The Influence of Learning Management System (LMS) Platform on Students' Academic Performance at the University of Bamenda

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Abstract
A Web-based Learning Management System (LMS) is a digital device that allows instructors and students to share didactic materials, make class announcements, submit and return course assignments, and communicate with each other online. This paper, therefore, seeks to investigate the influence of the Learning Management System platform on students' academic performance with insights drawn from The University of Bamenda, (UBa) as a case study. The data for the study were obtained from primary sources using a self-administered questionnaire. The sample population comprised students who studied through the Learning Management System in the 2020/2021 academic year. A sample size of 452 students was selected from the twelve (12) establishments of The University of Bamenda using Yamane's 1967 sample size formula. The study employed the Ordinary Least Square regression technique for data analysis. The findings reveal that the LMS platform has a significant influence on students' academic performance at The University of Bamenda. Also, the independent variables (system quality and service quality) have a negative significant influence on student's academic performance as shown by their coefficients of -4.983 and -3.443 and their p-value of 0.023 and 0.002 respectively whereas information quality has a positive significant influence on students' academic performance as justified by it coefficients of 5.314 and its p-values of 0.004. Based on these findings, the study recommended that government should speed up the E-National Higher Education Programme by rapidly completing the University Digital Development Centre which will improve system quality accessibility and service quality attainability towards students. Also, the UBa administration should continue to sensitize students on the usefulness of the learning management system by organising more seminars and workshops on how to use the platform and wide distribution of the LMS manual to students and lecturers to enable them better understand the functioning and use of the platform.

Keywords: ***Learning Management System, System Quality, Service Quality, Students' Academic Performance***

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Introduction

In this era of globalisation and technological revolution, education is considered the first step for every human activity. It plays a vital role in the development of human capital and is linked to an individual's well-being and opportunities for better living (Battle & Lewis, 2002). In recent years, universities around the world have become increasingly interested in e-learning to meet the growing student population, provide a broad and fast information base, and open up other areas of communication between students and faculty teachers on the one hand and among students themselves on the other hand (Khaddash & Al-Hadhrami, 2006). It is worth mentioning that the information and technological revolution that shook the whole world entered university teaching via the widest doors and imposed itself on all parties of the educational learning process. This fact led the Department of Higher Education to implement e-learning and consider it an ultimate priority to save time and effort despite the high cost and necessary infrastructure required for this operation (Al-Mutairi, 2015; Aljarrah, 2011).

As has been noticed for many years, there have been constant calls for the use of technology in higher education. This led most universities to embark on using technological software both in the classroom and in the administration (Balta & Duran, 2015). The rationale behind this undertaking lies in promoting the efficiency of university teaching, ensuring its flexibility, and linking it to the reality in which students live. One such software is the Learning Management System (LMS) (Jayson, 2006). The Learning Management System allows learners to communicate and interact with their teachers to work together in a new and enjoyable way. It helps educational institutions transform the Internet into a strong medium in the process of teaching and learning (Aljarrah, 2011).

Also, the application of the Learning Management System (LMS) is now common in the higher education domain, particularly in distance learning or online courses. Indeed, there has been an increase in the use of LMS in the practice of teaching and learning in this domain (Gautreau, 2011). Effective LMS implementation can be reflected through its usage by the end users (Rafi, Samsudin, & Hanafi, 2015), and at present time, the satisfaction of end users has become an important subject. This is because more and more institutions are using LMS in their online courses, and for this reason, an evaluation method is needed for measuring its effectiveness. For all organisations to have satisfied customers or users is one of their aims, and this is especially true among universities. In this regard, the application of LMS in the delivery of courses is regarded to be a crucial goal for the universities in the management and evaluation of the work produced by the students. User satisfaction is a notion that means the degree to which the stakeholders are confident that the technology employed is fulfilling their requirements (Ives, Olson, & Baroudi, 1983), and is regarded as the key variable that demonstrates the difference in marketplace success (Gitman & McDaniel, 2008). Apart from that, user satisfaction affects the product, and therefore, having the concept analysed will assist in product improvement (Zhang, Zhang, & Shen, 2010).

The evolution of LMS has made teaching and learning a lot more practical, exciting and innovative in higher education. The LMS provides the means and ways for universities to manage and administer courses (Godwin-Jones, 2012). It is mainly a type of application that allows students to obtain materials from lectures, discussions, and assessments and as a medium of virtual interaction between instructors and other students (Goh *et.al.* 2013; West, Waddoups, & Graham, 2007; Ronnand Teasley, 2009).

Learning is blended and complemented by this tool as instructors can amend or add to knowledge using other means besides what is already given in the classroom. Hence learning and teaching take on a different level which is virtual and online.

In addition, LMS makes it possible for instructors to choose the right kind of blended learning to suit the lessons. For example, the instructor can break the boredom of a classroom session by introducing chat, video conference, and discussion boards, depending on how effective the system is in that particular higher institution.

Therefore, Institutions of higher education with Internet capabilities have been able to provide online courses that allow students who are unable to physically attend classes onsite (Klassen & Vogel, 2003). According to Young (2006), online learning has changed the methods used to provide instruction as well as the role of instructors, specifically through distance learning.

In this case, the academic performance of students in tertiary institutions in Cameroon has become an issue of interest with the proliferation of private tertiary institutions.

The educational disruptions caused by the COVID-19 pandemic, which appeared in Cameroon in **Error! Bookmark not defined.**, dramatically worsened the situation, causing examination scores to plummet across the board. In 2020, just 60 percent of students passed the BEPC, while baccalaureate scores fell from 61 percent in 2019 to 47 percent the following year. Similarly, the success rate in the GCE AL declined from 78 percent in 2019 to 70 percent in 2020.

Student outcomes are not the result of simple cause–effect relationships, but of systemic interactions of factors that include the characteristics that teachers and students bring to the instructional context, as well as their institutional and cultural contexts.

Despite the context under which e-learning was introduced at The University of Bamenda, it must be noted that the Learning Management System has come to stay. After the implementation and utilisation of the UBa online platform since 2018, questions on the effectiveness and its effect on the performance of students remain unexplored scientifically. Before the introduction of LMS at The University of Bamenda, teacher - students interaction was mainly physical. With the introduction of LMS, many students still find it difficult to use the platform, and so do lecturers. Many students complain that infrastructural issues such as the absence of electricity and poor internet network make it difficult to use the platform.

Also, the inability of some lecturers to effectively use the platform has made it difficult for students to interact with teachers as most of the lecturers simply upload the notes on the platform and fail to interact with the students as many features of the platform are still not mastered by both the students and lecturers. Some staff rather choose to interact with students on social media platforms like WhatsApp, Instagram, Zoom and Telegram. The problem is more acute in some courses that involve solving and demonstrations as students will not be able to understand some of the demonstrations online. Despite the training sessions organised by the UBa administration in other to get various stakeholders familiar with the LMS platform, many students and lecturers remain restrained in using the online platform to teach and assess students. This and many more may pose several challenges to the effectiveness of the LMS and its effect on students' academic performance. With this in mind, one will begin to wonder how the performance of students in the different establishments in UBa is influenced by the LMS. This is why this study seeks to assess the influence of the LMS

platform on students' academic performance in UBa. To do this, the study adopted the following research questions: What is the influence of the UBa Learning Management System platform on students' academic performance at The University of Bamenda? What is the influence of system quality in enhancing the learning management system platform on students' academic performance? What is the influence of information quality in enhancing the LMS platform on students' academic performance at The University of Bamenda, and what is the influence of service quality in enhancing the learning management system platform on students' academic performance?

The overall goal of this study is to determine the influence of the Learning Management System platform on students' academic performance in The University of Bamenda. The specific objectives of the study are to assess the influence of system quality on the learning management system platform on students' academic performance in The University of Bamenda, to analyse the influence of information quality on the LMS platform on the academic performance of students in The University of Bamenda and to evaluate the influence of service quality on the LMS platform on students' academic performance in The University of Bamenda

The study was guided by the following hypotheses stated in their null form:
H_1: System quality of the Learning Management System has no significant influence on the academic performance of students at The University of Bamenda.
H_2: Information quality of the Learning Management System has no significant influence on student's academic performance at The University of Bamenda.
H_3: Service quality of the Learning Management System does not significantly influence students' academic performance at The University of Bamenda.

Literature Review

Learning Management Systems can be defined in various terms, such as learning content management system (LCM), course management system (CMS), learning content management system (LCMS), virtual learning environment (VLE), virtual learning system (VLS), learning portal, or e-learning platform. A learning system is also a collection of tools, which is used to manage the knowledge and resources of individuals and institutions and make them accessible to all learners. Each term might have a slightly different meaning, depending on your interpretation (Wright *et al.* 2014.). In this research, the author will be using a Learning Management System (LMS) as a common term. According to Valamis (2019), a modern LMS is specifically designed to be integrated and built into various add-ons application that supports the development, delivery, assessment, and administration of courses in traditional face-to-face, blended, or online learning environments.

Learning Management Systems can be used for different purposes e.g. in educational institutions they have been used for the benefit of planning and implementing courses, facilitating, assessing, and monitoring students' activities. The main role of LMS in education is to centralize course preparation as well as contents and different resources, delivery, and monitoring of student activities like forum discussion and collaborations as well as examinations and final assessments. (Wright et al. 2014.)

Sharma (2019) claims that there are two types of LMS choices, licensing type and deployment type. Licensing LMS is also referred to as Cloud LMS and it is supplied by third parties as on-demand services, while deployment type is in-house deployed and

managed by the organisation. However, from licensing LMS perspective there are two major differences, Proprietary Learning Management System and Open Source. Proprietary Learning Management Systems are critically licensed under high standard legal rights in terms of the number of users who can use the platform, limited locations where the platform will be visible, not to be disclosed to the public for the reason of security from being modified, reverse engineering and limited integration; shortly it is defined as a closed-source with license per user. (Leh, 2016.)

Price is an important factor in the choice of LMS. The price factor is determined by three software delivery types. These include premium, freemium, and open source.

In information technology (IT) studies, the measurements that are commonly used in predicting system quality include accessibility, efficiency, language, flexibility, timeliness, and factors of integration (Wixom & Todd, 2005; Almarashdeh, 2016). In systems of online learning including LMS, the quality of the system is associated with the observation of students on the performance of the system. Such perception is measurable via factors as follows: availability, ease of learning, usability, response time, and recognition of user expectations (Freeze, Alshare, Lane, and Wen, 2010). In past studies, system quality has been found to directly impacts student satisfaction (Almarashdeh, 2016; Ramayah & Leeb, 2012).

Information quality is commonly linked to measurements including accuracy, currency, conciseness, completeness, precision, timeliness of output, relevance, and format, in addition to reliability (Bailey & Pearson, 1983). For online learning, information quality denotes LMS's perceived output. In this regard, the indicators that are commonly employed in projecting information quality are as follows: format, completeness, accuracy, timeliness, adequacy, relevance, understandability, as well as accessibility (Saba, 2012; Al-Busaidi & Al-Shihi, 2010). In past works on user performance, information quality was reported to significantly affect students' performance (Delone & E. McLean, 2003; Seddon, 1997).

The purpose of measuring the quality of services within the context of online distance learning is yet to be explored by scholars (Shaik, Lowe, & Pinegar, 2006). In essence, service quality reflects the quality of support services that are offered to end users. Accordingly, the measurements of service quality include the constructs of responsiveness, reliability, assurance, and tangibles, besides empathy of the system (Al-Busaidi & Al-Shihi, 2010; Kettinger & Lee, 1997; Almarashdeh, 2018). For online courses, among the commonly used measures of service quality include reliability, responsiveness, and empathy, all of which, greatly impact student satisfaction (Roca, Chiu, & Martínez, 2006). Better service provision to the students will generate a higher level of satisfaction and performance.

The need for academic performance was realised far back in 1990, at the world conference on education for All in Jomtien, Thailand when some 150 organisations agreed to universalise primary education and massively reduce illiteracy by the end of the decade (United Nations Educational Scientific and Cultural Organisation - UNESCO 2009).

Academic performance (achievement) refers to what has been learned or what skills the student has learned and is usually measured through assessments like standardized tests, performance assessments, and portfolio assessments (Santrock, 2006). It could also be seen as the level of performance in a particular field of study. Higher scores indicate better academic performance (Egbule, 2004). In this study, Academic Performance is

regarded as participants' examination grade point averages (GPA) at the end of the duration.

One of the theories of this work is the System's theory of input-output model, developed by Ludwig Von Bertalanffy in 1956. The theory postulates that an organised enterprise does not exist in a vacuum. It is dependent on the environment in which it is established. They add that the inputs from the environment are received by the organisation, which then transforms them into outputs. As adapted in this study, the students (inputs) are admitted into the university from different social economic backgrounds and are from various school backgrounds, when they get into the university system, the management of the university transforms them through the process of teaching and learning and the student's output is seen through their academic performance.

The theory of Planned Behaviour (Ajzen, 1991) has proved to be a robust model of behavioural intention that accounts well for social factors in decision-making and is utilised in this study.

The technology acceptance Model was developed by Fred David in 1989. The model is rooted in the Theory of Reasoned Action (TRA). The TAM model is considered to be the most influential and commonly employed theory describing an individual acceptance information system (Lee et al., 2003). The technology acceptance model (TAM), which is derived from the theory of reasoned action (TRA), has gained recognition as the most useful among them for investigating the acceptance of novel technologies, and it covers significant factors affecting their use. Moreover, since its introduction, the TAM has been extensively tested and validated empirically by scholars in various fields and contexts to explain user belief-intention-behaviour across a broad range of computer-related technologies (Teo, 2009; Giesbers, Rienties, Tempelaar, & Gijselaers, 2013).

Students use the internet when they need to gather further information when it comes to understanding lectures and ideas for assignments. There are contradicting views from researchers on whether the internet is a good medium for students to search for information, as some agree, while some disagree with this idea.

According to Schofield and Davison (2002), the complexity of the situation is summarized as follows: "Today, millions of students in the United States and around the world can connect to the Internet from their schools. Billions of dollars have been spent to provide such access with the expectation that the information and communication resources the Internet provides will improve educational outcomes. Yet educational benefits do not flow automatically from Internet access. Attitudes and expectations, technical knowledge, classroom culture and Internet culture, curriculum design, implementation, and follow-through all affect what teachers and students can accomplish with the Internet. In at least one critical respect, the Internet turns out to be no different from any other classroom resource. What you get out of it depends a great deal on what you put into it" Schofield and Davison (2002).

Several studies have been conducted on the effectiveness of the Learning Management system and its relationship with student motivation, satisfaction and performance. These studies yielded mixed findings. This section provides a review of early empirical studies on the subject matter under investigation.

Ramazan (2017) conducted a study on Learning Management System Acceptance Scale (LMSAS). This study was conducted in the 2016-2017 academic year with three

groups of participants, making 515 medical students in all. A construct with four factors and 21 items was obtained at the end of the EFA, which explained 64.39% of the total variance. CFA results showed that the construct with four factors and 21 items had a good fit with the data. The reliability of the measurements based on the scale was examined using Cronbach's alpha and test-retest methods. To examine the discriminatory power of the items, adjusted item-total correlations and comparison of the top and bottom 27% of participants were used. Findings showed that the scale developed in the study can be used as a tool that generates valid and reliable measurements of students' acceptance of learning management systems.

Almoslamani and Yousef (2018) carried out a study on the Effectiveness of Student Engagement Using a Learning Management System in the Blended Learning Environment at Saudi Electronic University. He used data from LMS activities self-reported by students with special attention to whether gender played a role in the level of engagement and quality of the outcome. This study used a quantitative method to analyze the correlational relationship between the perceived amount of time students spent hourly participating in LMS activities and student grade point average (GPA). The participants were 246 students from Saudi Electronic University. Results indicated no statistically significant difference between genders regarding their online engagement.

Mohammed Nasser, (2020) studied the challenges students face in learning English as a foreign language when using the E-learning system at the University of Bisha. He also investigated whether using E-learning is beneficial to EFL students learning English to the degree anticipated. The study sample included 36 teaching staff and 261 EFL students at the University of Bisha - English department. The study results showed that there are no significant differences between EFL students (males and females) in E-learning activities.

Kimani Maina and David M. Nzuki, PhD (2015) carried out a study on adopting determinants of e-learning management system in Institutions of Higher Learning in Kenya: A Case of Selected Universities in Nairobi Metropolitan. The study examined the influence of performance expectancy, effort expectancy, social influence and facilitating conditions on the acceptance of E-learning Management Systems (EMS) in institutions of higher learning in Kenya. Descriptive research design and in particular cross-sectional design were employed to empirically investigate the extent to which problems influence the adoption of E-learning Management Systems (EMS). A self-administered questionnaire, face-to-face interviews and observation were administered to a sample size of 600 that consisted of lecturers, students, administrators, and technical staff from at least five Universities within Nairobi Metropolitan. Analysis was done using descriptive as well as inferential statistics to draw inferences between the variables. The study found that the use of EMS was a new technology as most of the respondents had an experience of fewer than 3 years. Also, the study found that expected performance, enabling infrastructures, institutional policies, training support and leadership and ease of effort use influenced the adoption of EMS in institutions of higher learning.

Nair and Patil (2012) examined the impact LMS have on students and how effectively LMS has influenced students in their academic activities. A questionnaire was prepared in the academic year 2008-09 and circulated to the students enrolled for various Bachelor (Honours) degree courses of affiliated partner, University of Stirling, UK. The result of the survey clearly showed the positive impact LMS has on students. Although the response from the students of the academic year 2008-09 was not that encouraging

due to a lack of awareness of the advantages of using LMS. The training given to the students on LMS has been very successful and the majority of the students have responded very positively in the academic years 2009-10 and 2010-11. The frequency of using LMS was good. The students felt that course activities have become more convenient. Students' learning skills have been improved. Muscat College ICT services were found to be efficient. Overall, the majority of the students have had a very good experience using LMS.

Haddad (2018) explored the relationship between the proposed factors and student satisfaction, while also measuring LMS outcomes. The attained results evidence the positive impact of all proposed factors on student satisfaction. Also, the results indicate that a higher rate of user satisfaction increases the benefits for the students. Data for the study were collected from 285 students in four universities in Saudi Arabia. The data were analysed with the help of descriptive tools and structural equation modelling. Results from the analysis revealed that system quality, information quality, service quality and perceived usefulness all exert a significant effect on students' satisfaction.

Dulkaman and Ali (2016) investigated the factors related to LMS that influence students' academic performance. Quantitative data from 20 respondents at a large Malaysian university were obtained from a 12-item questionnaire. Findings showed that the effectiveness of the Learning Management System and students' motivation significantly correlated with their academic performance success. The findings suggested that instructors need to play a greater role in motivating students to use the LMS via innovative and creative means.

Reid (2019) explored how learning management systems influence adult learners' method of acquiring higher education, how learning management systems influence adult learners' transformative learning and how LMS is a game-changer for traditional teaching and learning at adult and higher education institutions. The empirical study focused on the perspectives of faculty members, students, and academic leadership concerning learning management systems utilisation, benefits, preference, and satisfaction that influenced traditional teaching and learning at adult and higher education institutions. The qualitative and quantitative research methods used by the author showed optimistic responses from faculty members and students regarding learning management system preference, utilisation, appreciation, and satisfaction with online teaching and learning at adult and higher education institutions.

Mashaqbeh (2009) conducted a study that aimed at surveying students' views on Learning Management System software as a Means of assisting in the educational process and its correlation with some variables. The study covered the computer course and architecture course at Al-Bayt University. The results showed that there were no statistically significant differences between the students' opinions related to the gender variable, the school year, the type of course, or the previous experience and that most students felt pleasure while using the system. Nevertheless, the results showed that the students encountered other impediments such as the lack of clarity of evaluation methods used in the course and that the ways to communicate with students by the teacher were insufficient.

Buabeng-Andoh and Baah (2020) tested a research model to determine the determinants that impact students' actual use of the learning management system. A survey questionnaire was used to gather data from 148 university students who used LMS in their course of study. The structural equation model was used to analyze

quantitative data. The study revealed that (1) performance expectancy, effort expectancy and institutional support positively impacted students' actual use of LMS, (2) social influence and infrastructure support did not positively impact students' actual use, (3) gender had a significantly moderated effect on the correlation between institutional support and actual usage of technology. This study added to existing studies on the use of UTAUT in explaining students' actual use of technology in developing nations

In Salloum's study (2011) which aimed to identify the degree of integration between the virtual classrooms and the system of e-learning Learning Management System, the researcher compared the different virtual classroom systems in terms of integration with e-learning management systems. The study showed several results, including the need to use virtual classroom techniques in e-learning in general and in the live broadcast of lectures and tutorials in particular because of the benefits of many of these programs. Virtual classrooms provide many solutions, especially in an environment similar to the situation in Saudi Arabia, where there are great numbers of students who are not absorbed by universities and the crowded traffic congestion in cities and the nature of education policy in the Kingdom which separates sexes from each other. The use of virtual classes allowed teaching female students by male faculty members, thus solving the problem of the non-availability of specialized faculty members of the same sex of the students.

Gaensler (2004) investigated the use of WebCT in an undergraduate precalculus class and found that students' learning was both active and collaborative. Students also exhibited reflective discussion and integration of new ideas with preexisting knowledge. As the instructor used various features of the LMS, including email, discussion boards, online lecture notes, and interactive quizzes, students gained confidence in engaging in dialogs that enhanced their understanding of pre-calculus concepts. Gaensler argued that this blended approach engendered a more profound learning experience than if the course had only been taught in a traditional face-to-face instructive approach.

A good number of studies have been carried out on learning management systems and their relationship with different student outcomes. However, it should be noted that most of these studies focus on examining the effectiveness of Learning Management Systems around the world. Very little attention has been directed towards the influence of LMS utilisation and students' performance even when these studies exist, they use merely descriptive approaches to examine this relationship without any rigorous econometric analysis of the linkage. Moreover, such studies are practically inexistent in the Cameroonian context. Thus, this paper seeks to field the above-mentioned literature gap by assessing the influence of the Learning Management System platform on students' academic performance. This study uses robust econometric modelling and estimation techniques to test the hypothesis to provide a reliable and predictable result

Methodology

This paper examined the influence of the Learning Management System on students' academic performance. The paper was limited in terms of space to the students of the University of Bamenda. The University of Bamenda is located in the North West Region of Cameroon. This region is made up of seven (7) divisions (Mezam, Momo, Menchum, Bui, Donga Mantung, Boyo, and Ngoketunjia). The University of Bamenda is situated in the Mezam division precisely in the Tubah subdivision. It is found in a small village called Bambili that has been the center of education in the North West Region. The

University of Bamenda is the lone state university in the region. The time spanned investigation was between November 2020 to August 2021. The justification of the time scope is based on the adoption and implementation of LMS in the University.

The paper used The University of Bamenda (UBa) which is an Anglo-Saxon University in Bamenda, North Western Cameroon, established in 2011 as the second English language university in Cameroon, the University of Buea has been the only one up till then. It began with the Higher Teachers Training College and the Higher Technical Teachers Training College as the only faculty.

This population consists of students, university administrators, providers of telecom network services, LMS platform providers and the teaching staff of The University of Bamenda. The target population refers to a real hypothetical set of people and objects by observing them and extending them to the entire population or set of events. The population of the study consists of national and international students of The University of Bamenda which is estimated at 16,500.

The stratified sampling technique was used to structure the population between the various schools and faculties and the purposive sampling technique was used for the study to ensure that all establishments and levels were represented in the sample. The study adopted a sample size of 391 obtained from the population using Yamane's 1967 sample size formula.

The primary instrument of data collection was the structured questionnaire prepared using the Likert Scale format.

The dimensional reduction technique – principal components were used to derive an index score for academic performance. The index was normalised using the formula;

$$\widehat{nSP_i} = 100 * \frac{SP_i - \min(SP)}{\max(SP) - \min(SP)} \dots\dots\dots..3.1$$

Where $\widehat{nSP_i}$ is the normalised performance score for student i, SP_i is the performance value of student i, and $\min(SP)$ and $\max(SP)$ are the minimum and maximum performance values for all the students, respectively. The scores of the normalised index range from 0 to 100, where higher scores indicated higher students' performance. An index was also generated and normalised for system information, and service quality following the method elaborated in equation 3.1.

Since the dependent variables was continuous and we didn't suspect the existence of endogeneity nor heterogeneity, the appropriate method of analysing the data was multiple linear regression using the ordinary least square estimation technique. The non-existence of endogeneity was inferred from the absence of a possible bi-directional causality between the LMS platform and academic performance. The absence of heterogeneity could also be ascertained from the fact that all the students in the study had the same access to the platform.

The hypothesised functional model is presented as follows:

$Performance\ (nSP)$ =f (System quality (nSYSQ), information quality (nINFQ), service quality (nSERQ), gender, age, marital status, school)

Where nSP is the academic performance of students, nSYSQ is the system quality, nINFQ is information quality, nSERQ is service quality. The model also includes a set of control variables, namely: age, marital status, gender and school of the student.

In the econometric form, the model is written as:

$$nSP_i^* = \beta_{0+} \beta_1 nSYSQ_i + \beta_2 nINFQ_i + \beta_3 nSERQ_i + \beta_4 Gender_i + \beta_5 AGE_i + \beta_6 MS_i + u_i$$

……..……..3.2

In equation 3.2, β_1, β_2, and β_3 capture the magnitudes of the influence of system quality, information quality and service quality respectively, on student's academic performance. These coefficients are expected to be positive, because the better the perceived quality of the LMS system by students, the more likely the students' academic performance will improve. The coefficients β_4 and β_5 are expected to be different from zero meaning it can either be positive or negative. This due to the fact that there are no clear evidences in the literature on the relationship between gender and academic performance and between age and academic performance.

Table 1: Definition of Variables

Variables	Representation	Definition of Variable	Expected Sign
SYSQ	System quality	Normalised score of system quality based on questionnaire items	+
INFQ	Information quality	Normalised score of system quality based on questionnaire items	+
SERQ	Service quality	Normalised score of system quality based on questionnaire items	+
SEX	Gender	1 if female and 0 if male	+/-
AGE	Age	Age of respondent, continuous variable	+/-
MS	Marital status	1 if married, 0 if single	+/-

Source: Compiled by the Authors, 2021

The data collected was presented using frequency tables and charts. The Ordinary least square regression analysis was used to test the various hypotheses. Correlation analysis (Pearson Product Moment Correlation) was also used to assess the nature and strength of the relationships between the variables of the study.

Results

Table 2: Age Distribution of Respondents

Category	Frequency	Percent	Cumulative
Less than 18	8	1.77	1.77
18 – 20	120	26.55	28.32
21 – 23	152	33.63	61.95
24 – 26	96	21.24	83.19
27 – 30	52	11.50	94.69
30+	24	5.31	100.00
Total	452	100.0	

Source: Field Survey, 2021

The above table shows the distribution of respondents by age. Out of the 452 sample respondents, 8 were of age less than 18 years constituting 1.77%. Equally, 120 out of the 452 respondents were between the age 18-20 years thus constituting 26.55% of the sampled population. Also, 152 respondents were between the ages of 21-23 years constituting 33.63% of the total sampled population. More empirical results revealed that 96 respondents out of the total sampled population who make up 21.24% were aged

between 24-26 years. It was further revealed that 52 respondents were between the ages 27-30 years constituting 11.50% of the total sampled population while the rest 24 respondents who made up 5.31% were of age 30 years and above. The sample was dominated by students who were young adults, between the ages of 18 and 30+. Thus the respondents were mature enough to understand the questionnaire items and provide valid and reliable responses.

Table 3: Gender Distribution of Respondents

Category	Frequency	Percent	Cumulative
Male	206	45.58	45.58
Female	246	54.42	100.00
Total	452	100.00	

Source: Field Survey, 2021

From the table above, we can observe that 45.58% of the surveyed population were male with a frequency distribution of 206 respondents while the rest 54.42% were female with a sampled population of 246 respondents. This indicates gender disparity in the student population of The University of Bamenda. This implies that women are found to be more concerned about ease of use whereas men are more concerned about technology usefulness (Ahmed 2019).

Table 4: Respondents' Level of Education

Category	Frequency	Percent	Cumulative
Year 1	220	48.67	48.67
Year 2	135	29.87	78.54
Year 3	53	11.73	90.27
MSc	36	7.96	98.23
PhD	8	1.77	100.00
Total	452	100.00	

Source: Field Survey, 2021

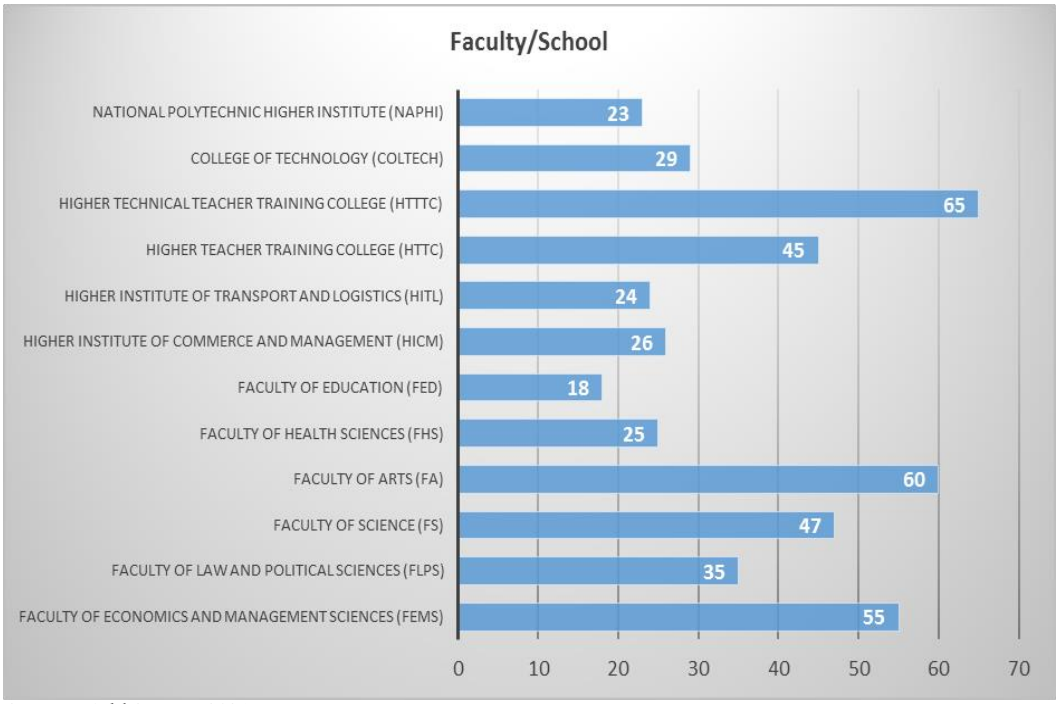
From the above table, we can observe that level of education is divided into three categories that are B.Sc., M.Scs. and Ph.D. it is observed from the table above that among the total sampled population, 220 respondents who constitute 48.67% were Year 1. It was also observed that 135 respondents who constitute 29.87% of the total sample population were in Year 2. It was also revealed that 53 respondents who constitute 11.73% of the total sampled population were in Year 3. More results on Postgraduates show that 36 respondents who constitute 7.96% were MSc while the rest 8 respondents who made up 1.77% were PhD.

Table 5: Marital Status of Respondents

Category	Frequency	Percent	Cumulative
Single	396	87.61	87.61
Married	56	12.39	100.00
Total	452	100.00	

Source: Field Survey, 2021

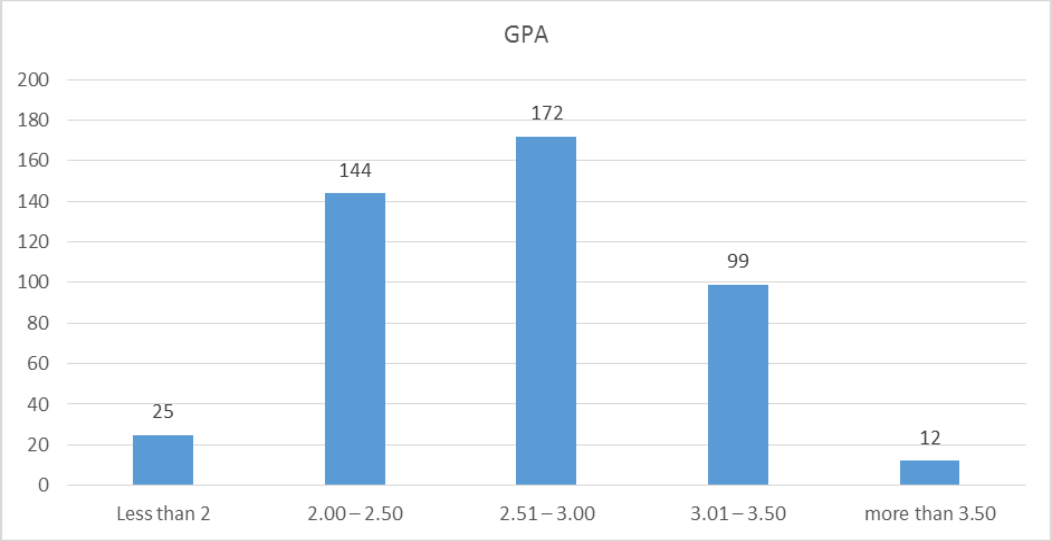
The table above shows the distribution of the marital status of the respondents of the surveyed population. Among the sampled population, persons who constitute 87.61% of the total sampled population claimed to be single while the rest 56 sampled persons which constitute 12.39% were married. This shows that the majority of the respondents are single. Most students at The University of Bamenda are teenagers who are at their tender ages and are mostly single.



Source: Field Survey, 2021

Figure 1: ***Respondents' Faculty/School***

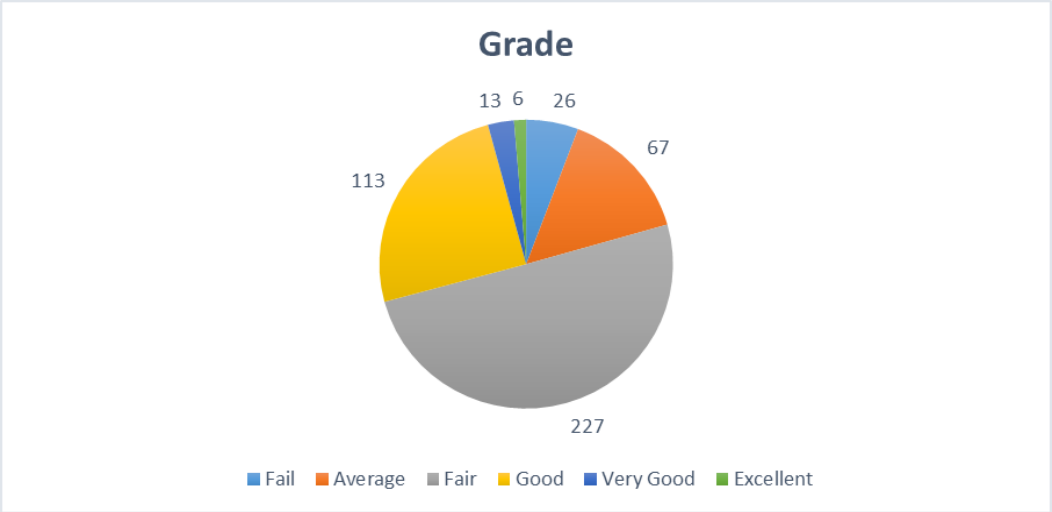
The figure above is classified into the various faculties and schools in The University of Bamenda with their corresponding respondents as follows: 23 students were from National Polytechnic Higher Institute (NAPHI), 29 students were from the College of Technology (COLTECH), 65 students were from Higher Technical Teacher Training College (HTTTC), 45 students were from Higher Teacher Training College (HTTC), 24 students were from Higher Institute of Transport and Logistics (HITL), 26 students were from Higher Institute of Commerce and Management (HICM), 18 students were from Faculty of Education (FED), 25 students were from Faculty of Health Sciences (FHS), 60 students were from Faculty of Arts (FA), 47 were from the Faculty of Science (FS), 35 students were from Faculty of Law and Political Sciences (FLPS) and 55 students were from Faculty of Economics and Management Sciences (FEMS). However, the sampled respondents per establishment reflected the total population of each faculty and school. Therefore, HTTTC with the highest frequency has the highest population in the sample while FED with the lowest sample size has the lowest population.



Source: Field Survey, 2021

Figure 2: Students' GPA

The results in the above figure show the range of GPAs gotten by the various students in both schools and faculties. The figure shows that 25 students had a GPA of less than 2, and 144 of the students had a GPA of between 2.00-2.50. Results available also show that 172 students had a GPA of between 2.51-3.00, also 99 respondents had a GPA of 3.01-3.50 and 12 students only had a GPA of above 3.50. This shows that the majority of the students who participated in this study indicate they have GPAs of 2.5 and 3 which is second class lower and upper divisions. Based on this, we can depict that the academic performance of these students based on the LMS is good.



Source: Field Survey, 2021

Figure 4.3: Grade of Students

The results in figure 3 show the grades of students in the various schools and faculties. The results show that 26 students had failed, 67 students were on average, and 227 students were reported to have fair grades. It was also observed that 113 students had a grade of good on their performance, 13 students had very good and 6 students performed excellently. These grades are directly related to the GPA since the grading is done using the GPA system.

Table 6: Descriptive Statistics of System Quality, Information Quality, Service Quality and Academic Performance

Variable	Obs	Mean	Std. Dev.	Min	Max
System quality	452	53.648	19.16	1.00	5.00
Information quality	452	55.458	21.561	1.00	5.00
Service quality	452	42.101	28.131	1.00	5.00
Academic performance	452	52.995	16.753	1.00	5.00

Source: Computed by Authors using Stata version 14, 2021

Table 6 presents the summary statistics for all the variables in the study. System quality has a mean value of 53.648 for all the establishments and the scores of its index do not deviate too far from the means. In other words, the standard deviation obtained was 19.16. A mean of 53.648 is considered good meaning the system quality at The University of Bamenda is fairly above average. Information quality has the highest mean value followed by system quality. Surprisingly, the mean value of the service quality as rated by students is below the average and therefore can be considered poor. The finding revealed that despite the achievement in information, system and academic quality a lot still needs to be done to upgrade to the grade of excellence in service quality. From the descriptive statistic, it can be inferred that the observation does not deviate too far from its means, and therefore the variables are reasonable, sound and convenient to be used for further investigation.

Table 7: Pearson Pairwise Correlations of the Variables of interest

Variables	Academicperf_n	Systemquality_n	Infoquality_n	Serquality_n
Academicperf_n	1.000			
Systemquality_n	-0.024	1.000		
Infoquality_n	0.226*	-0.060	1.000	
Serquality_n	0.188*	-0.033	0.848*	1.000

****** p<0.01, ** p<0.05, * p<0.1***

Source: Computed by Authors using Stata version 14, 2021

The result of the correlation analysis reveals that system quality has no significant relationship with students' academic performance. **Information quality on its part has a weak and positive relationship with students' academic performance, and this association is significant at 10%.** Service quality has a weak positive relationship with students' academic performance, and this association is significant at 10%.

The correlation analysis also reveals that information quality has no significant relationship with system quality, and that service quality has no significant relationship with system quality. However, service quality has a strong positive relationship with information quality in the order of 84.8%, and this association is significant at 10%.

Table 4.7: Cronbach Alpha

Index	Cronbach Alpha
normal systemquality **normal infoq** **normal serq** **normal academicperf**	0.58

Source: Computed by Authors using Stata version 14, 2021

The result of the scale reliability of the indexes as measured using the Cronbach Alpha revealed strong evidence of internal consistency as it is above the minimum cut-off criteria of 0.5 as recommended for the new index by Nunally and Bernstein (1994).

Table 8: Ordinary Least Square regression

Academic performance_n	*Coef.*	*St.Err.*	*t-value*	*p-value*	*[95% Conf*	*Interval]*	*Sig*
Sysquality_n	.352	.562	0.63	.544	-.886	1.589	
Infoquality_n	.155	.078	2.00	.046	.003	.308	**
Servquality_n	.021	.056	0.37	.708	-.09	.132	
Age: base less than 18							
18 – 20	2.851	.869	3.28	.022	.618	5.084	**
21 – 23	-3.735	.671	-5.57	.003	-5.46	-2.011	***
24 – 26	-.102	1.43	-0.07	.946	-3.777	3.574	
27 – 30	-2.227	1.15	-1.94	.111	-5.182	.728	
30+	-3.945	1.58	-2.50	.055	-8.005	.115	*
Gender : base Female							
Male	.788	1.593	0.50	.621	-2.342	3.919	
MS : base Single							
Married	-3.702	2.607	-1.42	.156	-8.826	1.421	
School : base FA							
HTTTC	-3.406	3.193	-1.07	.287	-9.683	2.87	
HTTC	-.637	3.319	-0.19	.848	-7.16	5.886	
COLTECH	-7.332	3.878	-1.89	.059	-14.955	.291	*
HICM	-6.276	4.068	-1.54	.124	-14.272	1.719	
HITL	-.774	3.665	-0.21	.833	-7.977	6.43	
NAPHI	-1.193	3.735	-0.32	.75	-8.534	6.148	
FED	3.478	1.418	2.45	.058	-.168	7.124	*
FHS	3.288	4.352	0.76	.45	-5.265	11.841	
FLPS	-4.957	4.206	-1.18	.239	-13.224	3.309	
FS	-9.998	3.564	-2.81	.005	-17.004	-2.993	***
FEMS	-5.368	3.832	-1.40	.162	-12.9	2.164	
Constant	40.827	9.383	4.35	0	22.385	59.268	***

Mean dependent var	3.000	SD dependent var	1.615
R-squared	0.629	Number of obs	452
F-test	2.744	Prob > F	0.001
Akaike crit. (AIC)	56.769	Bayesian crit. (BIC)	74.440

****** p<.01, ** p<.05, * p<.1***

The results in table 8 show that the coefficient for r-squared is 0.629 which indicates that the variables in the model account for 62.9% of the changes in the academic performance of students at The University of Bamenda. This, therefore, show that the variables fit the model as only 37.1% is accounted for by the variables not included in our model. The results also show that the p-value of F-statistic is 0.001 which indicates that the model is globally significant at 1%. Therefore, all the independent variables of LMS (system quality, service quality, information quality, and the control variables) have a joint significance on the academic performance of students at The University of Bamenda.

The results further show that system quality has a positive influence on the academic performance of students. This is indicated by its regression coefficient of 0.352. This shows that a unit increase in system quality will result in a 0.352 unit increase in the student's academic performance. Looking at the statistical significance, we observed that system quality is not significant since the p-value of 0.544 is greater than 10%. The insignificant relationship between system quality and the academic performance of the students permits us to accept the first hypothesis of this study according to which system quality has no significant influence on the academic performance of students at The University of Bamenda and we reject the alternative.

Information quality is one of the contributing factors to the academic performance of students at The University of Bamenda. The results show that its regression coefficient is 0.155 and a 1 unit increase in the level of information quality is capable of improving the academic performances of students at The University of Bamenda to the tune of 15.5%. It is also significant since the p-value of the t-test is 0.046 which is significant at a 5% level of significance. The significant positive influence of information quality on the academic performance of students at The University of Bamenda permits us to reject null hypothesis 2 in the study which stated that information quality has no significant influence on student's academic performance at The University of Bamenda.

The result equally shows that the coefficient of service quality is 0.021 which indicates that service quality has a positive effect on the academic performance of students at The University of Bamenda. This shows that a unit increase in service quality will result in a 0.021 unit increase in the academic performance of students at The University of Bamenda. Looking at the statistical significance, we observed that system quality is insignificant since the p-value of 0.708 is significant at a 1% level of significance. Therefore, the null hypothesis of no significant influence on service quality on the academic performance of students is accepted. This confirms the apriori expected sign which was also positive.

The results of age as a control variable also show that the average academic performance of the students within the age range 18 – 20 is higher than the academic performance of students below 18 years by 2.85 units and the results are statistically significant at 5%. Again, average academic performance within the age range of 21 to 23 years is lower than the academic performance of students below 18 years by 3.735 units. The results also show that the average -.102 is within the range of 24 to 26 years. The ranges 27 to 30 and 30+ also saw a decrease in performance of 2.227 and 3.945 respectively for students below 18 years.

Marital status was also used as one of the control variables. The results show that academic performance may be lower for married students as compared to single students, but the effect of marital status on students' academic performance is however

insignificant since the p-value of the associated t-statistic is greater than 10%. Also, the results reveal that gender is not a significant determinant of a student's academic performance since the p-value of the associated t-statistic is greater than 10%.

The results also indicate that the average academic performance of students in HTTTC, HTTC, COLTECH, HICM, HITL, NAPHI, FLPS, FS and FEMS is lower than the average academic performance of students in FA. However, this result is only significant for COLTECH, NAHPI and FLPS. On the other hand, the average academic performance in FED and FHS is higher than the academic performance at FA. The result is however only statistically significant for FED.

The result of the Bruesch-Pagan test shows no evidence of heteroskedasticity in the model therefore the model is homoscedastic. The model also shows no evidence of serial correlation as the null hypothesis of the VIF was accepted as the mean VIF was only slightly greater than the 2.5 cut-off criteria. The null hypothesis of the reset test for no model misspecification was also accepted, meaning the fitted model does not suffer from any form of misspecification.

Discussion of Findings

The results show that Learning Management System can influence students' academic performance at The University of Bamenda, Cameroon. This implies that many students can adopt the learning management system seeing that it is very useful in the teaching-learning process. This is because the p-value of F-statistic is 0.01 indicating that the model is globally significant at 1%. Therefore, all the independent variables of LMS (system quality, service quality, information quality and the control variables) have a joint significance on the academic performance of students at The University of Bamenda.

The results further show that system quality Learning Management System on students' academic performance at The University of Bamenda has a positive and insignificant influence on the academic performance of students. This implies that the system quality and service quality of the Learning Management System positively but insignificantly influence students' academic performance at The University of Bamenda.

The findings are in line with Ramayah *et al*. (2012) who found that e-learning developers and users need to ensure the availability of quality, relevant and complete information to meet the need of students to ensure academic performance without side-lining the importance of reliable and accessible system. If systems usage continuance intention is low because of students' academic performance, Learning Management System implementation is deemed unsuccessful in The University of Bamenda given the high investment costs involved in developing and maintaining the Learning Management System. Also, the findings tie in with Topper (2003) who investigated the relationship between his students' level of participation and their subsequent sense of learning and instructional quality in a graduate-level online course using the Blackboard LMS. The instructor found out that students posted online messages, but the online discussion did not mirror the deeply connected conversations he was used to in face-to-face contexts.

The findings equally show that service quality has a positive and insignificant influence on the academic performance of students at The University of Bamenda. This confirms the apriori expected sign which was also positive. This result is in line with the results of Nair and Patil (2012) who examined the impact LMS has on students and how

effectively LMS has influenced students in their academic activities. The result of the survey clearly showed the positive impact LMS has on students. Almoslamani and Yousef (2018) also carried out a study on the Effectiveness of student engagement using a learning management system in the blended learning environment at Saudi Electronic University and whose results indicated no statistically significant difference between genders regarding their online engagement. In addition, no significant relationship was found between students' grade point average and online discussion, audio discussion, and virtual lectures.

Information quality is one of the contributing factors to the academic performance of students at The University of Bamenda. It is also significant since the p-value of the t-test is 0.046 which is significant at a 5% level of significance. The significant positive influence of information quality on the academic performance of students at The University of Bamenda permits us to reject null hypothesis 2 in the study which stated that information quality has no significant influence on student's academic performance at The University of Bamenda.

However, it should be noted that most of these studies focus on examining the effectiveness of Learning Management Systems around the world. Very little attention has been directed toward the effect of LMS utilisation and students' performance. Even when these studies exist, they use merely descriptive approaches to examine this relationship without any rigorous econometric analysis of the linkage. Moreover, such studies are practically inexistent in the Cameroonian context. It is not unconnected with the study of Ramazan (2017) on the Learning Management System Acceptance Scale (LMSAS) whose findings showed that the scale developed in the study can be used as a tool that generates valid and reliable measurements of students' acceptance of learning management systems.

Conclusion

This study concluded that system quality, information quality and service quality can influence the learning management system on students' academic performance at The University of Bamenda, Cameroon. The information system is also found to be significant in affecting the academic performance of students. Furthermore, the control variable, the age of the students shows that age, therefore, has a significant role to play in the academic performance of students. The findings provided by the study may enable the developer of UBa learning management system to think seriously about these factors that will influence students' academic performance. It will further enable the developer to create strategies to enhance the learning management system by focusing on students' academic performance. Also, appropriate actions can be taken to increase students' perceptions of fully adopting the learning management system in UBa. There is a need for continuous research to improve this study and address its limitations. It is hoped that this study will give a preliminary insight and understanding of students' academic performance to maximise the actual use of the learning management system.

The study showed that all the variables had a positive and significant influence on students' academic performance. Considering the objectives of the study and the subsequent results, the study strongly recommends that government should speed up the E-National Higher Education Programme by rapidly completing the digital centre which will improve system quality accessibility and service quality attainability towards students.

The results show that service quality has an insignificant influence on academic performance. It is therefore recommended that the administration should keep on maintaining the quality of the platform to enable the students to continue using it to enrich their studies as this will further improve their performance.

Information quality also has a positive influence on students' performance at UBa. The researcher, therefore, recommends the operators of the system continue enhancing the quality of the information in this platform as this will be beneficial to all the stakeholders using the platform.

Also, the UBa administration should continue to sensitize students on the usefulness of the learning management system by organising more seminars and workshops on how to use the platform and also make the LMS manual accessible to all users especially students and lecturers for easy implementation.

Finally, the user of the learning management system (students) should invest more time in the LMS platform which will permit them to master the application of the system and obtain maximum efficiency in the learning process.

Future research can be carried out to improve the model by incorporating other relevant independent and dependent variables based on new findings from the latest literature at the time. It can also be expanded on different users' experiences on the influence of the learning management system at The University of Bamenda.

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