Factors Impacting the Usage Intention of Learning Management System in Higher Education

Jingying Huang [1*], Somsit Duang-Ek-Anong [2]**

Abstract

Purpose: The purpose of this research is to examine the factors impacting the usage intention of the Learning Management System (LMS) in higher education of Sichuan, China. **Research design, data and methodology:** Sample data was collected by using quantitative method and questionnaire as a tool. Item-Objective Congruence and pilot test were adopted to test the content validity and reliability of questionnaire before distribution. Data was analyzed by utilizing Confirmatory Factor Analysis and Structural Equation Modeling to validate model's goodness of fit and confirm the causal relationship among variables for hypothesis testing. **Results:** The study has found that the conceptual model was able to predict the behavioral intention (BI) to use LMS in higher educations. Perceived Usefulness (PU) and Attitude Towards Using (ATU) are two key antecedents of BI to use LMS. **Conclusions:** PU was the strongest predictor of BI to use both directly and indirectly, which PU was driven significantly by service quality, information quality, and system quality. Therefore, this study suggested that developers of LMS course and management of higher education institutions should focus on improving the quality factors of LMS for students to perceive the system as useful and would further formulate favorable attitude and behavioral intention toward using LMS.

Keywords : Learning Management System, Higher Education, Behavioral Intention to Use, China

JEL Classification Code: A22, I23, L86, M10

1. Introduction[1]

Information and Communications Technology (ICT) has been applied in various areas of society, which tremendously changed all aspects of life. Among them, ICT usage in the field of education is known as educational technology (Wong, 2016). Educational technology refers to the usage of information technology for teachers and students to conduct teaching and learning including curriculum development, and professional development in academic institutions all around the world for many years (Usluel et al., 2008). Electronic learning (e-learning) is inevitable in the teaching environment. The high-speed internet is then important and create a requirement for teachers and students to have for accessing online materials. The Learning Management System (LMS) is a kind of computer software, which was regarded as an essential tool for electronic teaching and learning. Nichols (2003) indicates that LMS is a group of electronic learning (e-learning) tools used through a shared management interface. Alias and Zainuddin (2005) define LMS as a web-based technology, which advances the learning process through rational planning, application, and assessment in educational institutions.

1　* Ph.D. Candidate, Graduate School of Business and Advanced Technology Management, Assumption University, Thailand. Email: 94599555@qq.com

2　** Program Director, Technology Education Management, Graduate School of Business and Advanced Technology Management, Assumption University, Thailand. Email: somsitdng@au.edu

The LMS has five main functions (Khan & Ullah, 2020). Instructional function: It includes assignments, testing, evaluation, the creation, management, and curriculum management. Content management function: The instructional materials such as files, slides, images, videos can be updated and stored separately by teachers. User management function: Individual and group account of users can be created, managed, imported, and exported into the system. The features of LMS also include maintaining the profiles and passwords of users. Interactive function: It is a real-time virtual classroom, which is synchronous communication with application sharing, instant messaging, interactive whiteboard, discussion boards, chat rooms, files upload or files download, digital drop boxes, and file transfer. Visual function: It handles all the appearance of the platform, which includes a graphical interface, color, button shape, font type, font size, and links to all the elements.

Advantages of LMS are firstly on its low cost and high efficiency. LMS enables to provide flexibility. There is no travel fee, users can access learning courses anytime and anywhere. So the cost of learning is low and attractive. Second, LMS is not limited by space and time, with no doubt, it is one of the most convenient ways for anyone to achieve lifelong learning. Third, LMS has bridged the gap in educational opportunity inequity across the country. Fourth, LMS can afford various types of learning styles. It focuses more on the users' personalized needs, including the information on what they want to learn. LMS is not only convenient to use but also cost-efficient for users. However, LMS also has several drawbacks comparing to traditional learning. LMS can lacked interactions and collaborations between the teachers and learners, so it can be a challenge for teachers to develop the learning that supports the needs of diversified students (Wang et al., 2020). Teachers need to possessed information management and computer literacy skills to efficiently utilized LMS for their teaching. Although the cost of learning can be low, the facilities should also be sufficient to support student's learning, which is the infrastructure e.g., computers, high band width internet, accessibility IT devices and network (Moczynski, 2020; Ngai et al., 2007).

LMS has been adopted by many higher education institutions to support learning, which has been considered as a vital tool in the learning and teaching process for users (Alghamdi & Bayaga, 2016; Nagy, 2016). In the research of Hassanzadeh et al. (2012), the definition of higher education has changed a lot, accompanied by the approach of information technology. Online learning is one of prominent offers from higher education institutions worldwide. In this digital age, numerous higher education institutions aim to meet the needs of future occupations, hence the course contents changed dramatically. Students are looking for courses that meet their requirement rather than the standard courses only in institutions (Hanover Research, 2015). This trend has forced institutions to adjust and adapt their curriculum. Mixed learning is one of the digital learning teaching models, which combines the advantages of traditional learning and electronic learning. LMS is primarily used in the teaching process in higher educations, in which teachers and learners can give a full play to their initiative and creativity. According to Hill (2012), online courses fully meet these requirements, and institutions have to provide more short-term and personalized courses. There are many other socioeconomic factors, which have promoted the demand for LMS, for example, higher educations are expected to expand online courses to cope with growing enrollment from worldwide.

Discussion about teaching-learning method of higher education is crucial during the COVID-19 pandemic. To prevent the spread of the COVID-19 crisis, people had to stayed home for social distancing, and students' education were hindered. Higher education institutions were forced to suspend face-to-face classes, so flexibility and innovation are required to ensure continuance of learning. LMS, a technology belonging to electronic learning, makes teaching possible (Zwain, 2019). Higher education institutions must rapidly develop online education to survive (Sener, 2010).

The Ministry of Education of China-proposed "suspended class, ongoing learning, and ongoing teaching", which not only promoted the informatization reform of the education industry but also stimulated and released the potential market demand for online education. This research has focused the behavioral intention in the regional perspective of Sichuan, China. Sichuan is in the central and western part of China with 132 universities. There is a significant gap in the technology platform environment of universities in the different regions, and the online learning experiences of students in eastern, central, and western (Zheng et al., 2021). Encouraging the usage of LMS for teaching-learning process among higher education institutions is vital in this digital age. Therefore, this research is conducted to examine the factors that can motivate the students' intention to use LMS for their learning. Developer of course curriculum, teachers, and top management of higher education institutions are beneficial from this research to develop course contents and teaching-learning process that meet the needs of students in order to promote the behavioral intention to use LMS for their learning. The findings are important for both LMS course developer and higher educations that wish to expand to online learning and or transit their course curriculum from traditional learning to mixed learning forms.

2. Literature Review

2.1. System Quality

Based on the previous studies, system quality is assessed by website design, system navigation, system flexibility and responsive time (DeLone & McLean, 2003; Wixom & Todd, 2005). System quality is related to feature-based online function (Lin, 2007). Electronic learning system has been considered as a most useful platform due to their functions, such as complete controllability and flexibility, especially to users who are sensitive to the system quality (Pituch & Lee, 2006; Shin, 2007). The higher level of system quality, the more convenient and faster response for the users (Ahn et al., 2007). System quality seems more crucial in a virtual community environment where many users are unwilling to adopt the web site due to lack of access rights, delay in response, frequent disconnections or have troubles in navigating web (Yoo et al., 2012). The quality of system can be comprised from the technology accessibility and readiness of the teachers and students due to the high reliance of technology when operating LMS (Moczynski, 2021).

Functional groups and navigational aids in a virtual environment created by a high-quality website can be easily identified for customers to ensure the exchange of effective information. So the system quality has a positive impact on the perceived usefulness (Kim et al., 2008). From these supported studies, the following hypothesis has been formulated:

H1: System quality has significant impact on perceived usefulness.

2.2. Information Quality

According to Wang and Lin (2012), information quality is regarded as the capacity of system passing on the intentional meaning of the information. Lin (2015) notes that information quality is the content quality, which is offered by online support. Research supports that information quality includes factors, such as correlation, accuracy, and timeliness of information in an information system (IS) (van Birgelen et al., 2008). Information quality focuses on content-based online function (Lin, 2007). The quality of course content is considered to be the most common measurement of information quality in online study environment (Lee et al., 2009). Some of the course content may not be appropriate for online learning or in other words require practice-based in person such as operative techniques and complex topics (Moczynski, 2021). Therefore, information quality may vary by course content and the limitation should be addressed when developing online course.

An effect of information quality upon perceived effectiveness is significant (Lin, 2007). Information quality is demonstrated useful only when customers think the information on the site is precise, well-informed and recent (Perkowitz & Etzioni, 1999). From these supported studies, the following hypothesis has been formulated:

H2: Information quality has significant impact on perceived usefulness.

2.3. Service Quality

The description of service quality is reliance, response capability, and individualization (Cai & Jun, 2003; Lee & Lin, 2005), which is regarded as the support provided by service providers (DeLone & McLean, 2003). Moreover, Parasuraman et al. (1985) states service quality is the extent of differentiation between users' expectation and provided service performance. Santos (2003) defines that service quality of website is customer's overall assessment on the brilliance of service delivery in a virtual context. An important aspect of the success of information system in an electronic commerce context is the service quality, and customer service is critical (DeLone & McLean, 2003). Service quality can be a challenge for LMS as its management of administration would require intensive technical expertise which usually cannot be support timely by the teachers (Al-Handhali et al., 2020).

Reference from Cho et al. (2009), the technical support services provided by specialists determine the quality of the personal service, which is a robust predictor of acceptability in an e-learning environment. Previous studies have shown that it is widely believed that service quality positively affects the perceived usefulness (Cao et al., 2005; Harris & Goode, 2004), and it is an important factor that contributes to IS success, referring to response time in supporting users with problems (Ahn et al., 2007). Lee (2010) also agrees that service quality is a crucial factor that significantly impacts perceived usefulness of online learning. The hypothesis is formulated:

H3: Service quality has significant impact on perceived usefulness.

2.4. Perceived Usefulness

According to Davis et al. (1989), the definition of perceived usefulness is the extent that a person feels individual's task performance would be enhanced by using a certain system. Lin (2007) suggest that perceived usefulness indicates that customers have confidence in their ability to access information and service and improve their information transfer performance in virtual communities. An important motivation for IT system adoption in the workplace is the advantages of the systems that users

believed it can benefit their tasks (Bhattacherjee & Sanford, 2006). The impact of perceived usefulness upon individual's behavioral intention to use electronic services is significant (Bhattacherjee, 2000). These studies have led to the following hypothesis:

H4: Perceived usefulness has significant impact on attitude toward using.

H6: Perceived usefulness has significant impact on behavioral intention to use.

2.5. Attitude

According to Ajzen (1989), attitude is the tendency to respond positively or negatively to a personal object, individual, institution, event or any other distinguishing aspects of the personal world. Attitude towards behavior is the personal active or passive sensation about an action, individual beliefs about behavior and individual subjective assessment of beliefs (Fishbein & Ajzen, 1975). Attitude toward use is assessment of one's desire to use a specific information system application (Ajzen & Fishbein, 1980), which is regarded as a comparatively stable structure. Attitude is a component under technological acceptance models (TAM) because of its significant impact on behavioral intention (Ajzen, 1991; Davis, 1993; Fishbein & Ajzen, 1975). The intention of individual entering into a particular activity is awfully related to attitudes, which is an essential factor in predicting one's future behavior (Lau & Woods, 2008).

Numerous researches propose that the factor of attitude towards using the system positively affects the users' intention to use (Davis, 1989; Lee, 2009). Referring to studies, the hypothesis is concluded as follow:

H5: Attitude towards using has significant impact on behavioral intention to use.

2.6. Trust

Zhou (2012) defines trust as a perception that a potential user has faith in reliability and independence of the system service. The concept of trust is a percipience of faith in dependability and honesty of online companies in electronic commerce context (Belanger et al., 2002). Lee et al. (2015) has showed that the trust is a principal prognosticator of behavioral intention in information systems. In addition, trust has always proven to be an essential element for employing the electronic services (Pavlou & Gefen, 2004; Rotchanakitumnuai, 2008).

Trust is a vital factor in determining people's attitude towards the use of electronic services (Kim & Tadisina, 2007). Based on the study of Agag and El-Masry (2016), users' trust influence upon their attitude is significant. Moreover, the higher individual trust in the technology

system, the higher it turns into positive attitudes to use (Chawla & Joshi, 2019). Furthermore, Yoon (2002) states that trust indirectly affect the behavioral intention through attitude. Gefen and Heart (2006) notes that the influence of trust on the behavioral intention to employ e-service is significant. These investigations lead to conclusion of the hypothesis as follow:

H7: Trust has significant impact on attitude toward using.

H8: Trust has significant impact on behavioral intention to use.

2.7. Behavioral Intention

According to Ajzen (1991), behavioral intention is defined as the perception of a person preparing to execute a certain action. In technological acceptance model (TAM), behavioral intention refers to the extent of people willing to participate in a particular behavior (Davis, 1989; Sripalawat et al., 2011). Based on previous studies, consumer's attitude is associated with his or her behavioral intention (Ajzen & Fishbein, 1980).

3. Research Methodology

3.1. Research Framework Model

The researcher has proposed the research model based on the adoption of both extended Technology Acceptance Model (TAM) and the updated DeLone and McLean successful models. TAM explains the acceptance and adoption of Information System (IS), which also analyze the factors affecting users' adoption. It supports a theoretical foundation to understand the external factors that affect users' attitude and intention, which has been widely used to predict the usage of information technology. Drennan et al. (2005) mention that TAM is originally created to research technology acceptance in business environment, then it has been proved to be a simple model applicable for using in the context of education.

The research model is also adopted from three theoretical frameworks of previous studies. The first theoretical framework was conducted by Wang and Lin (2012), which provided the study of service quality, information quality, and system quality influences toward perceived usefulness and behavioral intention to use. The second theoretical framework was conducted by Perry (2017), which revealed consumers' intention of usage was primarily judged by attitude, and attitude primarily determined by usefulness. It provided the study of perceived usefulness and attitude towards using influences. The third theoretical framework adopted was from a study by Chawla and Joshi (2019), which provided the study of trust. Trust was considered to be a vital

factor that decided the customers' attitude and behavior intention to adopt a similar technology. The research conceptual framework is proposed as following Figure 1.
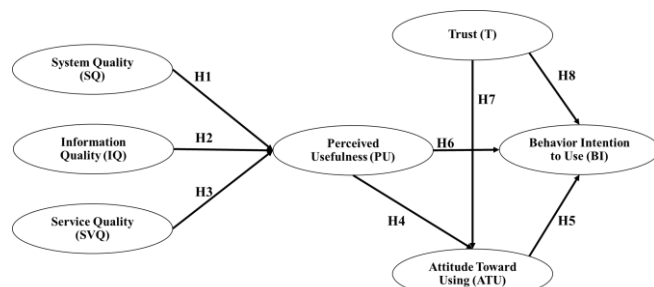

Figure 1: Research Conceptual Framework

The purpose of the research is to explore key factors impacting the behavioral intention of using learning management systems (LMS) in higher education at Sichuan, China, and also investigating the causal relationships between all variables in the research conceptual framework.

3.2. Methodology

In this study, empirical analysis and quantitative method were adopted. Sample data were collected from target population by using questionnaire as a tool. Before large-scale of data collection, content validity and reliability of the questionnaire were verified through Item-Objective Congruence (IOC) test and pilot test of Cronbach's Alpha. After reliability test, the questionnaires were distributed online to undergraduates including sophomore, junior and senior from five higher education institutions in Sichuan, China. The respondents are required to have more than one year of LMS experience.

Anderson and Gerbing (1988) proposed two-steps of Structural Equation Model (SEM) method, which were adopted in this study to analyze the sample data. First step was using SPSS and AMOS for Confirmatory Factor Analysis (CFA) to examine convergent validity and the second step was to conduct SEM to explore causal relationship between all constructs in the conceptual model to test the significance of influences and proposed hypotheses. SEM has the advantage of ability to explore a range of dependencies synchronously, especially when the model consisted both direct and indirect influences between structures (Hair et al., 2010).

3.3. Population and Sample Size

In the research, the target population are undergraduates from five higher education institutions in Sichuan Province, China with more than one year of learning experience through LMS. This is to ensure that participants were

familiar with LMS and have interactive experience with LMS. Based on the A-priori Sample Size Calculator for SEM by Soper (2006), the recommended minimum sample size was 425 from the parameters of 7 latent variables and 30 observed variables at the probability level of 0.05. Therefore, the questionnaires are distributed and screen for valid responses at 500.

3.4. Sampling Technique

The sample was scoped and selected by using the multistage sampling techniques of judgement sampling, stratified random sampling, and convenient sampling. Judgment sampling was adopted to select five higher education institutions located in five different regions of Sichuan, China, and then using the stratified random sampling to determine sample size from each institutions or sample stratum as shown in table 1.

Table 1: Population and Sample Size

University	Population Size	Proportional Sample Size
Sichuan University of Arts and Science	11,641	85
Neijiang Normal University	13,649	100
Chendu University of TCM	16,000	117
Leshan Normal University	13,500	99
Mianyang Normal University	13,500	99
Total	**68,290**	**500**

The questionnaires were distributed online through web board of each institution website for one month from June to July 2021. Therefore, convenience sampling is employed for any respondents who are willing to answer the questionnaires. Respondents are filtered from screening questions to ensure they are meeting the target respondents of undergraduates with no less than one year of learning experience with Learning Management Systems (LMS).

4. Results and Discussion

4.1. Demographic Information

The demographic profile of total 500 respondents is presented in table 2. The respondents consist of 161 females and 339 males which represents 32.2 percent, and 67.8 percent, respectively. For the year of study, sophomore accounts for 23.8 percent , junior accounts for 27.0 percent, and senior accounts for 34.2 percent.

Table 2: Demographic Profile

Demographic and General Data (N=500)		Frequency	Percentage
Gender	Male	161	32.2%
	Female	339	67.8%

Year of Study	Sophomore	119	23.8%
	Junior	210	42%
	Senior	171	34.2%

4.2. Confirmatory Factor Analysis (CFA)

Confirmatory Factor Analysis (CFA) can be regarded as a key starting in the SEM (Hair et al., 2010). Both variables' reliability and validity can be measured with CFA (Byrne, 2010). Convergent validity can be statistically measured by Cronbach's Alpha reliability, factor loading, average variance extracted (AVE), and composite reliability (CR) (Fornell & Larcker, 1981).

Factor loading above 0.50 are very significant (Hair et al., 1998). In this study, factor loadings of all individual items were greater than 0.50 and mostly were above 0.70, ranging from 0.697 to 0.935 as presented in table 3. Composite reliability (CR) was recommended at the value

of 0.70 or above and average variance extracted (AVE) was recommended at greater than or at 0.4 (Fornell & Larcker, 1981; Hair et al., 1998). In table 3, all estimates were significant as CR values exceed the level of 0.7 and AVE values exceed 0.5.

Cronbach's alpha was a technique applied to evaluate the items' internal consistency in construct (Killingsworth et al., 2016). The value of Cronbach's alpha should be at 0.7 or higher to indicate an acceptable reliability (George & Mallery, 2003; Hair et al., 2010). All Cronbach's Alpha values exceeded the level of 0.7 as per table 3. Discriminant validity appeared satisfactory in table 4. All variables were significant from the greater value of AVE square roots comparing to the factor correlations. Indicators of Goodness of fit were measured in table 5. Indices used for measurement were CMIN/DF, GFI, AGFI, NFI, CFI, TLI, and RMSEA, which all statistical values from CFA were greater than acceptable values and proven goodness of fit for measurement model.

Table 3: Confirmatory Factor Analysis Result, Composite Reliability (CR) and Average Variance Extracted (AVE)

Variables	Source of Questionnaire (Measurement Indicator)	No. of Item	Cronbach's Alpha	Factors Loading	CR	AVE
System Quality (SQ)	Gao and Bai (2014)	4	0.792	0.663– 0.722	0.793	0.490
Information Quality(IQ)	Gao and Bai (2014)	4	0.787	0.654 – 0.720	0.789	0.484
Service Quality (SVQ)	Wang and Ling (2012)	4	0.820	0.696 – 0.768	0.821	0.534
Trust (T)	C. Lin and M. Lin (2019)	4	0.809	0.642 – 0.753	0.810	0.518
Perceived Usefulness (PU)	Buabeng-Andoh (2018)	4	0.757	0.639 – 0.686	0.757	0.439
Attitude Toward Using (ATU)	Oertzen and Schröder(2019)	5	0.867	0.685 – 0.801	0.867	0.568
Behavioral Intention to Use (BI)	Gao and Bai (2014)	5	0.856	0.681 – 0.792	0.856	0.545

Note. CR = Composite Reliability, AVE = Average Variance Extracted

Table 4: Discriminant Validity

Varia-bles	SQ	IQ	SVQ	T	PU	ATU	BI
SQ	**0.753**						
IQ	0.135	**0.700**					
SVQ	0.203	0.475	**0.696**				
T	0.282	0.398	0.644	**0.731**			
PU	0.353	0.414	0.475	0.410	**0.662**		
ATU	0.271	0.522	0.455	0.403	0.658	**0.719**	
BI	0.324	0.410	0.534	0.685	0.440	0.444	**0.738**

Note. The diagonally listed value is the AVE square roots of the variables

4.3. Structural Equation Model (SEM)

In this study, Structural Equation Model (SEM) was adopted to analyze the collected data. The strengths of SEM include various aspects. First, SEM was capable to explore dependent relationships (Hair et al., 2010). Secondly, SEM examined the casual relationships among latent and observed variables. Third, random error in the observed variables was used to provide more accurate measurement results. Fourth, it used multiple indicators to measure latent variable. Lastly, it could also test hypotheses at the construct level, not only at the item level (Hoyle, 2011).

The goodness of fit for structural model was measured

and demonstrated in table 5. The statistical values were CMIN/DF = 3.385, GFI = 0.853, AGFI = 0.817, NFI=0.820, CFI = 0.865, TLI = 0.842, and RMSEA = 0.069. All values from fit indices were greater than the acceptable values, so affirmed the model fitness.

Table 5: Goodness of Fit

Index	Acceptable Values	CFA Value	SEM Value
CMIN/DF	< 5.00 (Awang, 2012; Al-Mamary & Shamsuddin, 2015)	1.775	3.385
GFI	≥ 0.85 (Sica & Ghisi, 2007)	0.919	0.853
AGFI	≥ 0.80 (Sica & Ghisi, 2007)	0.902	0.817
NFI	≥ 0.80 (Wu & Wang, 2006)	0.903	0.820
CFI	≥ 0.80 (Bentler, 1990)	0.955	0.865
TLI	≥ 0.80 (Sharma et al., 2005)	0.949	0.842
RMSEA	< 0.08 (Pedroso et. al., 2016)	0.039	0.069

Note. CMIN/DF = The ratio of the chi-square value to degree of freedom, GFI = goodness-of-fit index, AGFI = adjusted goodness-of-fit index, CFI = comparative fit index, NFI = normalized fit index, and RMSEA = root mean square error of approximation

4.4. Research Hypothesis Testing Result

The magnitude of correlation among the independent and dependent variables proposed in the hypothesis is

measured by regression coefficients or standardized path coefficients.

Table 6: Hypothesis Result of the Structural Model

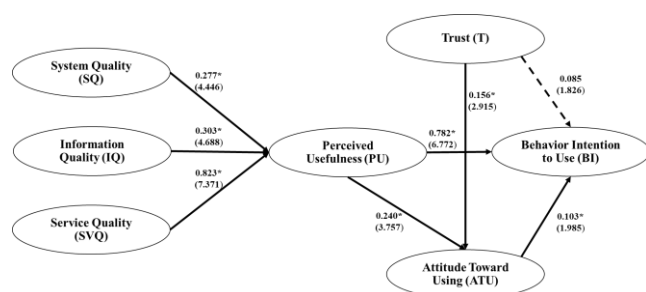| Hypothesis		Standardized Path Coefficients (β)	T-Value	Tests Result
H1	SQ → PU	0.277	4.446*	Supported
H2	IQ → PU	0.303	4.688*	Supported
H3	SVQ → PU	0.823	7.371*	Supported
H4	PU → ATU	0.240	3.757*	Supported
H5	ATU → BI	0.103	1.985*	Supported
H6	PU → BI	0.782	6.772*	Supported
H7	T → ATU	0.156	2.915*	Supported
H8	T → BI	0.085	1.826	Not Supported

Note. *Significant at p-value, p<0.05.

Figure 2: Path Diagram Result
Note. Solid line reports the Standardized Coefficient with * as p<0.05, and t-value in Parentheses; Dash line reports Not Significant

As presented in table 6 and figure 2, seven out of eight proposed hypotheses were supported. Behavioral intention to use LMS was strongly impacted by perceived usefulness, followed by attitude toward using. Perceived usefulness of LMS was significantly driven by service quality, information quality, and system quality, respectively.

Strongest impact on perceived usefulness is service quality. Path relationship of service quality and perceived usefulness has standardized path coefficient of 0.823 and t-value at 7.371 in H3. This supports the previous studies of Cao et al. (2005), Harris and Goode (2004), Lao and Pupat (2020), and Lee (2010). Service quality in terms of reliance, response capability, and individualization is another vital attribute of LMS usefulness.

Information quality was significantly impact perceived usefulness with standardized path coefficient of 0.303 and t-value at 4.688 in H2. Quality of information such as accessibility, timeliness, accuracy, and relevance can influence the degree of LMS usefulness perceived by students Al-Omairi et al. (2021), Lin (2007), and Perkowitz and Etzioni (1999).

Another significant factor impacting perceived usefulness is system quality with standardized path coefficient of 0.277 and t-value at 4.446 (H1). So, the features of LMS such as controllability and flexibility are important for students to consider and accept the system as

a useful tool Kim et al. (2008), Rui-Hsin and Lin (2018), and Yoo et al. (2012).

Attitude toward using was mainly contributed from perceived usefulness, then trust. The direct impact of perceived usefulness on attitude toward using is significant at standardized path coefficient of 0.240 and t-value at 3.757 in H4, which supported with the study of Arteaga Sánchez et al. (2013) and Camarero et al. (2012) that the more useful of LMS perceived by students, the more likelihood or positive interest on learning with LMS.

Trust also significantly impact attitude toward using with standardized path coefficient of 0.156 and t-value at 2.915 in H7. When the students have faith in reliability and independence of the LMS service, they are likely to have positive impression or attitude toward using the system Agag and El-Masry (2016), Chawla and Joshi (2019), and Kim and Tadisina (2007).

Perceived usefulness has significant direct impact on behavioral intention to use with standardized path coefficient of 0.782 and t-value at 6.772 in H6, which consistent with the study of Benjangjaru and Vongurai (2018), Bhattacherjee (2000), Lin (2003), and Perry (2017). Usefulness of the system in the extent that can enhances the performance of their learning is the strongest determinant of intention to use or participation in LMS. In addition, perceived usefulness has indirect impact on behavioral intention through attitude toward using and has a great direct contribution on attitude itself.

The second strongest impact on behavioral intention to use LMS is attitude toward using with standardized path coefficient of 0.103 and t-value at 1.985 in H5. The finding was consistent with Jaiyeoba and Iloanya (2019), Lau and Woods (2008), and Lee (2009), hence the students are likely or intent to use LMS when they have positive or favorable impression towards using the system.

Behavioral intention was not found to be impacted by trust at standardized path coefficient of 0.085 and t-value at 1.826, hence H8 is not supported. This finding was contracted with previous studies of Gefen and Heart (2006), Lee et al. (2015), and Tarhini et al. (2017) where they have claimed that the students are stimulated or influenced to use LMS when they trust or find the system reliable. However, the finding is aligned with the study of Al-Omairi et al. (2021) that students do not consider trust for their decision to use.

5. Conclusions and Recommendation

5.1. Conclusions

This study aimed to comprehensively analyze the important factors impacting behavior intention of using learning management system (LMS) in education institution

of Sichuan, China. The researcher proposed eight hypotheses in the conceptual framework to investigate the factors impact on behavioral intention. After the questionnaire is prepared and verified reliability, the questionnaire was distributed online to undergraduates with more than one year of learning experience through LMS from five universities in Sichuan. With the collected data, CFA was adopted to measure and test validity and reliability of research conceptual model. SEM was also employed to analyze and discuss the factors impacting behavioral intention to use LMS in higher education institutions. Seven out of eight hypotheses proposed were supported and proven to fulfill research objectives.

The findings of this research can be summarized as following:

- Perceived usefulness was the strongest predictor of behavioral intention to use, comparing to attitude toward using. According to Gefen et al. (2003), perceived usefulness is the users' personal evaluation to a certain extent on the utility of new IT such as performance based on a target related, which affected behavioral intention in a significant way. Also, favorable attitude of the students toward using LMS is greatly influenced by perceived usefulness. Therefore, to build recognition of system's usefulness and its advantages are vital for motivating behavioral intention.

- Secondly, the antecedents that significantly contributed to perceived usefulness were ranked from service quality, information quality, and service quality. Delivering high quality service to users would sustain users by gaining the sensation that the system is worthwhile and useful. Pituch and Lee (2006) show that system and service quality would be considered as useful by users when the response of electronic learning system is rapid, coherent, and logical. Compared with the traditional learning style, the information quality provided by electronic learning systems is informative and updated regularly, which may make learners regarded it works (Lee et al., 2009).

5.2. Recommendation

The researcher identified key factors of system quality (SQ), information quality (IQ), service quality (SVQ), trust (T), perceived usefulness (PU), and attitude toward (ATU) impacting behavioral intention (BI) to use Learning Management System (LMS) on the five major higher education institutions in different regions of Sichuan.

The above key factors should be developed and promoted in order to gain intention to adopt LMS in higher educations except for trust due to its insignificant. In this

research, perceived usefulness is the strongest predictor of both attitude toward using and behavioral intention to use LMS. Hence, promoting usefulness of the system must be emphasized. It implies that that undergraduates are tent to employ LMS if they regard the system as a useful tool that can enhances their academic performance. The developer of course curriculum, teachers, and top management of higher education institutions should ensure that the attributes of system quality, information quality, and service quality are available when using LMS. The features provided by LMS should be responsive, flexible, accurate and relevant to their studies. The feature should include quality technical assistance, so sufficient training should be conducted to improve service level of engineers and service administrators, so as to help learners more effectively learn online courses to improve learners' willingness to accept LMS. Once the quality features are ensured, the system's usefulness, operation procedures, and other facilities supported should be promoted to the students such as training or media communications for their awareness and recognition. These can stimulate or increase the positive attitude and the likelihood of using LMS in their learning process.

In summary, this study explains in detail the factors affecting the undergraduates' intention to use LMS. It provides LMS course developer and top management of higher education institutions to identify variables that impact undergraduates' intention to use LMS, which can be applied to projects, investments, and make full use of LMS.

5.3. Limitations and Further Study

There are certain limitations to this study that need to be noted, and the following are recommendations for further research. First, this study was only focusing on higher educations and collected data from selected five higher education institutions in Sichuan, so the scope and sample size is limited. Second, the topic of this study was only based on one type of LMS. Further research may be carried out across other types of online learning systems or system usage for other purposes such as Massive Open Online Courses (MOOCs), Ubiquitous Learning (U-Learning), or online learning for business organization use. Exploring different types and purposes of online learning might led to different findings, improving the generality of the research model and obtain more generalizable results. Third, the respondents in the research are limited to students only. Further research may add teachers into respondents to get their views about behavioral intention to use LMS. In the future studies, the researcher can use experimental method to control other variables that may confuse the causal relationship, such as defining a specific quality factor to observe the impact of this independent variable on the

dependent variable behavioral intention. In addition, qualitative research may be added for better understand undergraduates' behavioral intention to use LMS.

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