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Factors affecting learning effectiveness in the context of using learning management system (LMS): An empirical study at Universities in Vietnam

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Abstract

Early studies have shown that more than 90% of universities in the United States and about 95% of training organizations in the UK have applied LMS in teaching and learning. In particular, with the impact of the COVID-19 pandemic, the implementation of online learning and teaching management platforms at universities worldwide, including in developing countries, has increased significantly. After COVID-19 was controlled, the need for online learning and teaching grew steadily with a strong increase in blended programs. In order to provide empirical results on factors affecting learning effectiveness in the context of using LMS - a leading online learning management platform, the study uses primary data collected from accounting and auditing students at universities in Vietnam. The findings show that software quality, instructor quality, ease of use, level of commitment, and learning frequency all have an impact on the learning performance and effectiveness of students. The results are the basis to help parties (training organizations, students, lecturers) apply LMS to improve the effectiveness of the learning and training process.

Keywords: Accounting students; GPA; Learning Management System (LMS); Learning effectiveness; Learning outcomes

1. Introduction

The outbreak and rapid spread of the Covid-19, impacting on the people's daily activities at a global scale, have led to the necessity and level of intensive application of information technology, platforms, tools, and online learning applications Kulkarni, Chu [1]. The application of information technology has become an indispensable part of the modern education system by the integration of information and communication technology tools (ICT) Subadra, Nagamani [2], which has changed the way of teaching and learning. In addition to online training programs, integrated modules have been significantly increasing in current training programs. Classes take place including hours of direct learning in the classroom and a certain proportion of hours of online learning through electronic lesson plans, homework through the online training system, and electronic lectures, multimedia digital learning materials, e-books, simulation software...

However, in the early stages of the pandemic, due to quarantine requirements and online learning, the rapidly developing online learning systems had many disadvantages. The LMS was born to meet the needs of online learning and overcome most of the drawbacks of most current online learning tools Kurniali [3]. Some of the outstanding advantages of the system (LMS) are convenience for remote students, learning resources available at all times, communication conditions between teachers and students, and ability assessment on learner capacity easily and high adaptability to any number of students Suparjan, Ismiyani [4].

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Learning effectiveness is a measure of the extent to which students have acquired and demonstrated knowledge, skills, and abilities. Kulkarni, Gokhale [5] argue that learning effectiveness refers to the process and results of acquiring knowledge, skills and abilities in a specific field, such as music, through educational activities and experiences. The process of acquiring knowledge is an important step in building fundamental knowledge. If learners do not clearly understand knowledge, their ability to apply and solve problems will decrease, affecting learning effectiveness Gacovska Barandovska, Mitrevski [6]. While studying, learners develop and master skills related to a specific field, helping them become experts in that field Feszterová [7]. Learning outcomes appear when learners are able to apply learned knowledge to real-life situations or solve complex problems in their field. Results can be measured through achievements such as degrees, certificates, or teacher evaluations. The level of learning effectiveness can reflect the level of mastery of knowledge, the ability to apply that knowledge in practice, and the ability to perform tasks or tests effectively. This often demonstrates how well the student meets the requirements and learning goals set. Learning effectiveness is influenced by many factors, including internal factors and external factors Mücke, Busch [8]. Especially, in the online learning environment, factors related to software and forms of online teaching and learning also affect student learning effectiveness.

Many recent studies have mentioned the learning outcomes of learners when using LMS learning software such as Al-Busaidi [9], Mishra, Gupta [10], Firat [11], Chuenyindee, Montenegro [12]... or research on students' satisfaction when studying online by Vū [13]. However, pointing out the factors that impact the learning effectiveness and learning outcomes of accounting and auditing students in developing countries is still limited. Therefore, the study aims to overview, identify and test the impact of factors affecting student learning performance and learning outcomes in terms of using the LMS platform with combined training programs. The research results are useful information, supporting managers, lecturers, and students with appropriate solutions to improve the quality of online teaching and learning. Besides the introduction, the article includes part 2: Research overview and hypothesis development; The next section is the research method, followed by the research results and finally some conclusions and recommendations.

2. Literature review and hypothesis development

2.1. Literature review of learning effectiveness

To evaluate the impact of learning behavior on students' academic achievement in an LMS environment, Firat [11] conducted a survey of 71 students participating in the BT0311 Operating System course at the Faculty of Education at Anadolu University in the fall semester of the 2014-2015 school year, using both quantitative and qualitative research methods. Quantitative data included student LMS behaviors, examined by using Blackboard analytics over 14 weeks. Qualitative data were obtained through students' perspectives on the influence of the Learning Management System (LMS) on academic achievement, collected through a relevant Facebook group. The study also used data from students' GPAs of the face-to-face course as a secondary data collection strategy. Quantitative and qualitative data were collected, conducted using a mixed explanatory method. The results show that students use the LMS as a face-to-face educational support tool more intensively on school days (at the start of relevant lessons and at night during school days) and that they activate most content elements. Finally, almost all students agree that an LMS helps enhance their learning effectiveness only when the LMS includes features such as efficiency, interactivity, reinforcement, attractive design, social communication support and accessibility.

Another study by Pérez-Suay, Van Vaerenbergh [14], using statistical approaches (including descriptive statistics, correlation analysis and regression analysis) and using the number of interactions with LMS as a variable to measure student's effectiveness. The results from data recorded on Module from several subjects and qualifications show that the number of interactions with the LMS is a good indicator of student learning outcomes and can be used as a metric to monitor student learning progress.

The most recent study by Li [15] conducted a survey of 76 students participating in the "Java Framework Technology" course which was offered on an online teaching platform in the fall in 2022 - a course for third-year student with computer major (lasted 15 weeks), with an online lecture and a programming assignment per week with the aim to explore the influence of online learning behavior on learning effectiveness in the context of online education. Research shows that the number of visits to course materials, time spent to watch video lectures, and assignments are correlated with learning effectiveness. Students' active participation in online learning has a greater relationship with learning effectiveness. Overall, the findings indicate that measuring academic achievement through test scores is positively related to certain behavioral variables in an online learning environment.

2.2. Literature review of factors impact on learning effectiveness when using LMS

The study “The perceived usability of the learning management system during the COVID-19 pandemic: Integrating system usability scale, technology acceptance model, and task-technology fit” by Chuenyindee, Montenegro [12] has explored the possibility LMS system usability during the COVID-19 pandemic, using integrated Technology Acceptance Model (TAM), Task Technology Fit (TTF), and System Usability Scale (SUS). The data were collected from an online survey of 502 Filipino students from different academic institutions and different fields of study. The study evaluated the correlation between independent variables (including: ease of use and LMS technology characteristics) and dependent variables (usefulness, satisfaction and usability of the LMS system). The results show that ease of use and LMS technology characteristics have a significant influence on usefulness and student's satisfaction. Additionally, student's satisfaction was found to have a significant influence on LMS usability. These findings highlight factors that influence the perceived usability of an LMS during the COVID-19 pandemic.

The study "Exploring the factors influencing the effectiveness of online learning: A study on college students" was conducted to investigate factors affecting the effectiveness of online learning among college students during the COVID-19 epidemic by Kedia and Mishra [16]. The research subjects were 300 undergraduate and postgraduate students from three universities/colleges of Jaipur (Rajasthan) - JK Lakshmi Pat University, College of Engineering and IT Arya and JECRC University. The research results show that lecturers-students interaction, social media use, family support, and technical support have a positive relationship with students' learning effectiveness through student engagement. Research also demonstrates that peer interaction has a small effect on learner performance.

In Vietnam, Bui, Tran [17] based on survey results of 296 students of Ho Chi Minh University of Food Industry, pointed out that (1) Perceived ease of use, (2) System quality, (3) Instructors, (4) Participation and (5) Enthusiasm for learning all have a positive impact on online learning effectiveness. Among them, "Students' commitment to participating in learning" has the strongest and clearest influence on students' online learning effectiveness. Another study conducted to determine factors affecting online learning effectiveness of students at the School of Economics, Can Tho University by Nhung, Trâm [18] also analyzed 4 factors: course design, learning materials, interaction between lecturers and students, and interaction between students and students. The results show that all the factors have a positive impact on learning effectiveness. In particular, course design factors including goal design, clear learning process on LMS and diversity of content and delivery form have the most significant impact on online learning effectiveness. Tran and Xa [19] also provided empirical findings show the factors impact on learning online under context of Covid-19 pandemic that support above studies.

2.3. Hypothesis development

Based on the theoretical overview and previous studies, the hypotheses and research models are proposed as follows:

Firstly, the software quality is a factor that significantly affects the success of applying the Learning Management System (LMS) in higher education [20-22]. Therefore, the study proposes the first hypothesis as follows:

2.3.1. H1: The software quality of the LMS has a positive impact on the learning effectiveness of accounting and auditing students.

Secondly, the teaching quality and the capacity of lecturers is an essential variable that contributes to attracting learners' interest in learning and creating motivation [23, 24]. Besides, the quality of professional lecturers contributes to enhancing students' intellectual development, skills, innovation ability and level of knowledge absorption Fayolle and Redford [25]. On that basis, the second hypothesis in our study is stated as follows:

2.3.2. H2: The teaching quality of lecturers through the LMS platform has a positive impact on the learning effectiveness of students majoring in accounting and auditing.

Next, the ease of use of the LMS platform is another course characteristic that can impact learner acceptance, usage, and satisfaction with the LMS platform Sun, Tsai [26]. As a result, learner performance can be significantly improved if the features on the LMS platform are easy to use. Therefore, we propose the third hypothesis as follows:

2.3.3. H3: The ease of use of LMS has a positive impact on the learning performance of accounting and auditing students.

Besides, participation in online learning is defined as active participation in e-learning activities, with students considered as learning objects. Effective learning is determined or requires active participation. The higher the level of initiative in the learning process, the better their learning outcomes and effectiveness will be Simelane-Mnisi [27]. Accordingly, the next hypothesis is proposed as follows:

2.3.4. H4: The level of student commitment to learning has a positive impact on the learning effectiveness of accounting and auditing students.

Finally, as several previous studies have shown, female students often have a higher level of study diligence than male students and therefore they often demonstrate better learning effectiveness as well as better performance Ballester [28]. Therefore, we propose the following hypotheses:

- H5a: Gender has an impact on learners' learning effectiveness; and
- H5b: In learning modules through the LMS platform, female students' learning results are better than male students' learning results.

3. Methodology

3.1. Develop questionnaires and data collection

The data in the study is collected by online survey forms through Google Forms tool. The total number of accounting and auditing students sent based on the convenient selection of the research team is 250 students majoring in accounting and auditing at the universities in the North of Vietnam. However, after filtering out some samples with invalid information (students who are surveyed do not study on LMS but still fill in the form) or the time to answer questions is too short (this can be explained for respondents who choose only one level for all questions), the response of 193 students is used to analysis and test the research hypotheses.

3.2. Data processing

Data collected from survey forms will be synthesized, classified and arranged in a reasonable process. The research results will be presented based on the theoretical model selected. After that, the research team will use quantitative methods to test the research hypotheses. The research tests the research results through 4 types: Cronbach's Alpha testing, Exploratory Factor Analysis (EFA), Pearson correlation coefficient and multi-variable linear regression analysis.

3.3. Variable's measurement

Based on the theory, the overview of the research and research hypotheses, the proposed research model has independent variables including the software quality, the teaching quality of lecturers, the easy use, the level of student commitment, the frequency of learning, gender and dependent variables including learning effectiveness and learning results.

The independent and dependent variables are measured by specific content statements presented in the following table:

Table 1 Variables measurement

Code	Description	Source
CLPM	The software quality	
CLPM1	The Learning Management System (LMS) has a convenient layout, interface and features designed to meet my online learning needs.	Huong, Yen [29]
CLPM2	The Learning Management System (LMS) has chat tools, sharing forums that increase the interaction between students and lecturers, students and students.	Al-Busaidi and Al-Shihi [30]
CLPM3	The Learning Management System (LMS) stores and classifies documents such as online teaching videos, research, presentations, discussions, tests, ...	Al-Busaidi and Al-Shihi [30]
CLPM4	The Learning Management System (LMS) acknowledges and evaluates my learning process that helps me to self-orient and improve my learning effectiveness.	Lam, Hăng [31]
CLPM5	The Learning Management System (LMS) has fast and stable access speed.	Huong, Yen [29]

CLGVD	The teaching quality of lecturers	
CLGVD1	Examination and evaluation activities in online teaching are performed in an appropriate, transparent and accurate manner by lecturers.	Al-Busaidi and Al-Shihi [30]; Berbegal Mirabent, Mas Machuca [32]
CLGVD2	Lecturers have appropriate teaching methods (building lessons, designing slides, teaching styles, communication skills, interaction with students, applying practical knowledge...)	Huong, Yen [29]; Berbegal Mirabent, Mas Machuca [32]
CLGVD3	Lecturers have a positive attitude, always ready to support, take care and help students in the online learning process.	Al-Busaidi and Al-Shihi [30]; Berbegal Mirabent, Mas Machuca [32]
TDS	The ease of use	
TDS1	I feel the learning materials such as lessons, slides, textbooks, references... are fully updated by school and lecturers, which are meeting my online learning needs.	Al-Busaidi and Al-Shihi [30], Chuenyindee, Montenegro [12]
TDS2	I feel the Learning Management System (LMS) classified learning materials in an easy way to find and use.	Al-Busaidi and Al-Shihi [30]; Chuenyindee, Montenegro [12]
TDS3	I easily access and perform learning features on the Learning Management System (LMS).	Chuenyindee, Montenegro [12]
TDS4	I can access the Learning Management System (LMS) anywhere and anytime with Internet-connected devices to study.	Al-Busaidi and Al-Shihi [30]
TDS5	I can learn contents many times on the Learning Management System (LMS).	Al-Busaidi and Al-Shihi [30]; Chuenyindee, Montenegro [12]
TDS6	I can perform interactions with lecturers and classmates in the process of participating in LMS in a simple and easy way.	Al-Busaidi and Al-Shihi [30]
MDTG	The level of student commitment	
MDTG1	I spend time accessing LMS to participate in the class, follow and complete my learning progress at the request of lecturers weekly.	Al-Busaidi and Al-Shihi [30]
MDTG2	I comply with the learning rules of the school.	
MDTG3	I have a positive attitude in online learning (proactively researching, preparing lessons before classes, concentrating, self-conscious, participating in group discussions, ...)	Huong, Yen [29], Ballester [28]
HSHT	Learning effectiveness	
HSHT1	Learning in the Learning Management System (LMS) guarantees to provide me with sufficient knowledge and skills at the request of the subject/curriculum.	Huong, Yen [29]
HSHT2	Learning in the Learning Management System (LMS) ensures me achieving the desired academic results and personal goals.	Al-Busaidi and Al-Shihi [30]; Firat [11]
HSHT3	I promote my ability to self-study, self-research when studying on the Learning Management System (LMS) with the ability to track results, feedback, and timely comments.	Huong, Yen [29]
HSHT4	Through the Learning Management System (LMS), I can improve my study time management skills.	Kedia and Mishra [16]; Lam, Hång [31]
HSHT5	I am ready to participate in programs and online learning activities in the future.	Al-Busaidi and Al-Shihi [30]
GPA	Learning results	Firat [11]

Gender	The male is coded by 1, and Female by 0	Ballester [28]; Gammie, Gammie [33]; Gracia and Jenkins [34]
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4. Research results

4.1. Descriptive statistics results

The following table provides descriptive statistics of the research sample, showing that the number of female students participating in the survey account for a large proportion with 161 students (83.4%), while the number of male students joining in the survey is 32 students (account for 16.6%). In the total number of students participating in the survey, the research form has ensured the representation when there are sufficient students in the first, second, third and fourth year. In particular, third-year students are in the first position in the research form (account for 75.1%).

Table 2 Descriptive statistics of research sample

Criteria	Number of students	Rate (%)
Gender		
Male	32	16.6%
Female	161	83.4%
Student's year		
Freshman	14	7.3%
Sophomore	26	13.5%
Third-year	145	75.1%
Final-year	8	4.1%
School		
Thuongmai University	114	59.1%
Other universities	79	40.9%

(Source: Data analysis result)

Next, the sophomore students account for 13.5%, the freshman students make up for 7.3% and the final-year students account for the lowest proportion of 4.1%. 193 students participating in the survey come from many different universities in Hanoi, of which Thuongmai University account for the largest proportion of the form with 59.1%.

Table 3 Descriptive statistics of measurement factors of variables

Factor	General average score
The software quality	4.12
The teaching quality of lecturers	3.39
The easy use	4.06
The level of student commitment	4.00
Learning effectiveness	3.92

(Source: Data analysis result)

Statistic results in table 3 show that most students participating in the survey highly appreciate the factors including the software quality, the teaching quality of lecturers. They also show the high level of student's participation with a general average point at 4. In particular, the factor "The software quality" (achieving an average score of 4.12) is the

highest appreciation. Meanwhile, the factor that is underestimated by students is “The teaching quality of lecturers” with only a 3.39 score.

4.2. Scale Reliability

The results of the Cronbach’s Alpha test show that most of the factors achieved good reliability. The consistency of the observed variables in the scale is high because the Cronbach’s Alpha coefficient is greater than 0.60 and the item-total correlation of all factors is greater than 0.3. The results are presented in the following table.

Table 4 Reliability scale

Code	Description	Cronbach’s Alpha
CLPM	The software quality	0.804
CLGVGD	The teaching quality of lecturers	0.852
TDSD	The easy use	0.850
MDTG	The level of student commitment	0.779
HSHT	Learning effectiveness	0.879

(Source: Data analysis result)

4.3. Exploratory Factor Analysis (EFA)

The results in table 5 showed that 17 observation variables of independent variables when put into analysis were divided into 4 groups. Total variance value = 64.474% > 50%: meet requirement; it can be said that these factors explained 64.474% the variable of the data. Eigenvalue’s coefficient values of factors greater than 1 and extract 4 factors that summarize the most information. The observation factors of the dependent variable extracted an only factor from the observation variables, the factor loading coefficient was over 0.3, which means that the dependent scales had guaranteed a single-oriented calculation, the observation variables of the dependent variable convergence.

Table 5 Summarize the results of the KMO and Barlett testing and the total variance for the factors

Factor	KMO	Bartlett sig.	Total variance extract	Number of factors extracted	The minimum factor loading
Independent variables	0.851	0.000	64.474	4	0.513
Dependent variable	0.855	0.000	67.361	1	0.805

(Source: Data analysis result)

Thus, the initial research model through the results of the scale reliability analysis with the Cronbach’s Alpha coefficient, Exploratory Factor Analysis, the proposed components all meet the requirements and are statistically significant. The above components will be used in the next tests.

4.4. Multivariate Regression Analysis

To determine the causal relationship between the dependent variable: online learning effectiveness and independent variables: the software quality, the teaching quality of lecturers, the easy use, the level of student participation in the research, the research team use regression analysis, besides, it is necessary to review the multicollinearity between independent variables. Regression analysis will show the level of impact of each independent variable on a dependent variable.

Table 6 Results of testing appropriate model

Constant	R	R square	Adjusted R square	Change R square	Change the meaning level
1	0.765 ^a	0.586	0.577	0.42115	0.000
<i>Independent variables: CLPM, TDSD, CLGVGD, MDTG</i>				<i>b. Dependent variable: HSHT</i>	

(Source: Data analysis result)

The above results from the table shows that R has a value = 0.765, which means that the relationship between variables in the model is close. Report of the regression results show that R square value = 0.586, which shows the appropriate level of the model was 58,6%. The variation of the students’ learning effectiveness variable is explained by 4 components including the factors: the software quality of the LMS, the teaching quality of lecturers, the easy use and the level of student commitment. The adjusted R square reflected the model’s conformity for the overall more accuracy, The adjusted R Square = 0.577 (or 57.7%) and significance level (sig.) = 0.000 < 0.05 means a linear regression model between “students’ learning effectiveness” and 4 mentioned components.

The F test used in the variance analysis table is a test of the hypothesis of the appropriateness of the overall linear regression model. The result table ANOVA shows that because F = 66.407 and p(F) = 0.000 < 0.05, it is possible to confirm the relationship between variables CLPM (the software quality), CLGVGD (the teaching quality of lecturers), TDSD (the easy use), MDTG (The level of student commitment) with HSH (learning effectiveness).

Table 7 Regression analysis results

Constant		Not standardized Beta coefficient		Standardized Beta coefficient	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.030	0.270		0.110	0.913
	CLPM	0.159	0.069	0.140	2.311	0.022
	TDSD	0.366	0.070	0.343	5.221	0.000
	CLGVGD	0.074	0.035	0.100	2.081	0.039
	MDTG	0.379	0.060	0.388	6.291	0.000

(Source: Data analysis result)

Through Standardized Coefficients Beta, the table shows the level of impact of each independent variable on students’ learning effectiveness. Following that, the two factors that have the most obvious influence on students’ learning effectiveness are: “The level of student commitment” factor has the largest influence (38.8%); the second influence is “The easy use” factor (34.3%). The two remaining factors have less impact levels than students’ learning effectiveness, respectively “The software quality” (14%) and “The teaching quality of lecturers” with an impact level of 10% to students’ learning effectiveness majoring in accounting and auditing in Hanoi when participating in online learning on the LMS.

Table 8 The results of testing the average difference in learning results between male and female

		Levene's Test for Equality of Variances		t-test for Equality of Means		t-test for Equality of Means			
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference
									Lower
GPA	Equal variances assumed	1.520	0.219	2.820	191	0.005	0.368	0.130	0.110
	Equal variances not assumed			2.393	38.869	0.022	0.368	0.154	0.057

(Source: Data analysis result)

Through the result from the table, Sig. F test = 0.219 > 0.05, so there is no variance difference between male and female groups. The research team will use the test results t in Equal variances assumed. Sig. t test = 0.005 < 0.05 (statistical

significance), which means there is a difference in grade point averages (GPA) between different genders. Specifically, female students have better GPA than male students. Therefore, the H5b hypothesis is accepted.

5. Conclusion

Based on the above research results, it can be concluded that the research hypotheses are all accepted. Accordingly, when studying through the LMS platform, accounting and auditing students in Viet Nam all agreed that the elements of students' participation, the easy use of the system, the software quality and the teaching quality of lecturers have a positive impact on their assessment of learning effectiveness, gender. In addition, the independent T-Test test has shown that female students have learning results better than male students in the LMS platform.

Recommendations

On the basis of the above research results, we believe that the perception of the influence of LMS on learning effectiveness and learning results will help students enhance their level of participation (level of using system, interaction, ...) more with the system. Many activities such as preparing for new lessons, reviewing homework, previewing the video, actively interacting with lecturers and classmates are extremely necessary to help learners achieve better learning results. The higher the level of interaction, the more awareness will be, the more advanced learning effectiveness; and then learning results will be improved. This is identical to the results of Kedia and Mishra [16]: "It is concluded that the interaction between the lecturers and students, the use of social media, technology and family support directly or indirectly affect students' participation and learning effectiveness".

Research results show that the teaching quality of lecturers is an important factor. So, in terms of lecturers, it is necessary to increase the additional classes, learn and master the use of LMS to make teaching and learning easier. Lecturers should innovate lectures, teaching methods and actively interact and exchange with students to create comfortable feelings, excitements for learners, thereby significantly improving the teaching quality. When designing LMS to attract the enthusiasm of learners, through the design of attractive, accessible learning pages, useful resources, and measures to control the participation of learners. The above results show that the software quality (easy to manipulate, easy to find information, easy to use, the system is designed and built well) has an important effect on learning effectiveness. Accordingly, the information technology department should offer many measures to improve the software quality to bring the best effectiveness to users.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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