technology Acceptance Model (TAM) (Source: Adapted from Abbad et al., 2009:3)

Methodology

Research Model and Hypotheses

A number of studies have successfully adopted TAM (Abbad et al., 2009; Alharbi & Drew, 2014; Ayub et al., 2010; Fathema et al., 2015; Ngai, Poon & Chan, 2007; Park, 2009) to examine the acceptance of e-learning or LMS in higher education but there are no studies from our search explaining the acceptance of a web learning portal in technical education where there is more focus on hands-on and laboratory works. This study sought to explore and explain the factors and perceptions of students which may influence students' acceptance of LMS in studying the topic of SDLC in the School of Business. To this end, TAM was employed to which four independent variables: Subjective Norm (SN), System Design (SD), System Accessibility (SA) and Technical Support (TS) were incorporated into the two TAM's general measures, PU and PEOU, as dependent variables of this study. Figure 2 shows the research model of this present study.

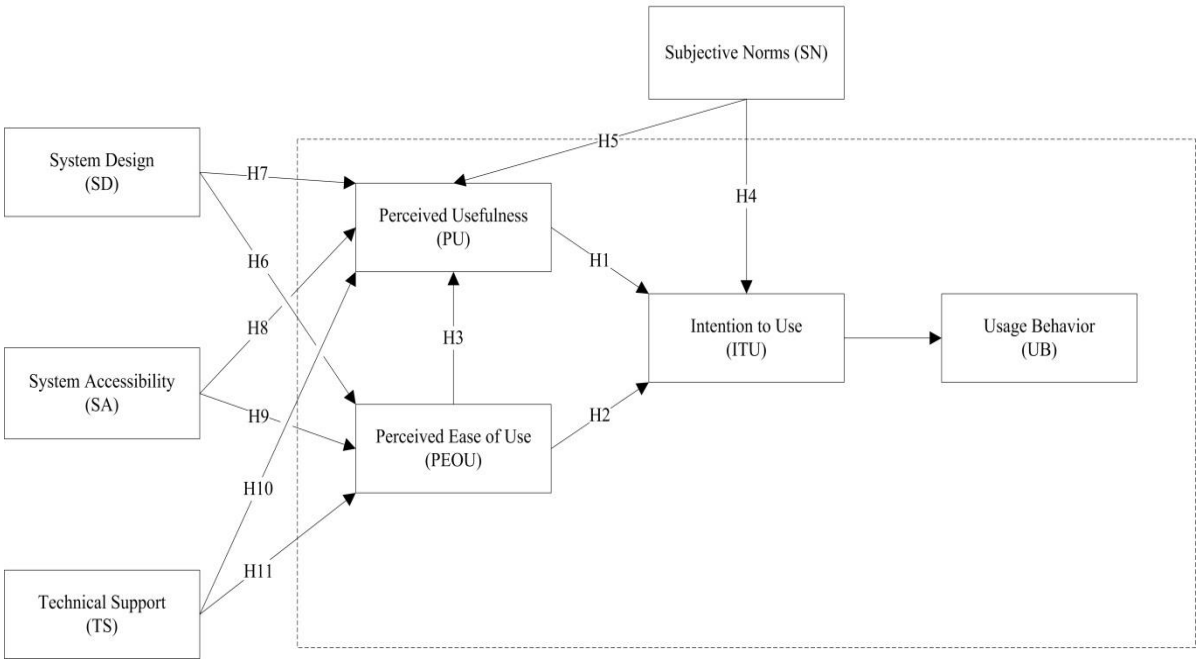

Figure 2. Research Model of the Study

Perceived Usefulness (PU) and Perceive Ease of Use (PEOU)

A substantial number of studies have highlighted the importance of PU and PEOU in measuring an individual's behavior. Davis (1989) theorized that PU and PEOU are the two major drivers to a person's intention to use. The higher the perceived level of usefulness and ease of use, the higher the usage. Further, Davis (1989) also found that an individual is most likely to use ISs when s/he perceived the system is easy to interact with and less effort is needed to operate. Thus, the high perceived level of ease of use will increase the perceived level of usefulness, but this does not guarantee the high usage of system. Therefore, PEOU is an antecedent factor to PU. This significant relationship was empirically supported by various researchers in research on e-learning systems (Alharbi & Drew, 2014; Ataran & Nami, 2011; Chuttur, 2009; Fathema et al., 2015; Sabah, 2016). Hence, the following three hypotheses were developed:

H_1: Perceived usefulness of learning SDLC using LMS will have a positive effect on student's intention to use the system in the School of Business.

H_2: Perceived ease of use of learning SDLC using LMS will have a positive effect on student's intention to use the system in the School of Business.

H_3: Perceived ease of use of learning SDLC using LMS will have a positive effect on student's perception of usefulness of using the system in the School of Business.

Subjective Norm (SN)

Subjective norm is one of the social influence variables that refers to an individual's perception that important people surrounding him/her thinks should or should not perform the behavior in question (Fishbein & Ajzen, as cited in Taylor & Todd, 1995). Based on previous research, findings have reported how SN can affect an individual's intention to use the system either directly or indirectly. Studies (Ataran & Nami, 2011; Venkatesh & Davis, 2000) found that SN has no direct effect on intention to use the systems but will only become significant with a mandatory setting. Studies conducted by Park (2009) and Sabah (2016) further found that SN has a significant influence on intention to use a system through PU. It was proposed in this study that SN variable to be included in this study to determine how social influence i.e. lecturers could affect the LMS usage in the School of Business. Thus, the following hypotheses were developed:

H_4: Subjective norm will have a positive effect on student's behavioral intention to use LMS in the School of Business.

H_5: Subjective norm will have a positive effect on student's perception of usefulness of using LMS in the School of Business.

System Design (SD)

Thong, Hong and Tam (2002) stated that the quality of the system interface makes a significant contribution to the adoption of the system. They further explained that a well-designed system serves as the platform for user action. The design of the system plays a vital role in an online environment whereby the students will use the computer to access the content and interact with their colleagues and lecturers without facing any difficulties while using it. Studies (Ayub et al., 2010; Thong et al., 2002) have found that SD has a direct effect and to be an influential determinant on PEOU, but no prior study on the effect of SD on PU has been conducted. Students tend to accept and perform certain tasks using LMS that they feel easier to perform in a comfortable way without facing difficulties. This lead to the formulation of the following hypotheses:

H_6: System design will have a positive effect on perceived ease of use of the LMS in the School of Business.

H_7: System design will have a positive effect on perceived usefulness of the LMS in the School of Business.

System Accessibility (SA)

Thong et al., (2002:222) defined the term "accessibility" as "the ease with which people can locate specific computer systems." Thus, in this context, the term "system accessibility" can be referred to as the degree of ease with which a student can reach a particular e-learning system to perform certain learning tasks anywhere and anytime (Park, 2009). Researchers found that SA is one of the important factors that determine how frequent the user is using a particular system as a source of information (Ayub et al., 2010; Thong et al., 2002). Thong et al., (2002) therefore theorized that the higher the SA is, the higher an individual perceived the system's usefulness. Hence, the following hypothesis was developed:

H_8: The better the system accessibility in the school, the higher the students perceived the LMS in the School of Business as useful for their learning.

On the other hand, Thong et al., (2002) further theorized that the higher the SA is, the higher an individual perceives the system's ease of use. This was supported by the findings in the study conducted by Park (2009) that SA has a significant effect on PEOU but not to PU. This is particularly true that the tendency of an individual in using such a system is very much dependent on how easy he/she can access to the system (Ayub et al., 2010). Therefore, the following hypothesis was suggested:

H_9: The better the system accessibility in the school, the higher the students perceived the LMS in the School of Business as easy to use in their learning

Technical Support (TS)

To ensure the higher acceptance of e-learning in school, it is vital that system TS should not be neglected (Ngai et al., 2007). Empirical evidence shows that e- learning would not be successful in achieving its goals when the intended users are not provided with access to technical advice and support (Abbad et al., 2009). Therefore, the availability of TS in the school is crucial and has been identified as one of the critical success factor in determining the acceptance of e-learning system in higher institutions (Selim, 2007). Ralph (as cited in Ngai et al., 2007:254) defined TS as ''knowledge people assisting the users of computer hardware and software products'', which can include help desks, hotlines, online support services, machine-readable support knowledge-bases, faxes, automated telephone voice response systems, remote control software and other facilities." Various findings are found on the effect of TS on PU and PEOU. Ngai et al., (2007) found that TS has a strong direct effect on PU and PEOU. A study by Abbad et al., (2009) however found that TS only has positive direct effect on PU but it has no direct influence on PEOU. As a result, the following hypotheses were postulated:

H_{10}: Technical support in the school has a positive effect on perceived usefulness of LMS in the School of Business.

H_{11}: Technical support in the school has a positive effect on perceived ease of use of LMS in the School of Business.

Data Collection Technique

Two versions of questionnaire survey were designed. Printed questionnaire was first developed to include the

measurement items of all constructs which then went through pilot testing stage. This stage was carried out to confirm that the survey is representative and changes were done for the actual data collection. Next, online questionnaire using SurveyMonkey platform was designed to host the final version. Online survey technique was employed to overcome the geographical distance of the intended participants. An email invitation enclosing information such as purpose of the study, confidentiality issue, author's contact details as well as survey link was distributed to students' email accounts. Students were given one (1) month to respond and complete the survey.

Population and Sample Size

The target population of this study was the existing cohort 5 students in the School of Business. Probability stratified random sampling method was used whereby a random list of students was retrieved from the Registrar Office in the institution including those who are in the second year of their study (the BIS module is only offered in Semester 4 of Year 2) in the various diploma programs which make up to a total of 150 students.

Instrumentation

Online Survey

The research instrument consists of three different parts. The first part, Section A, was constructed to gather demographic information such as age, educational background as well as computer and internet availability. Section B, as the core of the instrument, covered a total of twenty-nine measurement items which were adapted from literature (Ayub et al., 2010; Chuttur, 2009; Ngai et al., 2007; Park, 2009) and were refined to make them relevant to the context of the current study. All measurement items were randomized to avoid potential order effects (Fathema et al., 2015) and measured on a 5-point likert scale format from 1 being "strongly disagree" to 5 being "strongly agree." Participants were required to tick the box to reflect their level of agreement or disagreement on each measurement item. The final part of the instrument, Section C, incorporates an open-ended question to allow the participants to share their experience, give useful comments and honest feedback in using the LMS portal. Response to this question is voluntary and no restrictions were imposed on this final question. Appendix A presents all of the measurement items used in the online instrument.

Pilot Study

The instrument including all the twenty-nine measurement items was designed beforehand and prototyped with an expert for comments and feedback on the feasibility of the survey. The justification of this step is to develop content validity (Saunders et al., 2009:394) so that necessary amendments could be made to the instrument. Self-administered surveys were then distributed to sixty students, who were also the intended sample for actual data collection. Minor changes on the year of study and wordings of the items were incorporated into the online version of the survey. Generally, the survey was pretty much clear and straightforward to allow participants to respond quickly which considerably enhanced its clarity (Saunders et al., 2009).

Reliability Assessment

Reliability refers to a measurement within construct which reflects the internal consistency among indicators of each construct (Saunders et al., 2009:156). In other words, it is about how well a set of measurement items measures the same construct and consistent on different occasions. In this study, Cronbach's Alpha method was used to analyze whether a given construct is independent to other constructs. Results of internal consistency test of all measurement items are presented in Table 1.

The Cronbach's Alpha score of 0.7 or higher is generally considered acceptable (Alharbi & Drew, 2014) while value of more than 0.9 may indicate redundancy (Kindy, Shah & Jusoh, 2016; Tavakol & Dennick, 2011). The results demonstrate that the reliability values ranged from .40 to .71 whereas the Cronbach's Alpha for the model is 0.87. All the reliability levels are generally acceptable and exhibit satisfactory reliability. The findings confirmed that the items used in the instrument are reliable.

Table 1. Reliability Cronbach's Alpha of Factors

Factors	Cronbach's Alpha Scores
PU	0.712
PEOU	0.674
ITU	0.351
SN	0.574
SD	0.596
SA	0.649
TS	0.684

Validity Assessment

Validity is concerned with whether the findings are really about what they appear to be about (Saunders et al., 2009:157). In other words, it is an issue of measurement between constructs, that is, how well the selected items for a given construct are reasonable measurement of the construct. Since all items in the instrument have been adapted from standard questionnaires and went through the assessment of validity, thus, it was expected that all measurement items used in this study are of the same validity standard.

Data Collection and Reponses

The following table summarizes the responses to the survey collected over a period of time. Out of the 104 total responses received, six were discarded due to the partial completion of the survey resulting in missing values. Therefore, only 98 responses were kept and deemed to be appropriate for data analysis. Generally, the rate of responses was good to proceed with statistical analysis.

Table 2. Size of Sample Data Eligible for Data Analysis

Month	Week	Calculation
February	1	62
	2	24
March	3	18
	4	0
Total :		104
Dropped (incomplete) :		6
Retained :		98

Findings

Demographic Information

The descriptive statistics of the respondents' demographics are presented in Table 3. Based on the table, it is clear that female students dominated the sample population. Out of the 98 respondents, 72.4 percent of them were female while the remaining 27.6 percent were male. This statistical information reflects the increasing number of female students being enrolled in Brunei tertiary schools every year in comparison to their male counterparts (Economic Planning and Development, 2015).

73.5 percent of the respondents are in the age range of 20-24 years old and 24.5 percent of the respondents are below 20 years old. The remaining 2 percent are those with age above 25 years old that represent in-service students. Furthermore, all respondents are in year 2 of their study. 98 percent of the respondents owned at least a computer of which 88.8 percent of them have access to internet connection.

Computers with internet accessibility are now becoming a necessity in the life of students and with the emphasis of ICTs in Brunei. Education is now well supported by the Ministry of Education which provides all schools and institutions in the nation with necessary technologies and infrastructure. Another possible reason to this high percentage of computer ownership and connection availability is due to affordability as a result of low prices offered by local vendors and providers.

Table 3. Demographic Background of Respondents

	Number (*n*)	**Percent (%)**
Gender		
Male	27	72.4
Female	71	27.6
Age Group		
Below 20	24	24.5
20 – 24	72	73.5
25 – 29	1	1.0
Above 30	1	1.0
Program of Study		
Diploma in Business Accounting and Finance – DiBAF	43	43.9
Diploma in Business Studies – DiBS	8	8.2
Diploma in Business Studies (ENT) – DiBS(ENT)	6	6.1
Diploma in Business Studies (HRM) – DiBS(HRM)	23	23.5
Diploma in Business Studies (MKT) – DiBS(MKT)	18	18.4
Year of Study		
2	98	100
Computer Availability		
Yes	96	98.0
No	2	2.0
Internet Availability		
Yes	87	88.8
No	11	11.2

Exploratory Factor Analysis (EFA)

The results of the EFA show that 64.3 percent of total variance was accounted for in this factor solution. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) value is .789, which is above .6 (Pallant, 2002). The Barlett's Test of Sphericity is significant (p=.000), therefore, factor analysis of this study is appropriate. Table 4 shows the final items for the study.

The table demonstrates that items PU1 and PU3 show strong factor loading with .676 and .647 respectively. Despite all items measuring the same variable, it was deduced that an item may show weak loading when it is modified to address the context of a specific study – in this case to learn SDLC/BIS in the learning platform, compared to the other items that measure the general use of LMS. Therefore, the valid and selected items to measure Perceived Usefulness (PU) are PU1 and PU3.

Table 4. Final Items of the Study

Variables	**Items No**	**Factor Loading**
Perceived Usefulness	PU1	.676
	PU3	.647
Perceived Ease of Use	PEOU4	.730
	PEOU5	.717
Intention to Use	ITU1	.598
	ITU2	.483
System Design	SD3	.679
	SD4	.590
Subjective Norm	SN2	.686
	SN3	.583
System Accessibility	SA2	.535
	SA3	.572
Technical Support	TS4	.629
	TS5	.628

Items SD3 and SD4 loaded together strongly at .679 and .590 – it was deduced that both items could be used to measure the usefulness and ease of use of the LMS whereas the other two items (SD1 and SD2) could also be used to measure the ease of approaching the lecturers and classmates. Therefore, SD3 and SD4 were retained and selected to measure System Design (SD). The table also indicates that both SA2 and SA3 loaded together

with .535 and .572 respectively. It also can be seen that items PEOU4 and PEOU5 show strong factor loading with .730 and .717 respectively. Hence, PEOU4 and PEOU5 are valid and were selected to measure Perceived Ease of Use (PEOU). Items (SA2 and SA3) are valid and were selected to measure the System Accessibility (SA). As for the Intention to Use (ITU), both items (ITU1 and ITU2) are valid and chosen to measure the variable. The items loaded together at .598 (ITU1) and .483 (ITU2). SN2 and SN3 grouped together and loaded at .686 and .583 respectively whereas the other two items (SN1 and SN4) loaded weakly as they were refined to make it relevant to the context of the study. Thus, SN2 and SN3 were retained. Both TS4 and TS5 are valid and selected to measure Technical Support (TS). The items loaded together and closest to each other at .629 (TS4) and .628 (TS5). Both items measure the support in terms of training while the other items (TS1, TS2 and TS3) measure the support in terms of help desk presence, email inquiries as well as technician availability.

Hypotheses Testing

Table 5 shows descriptive statistics of all variables in the research model. As far as PU and PEOU are concerned, ITU (3.802), PEOU (3.796) and SN (3.676) were identified to be significant. The high mean of SN indicates that subjective norm, that is, when the lecturers emphasize on the use of LMS in teaching and learning will subsequently influence students to actually using the platform in school. The analysis further provides statistical evidence that the high mean of SA (3.559) and PU (3.622) would also suggest that when students have better accessibility to the platform, this will allow them to use and perform certain learning tasks using the LMS that they perceived would ease their learning and thus, enhance their performance. On the other side, the small standard deviation values would represent that the students have unvarying perceptions of the platform being used in school.

Table 5. Descriptive Statistics of Variables

Variable	Mean	Standard Deviation
Perceived Usefulness	3.622	.545
Perceived Ease of Use	3.796	.519
Intention to Use	3.802	.461
Subjective Norm	3.676	.468
System Design	3.398	.457
System Accessibility	3.559	.678
Technical Support	3.290	.504

However, the values of statistical means and standard deviation presented in the table were not sufficient to confirm the significance of the variables. Therefore, the sample data was further analyzed in the form of Pearson's product moment correlation to assess the strengths of the relationships among the variables in the model. Correlation coefficient results along with the level of significance of each variable were obtained and summarized as follows.

Table 6. Results of Hypotheses Testing

Hypothesis	Hypothesized Path	Correlation I	P-value	z
H_1	PU – ITU	.381	.000	Supported
H_2	PEOU – ITU	.344	.000	Supported
H_3	PEOU – PU	.445	.000	Supported
H_4	SN – ITU	.473	.000	Supported
H_5	SN – PU	.571	.000	Supported
H_6	SD – PEOU	.546	.000	Supported
H_7	SD – PU	.488	.000	Supported
H_8	SA – PU	.263	.000	Supported
H_9	SA – PEOU	.273	.000	Supported
H_{10}	TS – PU	.446	.000	Supported
H_{11}	TS – PEOU	.479	.000	Supported

The results of PEOU (r=.344) and PU (r=.381) turned out to be statistically determinant to the intention to use LMS. The results further indicate that PEOU is positively correlated to PU (r=.445). These statistical results mirror the findings of Venkatesh and Davis (2000) and other researchers (Alharbi & Drew, 2014; Fathema et al., 2015). Therefore, hypotheses H_1, H_2 and H_3 are well supported. A confounding result was found in respect to SN. A study by Taylor and Todd (1995) concluded that SN only has a positive influence on ITU whereas other researchers (Ataran & Nami, 2011; Vankatesh & Davis, 2000) found that SN has an influence on both ITU and

PU – however, this will only be statistically significant when technology became part of or is mandated in teaching and learning. The findings show that SN was found to have strongest magnitude on students' intention to use LMS (r=.473) and has a positive influence through PU (r=.571). This statistical outcome is consistent with the findings by Park (2009) and Sabah (2016), hence, hypotheses (H_4 and H_5) are accepted.

Based on the literature discussed earlier, SD has a positive correlation and found to be an influential factor on PU and PEOU. The analysis of data indicated that it coincides with the findings found by Thong et al., (2002) and Ayub et al., (2010) in which SD has a direct effect on PU as well as PEOU, r=.488 and r=.546 respectively. Thus, H_6 and H_7 are accepted. The analysis further indicated that SA was found to be significant in affecting students' intention to use the portal through PU and PEOU at r=.263 and r=.273 respectively. The finding is, however, in contrary with Park (2009) who found SA to be non-significant on PU. Nevertheless, hypotheses H_8 and H_9 are true. Finally, despite the uncertain effect of TS on PEOU as reported in literature, it was evident in the current study that TS provided to students in the school was significantly correlated with PEOU (r=.479) and positively an influential factor on PU (r=.446). The result agrees with the findings by Ngai et al., (2007). Therefore, hypotheses H_{10} and H_{11} are supported.

Multiple Regression Reports

Multiple linear regressions were used to determine the influence of SN, SD, SA and TS on PU and PEOU. Based on Tables 7 and 8, all the independent variables correlate substantially with PU (.571, .488, .263 and .446) and PEOU (.546, .273 and.479), above .3 and none of them correlate above .7 (Pallant, 2002). Therefore, all variables were retained. Collinearity diagnostics (i.e. tolerance and Variance Inflation Factor – VIF) were also conducted on all variables. Pallant (2002) recommended that no variable should fall below .10 for tolerance and below 10 for VIF indicating the possibility of multicollinearity and when both occurs, these certainly do not contribute to a good regression model.

Table 7. Correlations and Coefficients of Perceived Usefulness

Model	Unstandardized Coeff.		Std. Coeff.	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
(Constant)	.484	.408		1.186	.239	-.327	1.294					
MeanSN	.450	.113	.387	3.964	.000	.224	.675	.571	.380	.319	.679	1.473
MeanSD	.247	.126	.207	1.959	.053	-.003	.497	.488	.199	.157	.578	1.730
MeanSA	.030	.073	.037	.408	.684	-.114	.174	.263	.042	.033	.792	1.263
MeanTS	.165	.105	.152	1.563	.121	-.045	.374	.446	.160	.126	.680	1.471

a. Dependent Variable: MeanPU

In this study, the tolerance values for each independent variable, both on PU and PEOU, are above .10. Therefore, it does not violate the multicollinearity assumption. This is also supported by the VIF values, which are well below the cut-off of 10. These findings are not surprising as the Pearson's correlation coefficient between those variables ranged from .3 to .6.

Table 8. Correlations and Coefficients of Perceived Ease of Use

Model	Unstandardized Coefficients		Std. Coeff.	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
(Constant)	1.220	.366		3.336	.001	.494	1.945					
MeanSD	.438	.119	.385	3.688	.000	.202	.674	.546	.356	.305	.625	1.600
MeanSA	.039	.071	.051	.551	.583	-.102	.180	.273	.057	.046	.799	1.252
MeanTS	.288	.098	.280	2.943	.004	.094	.483	.479	.290	.243	.755	1.324

a. Dependent Variable: MeanPEOU

Furthermore, the findings also show that SN explains 38.7 percent of the variance of PU while SD explains 38.5 percent of the variance of PEOU. On the basis of the correlation coefficient analysis conducted earlier and this regression analysis, it is tempting to conclude that both SN and SD are the two useful predictors in this study. SN, that is, lecturers are believed to be committed in using the LMS but more efforts need to be taken by the lecturers to ensure greater usefulness is brought about by using it. Similarly, the design of LMS indicates that the students felt that the design helps them to use the LMS easily and learn comfortably but at the same time need further improvements. Figure 3 shows the final model of the study.

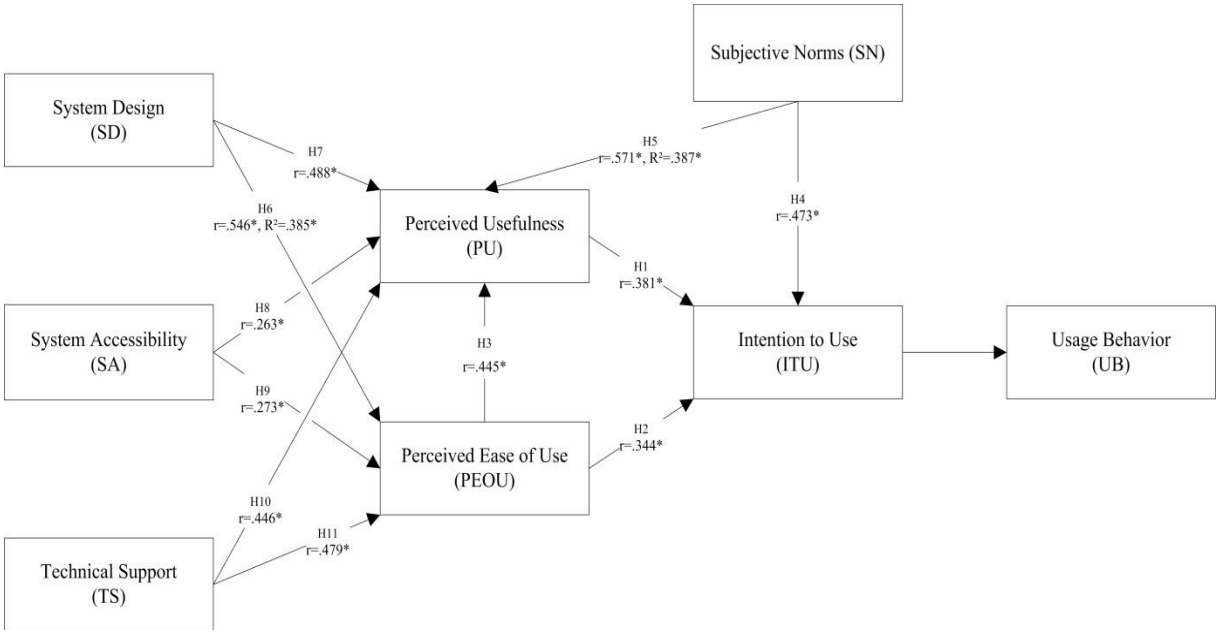

Figure 3. Final Model of the Study

Discussion

Several significant findings have evolved in this present study. The findings have confirmed that TAM is suitable to be employed in studying students' behavioral intention to use LMS in school. Both key drivers theorized in TAM, PU and PEOU were determined to have important influence on intention to use the LMS. Evidence shows that the higher the student perceived the portal as being useful, the more likely they will utilize the portal in their study. Equally, when the student perceived the portal as being easy to use, the higher the chances they will accept and use the platform. Thus, it is vital for the school to keep focus on finding ways to enhance the usefulness and simplicity of design of the platform to ensure full acceptance and usage. The statistical results further indicate that SN has also been recognized to be the most influential determinant to the adoption of the LMS. The analysis reveals that lecturers are believed to be a key role model to students in influencing them to accept and use the LMS. Lecturers play a vital role in encouraging students to use LMS by prompting the students to be involved in thread discussions, forums, carrying out tests and assessments over the web, sharing course content and materials, posting academic information as well as providing feedback as part of the teaching and learning process.

The analysis of this study also showed that SD is the second most important factor in the LMS environment. Ayub et al., (2010) stated that the design factor helps to attract students to use the learning portal and interest them. Onuiri and Oludele (2014) further added that good design allows users to easily navigate the portal and carry out tasks with minimal hindrances. The findings in this study indicate that the design of the LMS helps to attract them to engage in learning activities in the platform but the design needs to be improved in terms of the interface and interactional design. In addition, findings from regression analysis show that 38.5 percent variability of the design of LMS influences students' perception of the ease of use of the platform. This tells that effective design of the web portal is vital to ensure that students have positive attitudes to using the portal. In addition, the analysis also found that TS had a direct and indirect influence on the adoption of LMS by the students. Therefore, several possible operational measures can be taken in encouraging full acceptance and utilization of the learning portal in the school. To train students during the first week of joining the program, they need to be given user manual instructional guides on how the portal works and also videos demonstrating self-service troubleshooting need to be uploaded for viewing. One of the most obvious distinctions of utilizing a learning portal is its 24/7 accessibility. The statistical analysis reveals that SA was found to have an influence on students' perception of both PU and PEOU of the LMS. Respondents felt that they have no problem in accessing the portal but they doubted the stability of the network in the school. Therefore, improvement of network infrastructure and bandwidth needs to be done to allow students to access the portal easily. A handheld mobile application could be developed to render the platform to become handy and accessible anywhere.

The LMS positively influenced students' learning engagement and participation. Lecturers as important role models need to continuously find new ways to engage students in online instructional practices to make learning

activities more meaningful to students rather than just delivering content. Adzharuddin and Ling (2013) noted learning in a LMS could be better than traditional learning in that it has the potential to offer online discussions that could otherwise take up too much time in the classroom. It was found in this study that students are more active in contributing ideas in an online environment compared to traditional classrooms where students tend to be quieter when it comes to discussions. Learning over the platform will allow students not worry too much about their command of English as English is not their first language – so they become less nervous and do not have to worry about being embarrassed.

To further enhance the effectiveness of online learning, it is vital for lecturers to ensure that students are checked for their level of understanding on each concept introduced. This could be done by posting thought provoking questions that will encourage students to reflect and discuss the topic from their own perspectives. Thought provoking questions test students' abilities to focus their thinking on key concepts as well as to challenge and lead them to think critically on the subject matter. Learning online allows students to share their own cognitions and see things from different perspectives. Lecturers' comments and feedback are critical in all learning environments. In a traditional setting, feedback on students' performance can be done directly and in real time whereas in an online environment, it is essential to provide meaningful feedback to keep students motivated and engaged with online learning materials and enhance their overall performance outcomes. An LMS that failed to give the academics to post regular feedback on student's piece of work creates a discouragement to teaching staff (Rubin et al., 2010). When learning online, supplying feedback enables students to evaluate their learning progress, check how successful they have been in learning the concept, as well as to determine possible areas of self-improvement.

Conclusions

The current study contributes to the understanding of students' acceptance of LMS. Both subjective norm and system design were found to be significant determinants in influencing students to use LMS. At the polytechnic, most of the academic staff and lecturers are integrating their teaching using Moodle and other ICT tools due to its availability. The integration allows them to improve their communication with students and make the teaching and learning resources ready at the time of the class, and therefore will help in enhancing their teaching effectiveness. The institution acknowledged the importance of ICT in education; however, the polytechnic should take into consideration the factors that may affect further adoption of LMS by academics to ensure the prolongation of its LMS.

System design is the second most important factor that affects both perceived usefulness and perceived ease of use. Therefore, it is necessary for the polytechnic to put more emphasis on the design of its LMS. Overlooking this construct could have negative effects on the students' acceptance. One possible solution is to develop more user-friendly and user-oriented contents and portal. This new system will allow students to have new beliefs to their current attitude and thus lead to more satisfaction. This in turn allows them to be more comfortable and confident in using the LMS.

Implications of the Study

This current study reconfirms that TAM is useful in exploring user attitude in technology adoption and acceptance. As stated earlier, no previous study has been carried out at a higher education level to explore and investigate the adoption of LMS in Brunei. Thus, the present study has contributed useful knowledge to the scholarship on students' beliefs and attitudes towards the adoption of LMS in the context of Brunei. The findings from this study have complemented the scarce knowledge available particularly on the usage of LMS in the area of technical education. This study has provided insights on the practical application and adaptation of the various tools in the LMS to make them appropriate for the specific local context of Brunei to address Brunei's pedagogical necessities.

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Appendix A. Measurement Items of the Survey Instrument

Item No	Measurement Constructs
PU1	LMS allows me to accomplish more learning tasks than would otherwise be possible.
PU2	LMS could make it easier to study SDLC/BIS content.
PU3	LMS would improve my learning performance.
PU4	LMS gives me greater control over learning.
PEOU1	I find LMS easy to use.
PEOU2	I often become confused when I use the LMS.
PEOU3	It is easy for me to remember how to perform tasks using the LMS.
PEOU4	The process of using LMS is clear.
PEOU5	The process of using LMS is understandable.
ITU1	I intend to check announcements from e-learning system frequently
ITU2	I would use LMS to download lecture notes.
ITU3	I would use LMS to participate in forum to learn SDLC/BIS.
SD1	I can communicate with my lecturers through LMS easily.
SD2	I can interact with my classmates through LMS.
SD3	It is easy for me to understand every activity provided in LMS.
SD4	LMS is user-friendly.
SN1	My lecturer actively uses LMS while teaching SDLC/BIS.
SN2	My lecturer always includes important information in LMS.
SN3	My lecturer motivates us to use LMS.
SN4	My lecturer gives many activities in the forum.
SA1	I can access LMS although I am at home.
SA2	Internet speed in the school is sufficient.
SA3	LMS can be accessed quickly when in the school.
SA4	The stability of the computer network in the school is reliable.
TS1	A help desk is available when there is technical problem.
TS2	Email inquiries can be made when there is technical problem
TS3	Whenever I have access problem to LMS, I can get technical support from technicians.
TS4	The training on how to use LMS is made available.
TS5	The training on how to use LMS is sufficient.