ACCEPTANCE AND USE OF ELEARNING MANAGEMENT SYSTEM IN MEDICAL SCHOOLS IN ETHIOPIA; THE CASE OF MEDICAL EDUCATORS IN AAU COLLEGE OF HEALTH SCIENCES AND SAINT PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE, ADDIS ABABA, ETHIOPIA

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This is to certify the thesis prepared by Dr. Temesgen Endalew Legesse entitled "Acceptance and use of elearning management system in medical schools in Ethiopia; the case of medical educators in AAU College of Health Sciences and Saint Paul's Hospital Millennium Medical College, Addis ababa, Ethiopia" and submitted in partial fulfillment of requirements for the degree of masters of Science in Health Sciences Education complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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ACRONYMS AND ABBREVIATIONS

AAU	Addis Ababa University
CHS	College of Health Sciences
eLMS	eLearning Management System
Moodle	Modular Object-Oriented Dynamic Learning Environment
PLS SEM	Partial Least Square – Structural Equation Modeling (PLS-SEM
UTAUT	Unified Theory of Acceptance and Use of Technology UTAUT
SPHMMC	St. Paul's Hospital Millennium Medical College
SPSS	Statistical Package for Social Science
TAM	Technology Adoption Model

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ABSTRACT

Background: The integration of eLearning Management System within Ethiopia's medical education sector is poorly documented, with limited research exploring its acceptance and use. Existing studies primarily focus on technology instructors and postgraduate medical students, with a significant gap concerning medical educators specifically. This absence of data creates challenges for stakeholders wishing to advance eLearning Management Sytems in Ethiopian medical schools.

Objective: The primary goal was to examine the acceptance and use of Moodle based eLearning Management System by medical educators in two medical schools in Ethiopia.

Methodology: In this study a self-administered questionnaire structured around the Technology Adoption Model. Faculty members from two medical schools constituted the study population, complemented by interviews with ICT Directors. The sample size was be calculated using a formula suitable for for already known number of medical educators in the institutions to be studied. SPSS version 29 and SmartPLS 4 was employed for descriptive analysis and Partial Least Square – Structural Equation Modeling (PLS-SEM). Reliability and validity tests ensured the credibility of the research findings.

Results: Perceived ease of use and perceived usefulness significantly determined behavioral intention to use eLM. Management support, incentive, training, and behavioral intention were major determinants of actual usage. Training, management support, and incentives contributed 37.65%, 13%, and 16.9% respectively, while behavioral intention accounted for 38.1% of eLMS usage.

Keywords: eLearning Management System, Technology Acceptance, Medical Education, Ethiopia, Medical Educators.

CHAPTER ONE: INTRODUCTION

1.1 Background

The progress in information technology has had an impact on every facet of an organization's operations. [1] In a comparable manner, technology has significantly revolutionized the education sector, surpassing the limitations of traditional organizational boundaries. [2]

Technology has had a significant impact on education through its influence on the distribution of educational materials and related aspects such as content management, learning management systems, and e-learning as a whole. [3]

E-learning refers to the process of "using computer technology to deliver training, including technology supported learning either online, offline, or both on the internet. It can include multimedia materials, virtual classrooms, webinars, and more. [1]

E-learning enables the dissemination of educational resources beyond the conventional classroom, establishing a captivating and dynamic learning atmosphere. E-learning, a highly promising educational strategy, involves the use of technology to facilitate learning. It encompasses web-based and mobile applications, as well as various learning techniques and processes. [22]

The methods and practices of education are changing to include more online, collaborative, and offline, computer-supported learning, which is an outcome of contemporary digital technologies. Students in higher education heavily depend on massive online educational platforms and engage in self-directed study using their own smart and mobile devices. In the 21st century, the utilization of eLearning technologies in higher education is essential. [4,10]

In the current educational environment, e-learning is crucial because it is revolutionizing the entire system and rising to the top of the academic discussion.[5] Jordan's universities have publicly embraced e-learning, with staff and students using a range of tech-based resources. Nonetheless, compared to institutions in other nations, higher education institutions in developing nations continue to implement e-learning technologies more slowly. [6]

This research was conducted to look into all of the main parts of the Technology Acceptance Model (TAM), including perceived usefulness (PU), perceived ease of use (PEOU), Behavioral intention to use (BEI), and actual usage (ACU). The focal point of this analysis was to scrutinize the acceptance and adoption of Moodle-based eLearning Management Systems (eLMS) among faculty members within the medical education sector, specifically across two distinguished medical schools. Through this in-depth examination, the study shed light on the extent to which these educational technologies are integrated into daily teaching practices, highlighting the overall perception and acceptance of such systems by medical educators.

1.2 Statement of the problem

For Ethiopian medical educators, understanding and addressing specific needs, perceptions, and acceptance levels of the LMS is crucial for its successful deployment. Investigating these aspects will be vital to fully leverage e-learning to meet Ethiopia’s medical education objectives effectively.

Nevertheless, the effectiveness of e-learning in low- and middle-income countries (LMICs) relies on the availability of enough human and physical resources in the institutions, which may not always be the case. The preparedness of institutions to accept e-learning guarantees that new tools are aligned with the educational and economic context. [21]

The future direction for Ethiopian medical education through e-learning involves a strategic approach that encompasses the development of robust digital infrastructure, the provision of comprehensive educator and learner training programs, and the adaptation of curricula to integrate e-learning methodologies seamlessly. Collaborative efforts with regional and global partners can also enhance the quality and reach of medical education, preparing Ethiopian medical professionals more effectively for the challenges and opportunities of the 21st century.

Moreover, the research has tried to identify the underlying factors that drive the acceptance of Moodle-based LMS, considering both the technological aspects and the unique context of medical education. By evaluating the role of perceived usefulness and ease of use, the study seeks to uncover how these critical TAM constructs influence educators' attitudes towards adopting LMS technologies in their teaching methodologies. Furthermore, the investigation extended to assess the behavioral intention to use and the actual use of LMS among medical educators, tried to provide insights into the gap between the willingness to adopt such technologies and their real-world application in medical education.

This in-depth look at the topic adds to what is already known about how technology is accepted in higher education. It also has useful implications for designing, implementing, and advertising LMS technologies that are specifically made to meet the needs of the medical education community. Through this comprehensive analysis, the paper aspires to offer valuable recommendations for enhancing the effectiveness of Moodle-based learning platforms, thereby facilitating a more seamless integration of digital technologies into the curriculum of medical schools.

In summary, the global and regional experiences with e-learning in medical education provide critical insights for Ethiopia as it seeks to enhance its medical training programs. By addressing

existing challenges and leveraging opportunities for innovation and collaboration, Ethiopia can set a new standard for medical education that is accessible, effective, and responsive to the needs of its healthcare system and population.

Despite the adoption of Moodle based LMS by both of these institutions, there has been a discernible lack of comprehension regarding faculty members' willingness to embrace these LMS. This disparity has significantly impacted the efficacy of these digital endeavors. There is also no adequate study conducted to investigate the attitudes, views, and degrees of approval that faculty members in Ethiopian medical education have towards Moodle base eLMS. The objective of this inquiry was to provide insights into tactics that can optimize the implementation of LMS, leading to an enhancement in the quality of medical education.

1.3Significances of the Study

There's a lack of comprehensive data and research on the status, acceptance, use, and implementation of Moodle based LMS in Ethiopia's medical education sector. Standard guidelines or frameworks for integrating LMS in medical education are not well established. The extent to which medical educators in Ethiopia utilize or implement Moodle base eLMS is unclear.

This study sought to investigate the future implementation and usage of this eLMS by faculty members in Ethiopian medical schools, focusing on two significant institutions in the nation's capital where there is better internet connectivity. The aim was to conduct a practical study on the aspects that affect educators' adoption and utilization of eLMS, considering the fast progress in information and communication technologies and their substantial influence on educational approaches globally.

According to Federal Ministry of Education elearning institutional elearning policy guideline, the future of e-learning in Ethiopia's higher education envisions a robust, inclusive, and high-quality digital education system supported by substantial government investment in ICT infrastructure, dedicated e-learning units, and collaborative efforts with various stakeholders. The focus will be on creating flexible, learner-centric programs that expand access and improve learning outcomes while ensuring quality, academic integrity, and technological advancement. [37]

The findings will be used to build targeted interventions that enhance medical education through the adoption of moodle based eLMS. Moreover, the results will enhance the scholarly discussion on the implementation of this affordable moodle based eLMS in developing nations, specifically in the realm of medical education in Ethiopia.

CHAPTER TWO: LITERATURE REVIEW

The integration of e-learning into medical education has seen a significant transformation globally, with the advent of the COVID-19 pandemic accelerating its adoption across continents, including Africa. [19,20] This global shift toward digital learning platforms represents an innovative leap in educational methodologies, aiming to enhance learning outcomes among diverse learner demographics across various educational settings. Notably, in clinical medicine education, e-learning employs an array of methodologies, such as multimedia platforms and case-based instruction, to impart essential knowledge and skills across numerous medical disciplines. The efficacy of these interventions in positively impacting student learning outcomes highlights e-learning's potential to augment traditional pedagogical approaches within medical education. [7]

In the African context, the adoption of e-learning in medical education has shown promising developments. For instance, experiences from the Kenya Medical Training College, which implemented a research course using the Moodle e-learning platform, underscore the feasibility and value of e-learning in enhancing medical students' understanding of research, despite challenges related to technological access, navigation, and the volume of learning content. The overall positive feedback from students and faculty points toward the effectiveness of e-learning as a supplementary resource in medical education within African settings, provided there is adequate support and resources. [8]

Ethiopia's journey toward integrating e-learning in medical education mirrors the broader experience across Africa, confronting both challenges and opportunities in leveraging digital education. The potential of e-learning to transcend traditional educational barriers is increasingly recognized, yet its successful implementation necessitates addressing several critical issues.

Infrastructure and technological challenges remain paramount, with the need for reliable internet access and adequate training for educators and learners to utilize e-learning platforms effectively [9].

The global narrative on e-learning in medical education, emphasizing its role in improving accessibility and quality of medical training, resonates with Ethiopia's educational aspirations. However, to harness e-learning's full potential, sharing experiences and best practices with institutions in similar contexts can offer invaluable insights. These exchanges can inform the development of effective e-learning strategies tailored to the unique needs of medical education and facilitate an enhanced learning experience for future medical professionals [12,13,14].

Although there are difficulties in integrating e-learning, the promise of this technology in improving medical education should not be underestimated [15]. LMS offer considerable potential for the advancement of medical education due to their flexibility, accessibility, and capacity to meet varied learning demands [16]. A comprehensive review emphasized that the effectiveness of e-learning interventions in clinical practice depends on careful evaluation of instructional and usability elements [17]. Moreover, it is essential to comprehend the specific circumstances in which e-learning is utilized, as well as the distinctive attributes of both learners and educators, in order to fully optimize its advantages [18]. Ultimately, this will result in more effective and efficient online learning experiences.

The use of eLMS in higher education is still in its infancy in the majority of Ethiopian universities, according to evidence that the country's academics and administrative staff are unaware of its advantages. [9] A study focused on e-learning acceptance and use by university teachers in Ethiopian technology institutes revealed that perceived use and usefulness significantly impact

teachers' intentions to use e-learning systems. [11] There was no adequate study done about medical educators and their acceptance and use of e-learning systems in Ethiopia.

The majority of the research that has been conducted in the country has been either associated with technological institutions, the perceptions of students, or e-learning in general. On the other hand, there is no research that has been conducted, especially on the perception and acceptance of the usage of Moodle-based learning management systems by medical educators. [21,9,11,23]

Several theoretical frameworks offer insights into the various elements that impact user adoption and interaction with technology. These frameworks are encompassed in the research scope of utilizing e-learning systems.

The Unified Theory of Acceptance and Use of Technology (UTAUT) is one of the best because it uses ideas from several acceptance models, such as TAM. It focuses on performance expectancy, effort expectancy, social influence, and facilitating conditions as the main factors that determine intention and behavior to use technology. It also considers the moderating effects of individual differences such as gender, age, experience, and voluntariness of use. [24]

The Technology Acceptance Model 2 (TAM2) is an enhanced version of the original TAM. It introduces additional variables such as subjective norm, image, job relevance, output quality, result demonstrability, voluntariness, and experience. These variables contribute to a more comprehensive evaluation of technology acceptance behaviors, alongside the two primary variables of perceived usefulness (PU) and perceived ease of use (PEOU). [25]

Professor Fred Davis created the Technology Acceptance Model (TAM) in the late 1980s, which was serve as the foundation for the current study's theoretical framework. [26] It was discovered

that the TAM is one of the most frequently used theoretical frameworks in research papers about e-learning. [27].

This study utilized the Technology Acceptance Model (TAM) as a foundational framework to investigate the factors influencing the acceptance and use of Moodle based eLMS by medical educators.

The Technology Acceptance Model (TAM) comprises various critical factors:

Perceived usefulness (PU) refers to the conviction that utilizing a specific technology will improve one's job performance. According to the findings of a number of studies [30,31], there is a positive correlation between the increase in performance and the actual use of online learning and the perceived usefulness and utilization of an e-learning system.

Perceived Ease of Use (PEOU) refers to an individual's perception of the level of effort required to use a specific system. This model suggests that if users perceive a system as easy to use, they will be more likely to adopt and use it. [29]

Behavioral Intention towards Using (BEI) refers to an individual's general emotional response to the act of using a technology. Research has indicated that individuals who regard a technology as both valuable and user-friendly are more inclined to embrace it compared to those who lack these attitudes. In addition, attitudes about technology usage often evolve as consumers become more acquainted with various features and technologies. [32]

Behavioral Intention to Use (BEI) is a metric that quantifies an individual's level of intention to utilize a technology and the extent to which perceived usefulness (PU) and perceived ease of use (PEOU) impact this intention. [32] In some earlier studies, the BEI was found to be dependent on

a variety of factors, including device connectivity, compatibility, memory or performance, network coverage, and speed. [33]

Actual use (AcU) refers to the measurement of the frequency at which the technology is utilized, taking into account its ease of use and efficacy, and it is highly influenced by BEI. [24]

Every component plays a vital role in comprehending how medical educators embrace and incorporate eLMS into their teaching methodologies. When it comes to user acceptance behavior, the most important ones are perceived ease of use (PEOU) and perceived usefulness (PU), both of which are directly related to them. [28]

Organizational factors play a crucial role in influencing the adoption of new technology. Management support, user training, and incentives are essential aspects that significantly influence the adoption of new technology within an institution. An incentive, such as a promotion, cash rewards, or a decrease in work load and time, plays a crucial role in persuading people to embrace and implement a new technology. Training facilitates the assimilation of a new technology by providing personnel with the necessary knowledge and abilities to utilize the technology proficiently and productively. [34]

The theoretical framework of technology acceptance

The aim of this study is to dissect the critical roles played by perceived usefulness (PU) and perceived ease of use (PEOU) in shaping educators' attitudes towards, intentions to use, and actual utilization of LMS in the medical education context. By looking at all of these concepts in depth, along with Behavioral Intention to Use (BEI), and Actual Use (ACU), this study made useful suggestions for putting educational technologies to good use in medical education and training. Furthermore, the study looked in to how organizational characteristics serve as determining constructs in the original TAM model. The importance of incentives, user training, and the support and commitment of management in implementing new technology in developing nations well acknowledged.

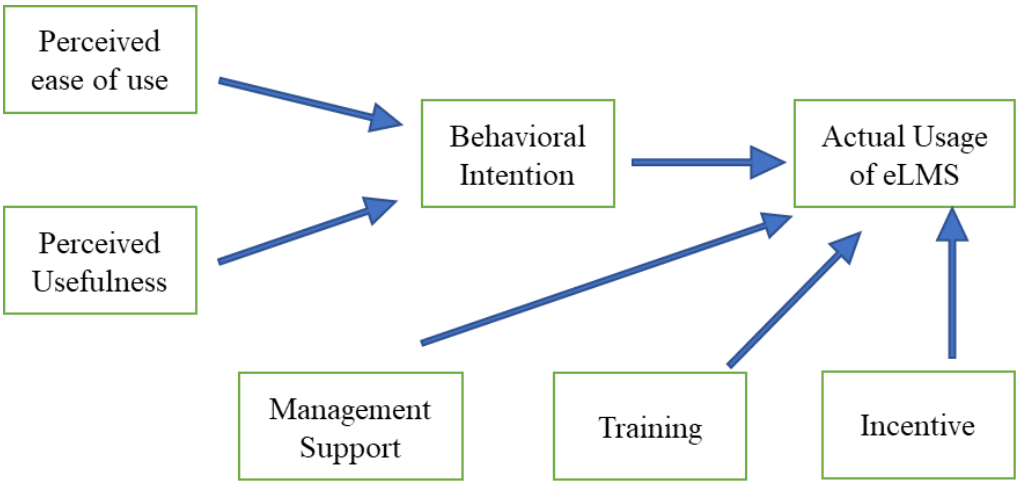

Fig. 1 Proposed Research Model

CHAPTER THREE: OBJECTIVES

3.1 General objective

- Examine the acceptance and use of Moodle based eLMS by medical educators at SPHMMC and AAU CHS medical schools.

3.2 Specific objectives:

- Determine the top key determinants of Moodle based eLMS acceptance
- Quantify the impact of identified determinants on the behavioral intention of medical educators to use eLMS, and correlate this behavioral intention with actual usage rate.
- Modify the Technology Acceptance Model (TAM) to include at least 3 key organizational factors, and assess their influence on eLMS usage
- Analyze the combined effect of determinants and organizational factors on the acceptance and implementation of eLMS

Research Hypothesis

The following six hypotheses are formulated to test the relationship between the dependent and independent constructs of the study.

- ✓ H1. Perceived usefulness positively affects behavioral intention to adopt eLMS
- ✓ H2. Perceived ease of use positively affects behavioral intention to adopt eLMS
- ✓ H3. Behavioral intention positively affects the actual usage of eLMS.
- ✓ H4. Management support positively affects the actual usage of eLMS.
- ✓ H5. Training positively affects the actual usage of eLMS.
- ✓ H6. Incentive positively affects the actual usage of eLMS

CHAPTER FOUR: METHODOLOGY

4.1 Study area

The focus of this study was on two prominent medical schools located in Addis Ababa, Ethiopia's capital. These are the School of Medicine at Addis Ababa University's College of Health Sciences and Saint Paul Hospital Millennium Medical College. The former is recognized as a leading institution in medical education and research within Ethiopia, known for its extensive range of both undergraduate and postgraduate medical programs. It boasts a rich curriculum, modern facilities, and a commitment to research and community outreach, positioning it as a key player in the advancement of healthcare education in Ethiopia.

Saint Paul Hospital Millennium Medical College, while newer compared to its counterpart, has rapidly emerged as a significant center for medical education and healthcare services. It sets itself apart by combining theoretical and practical medical training, underscoring this with cutting-edge teaching strategies and research initiatives. Through its affiliation with Saint Paul Hospital, the college offers practical experience in a hospital environment, enriching student learning and preparing them for medical profession challenges. Both institutions are pivotal in meeting Ethiopia's healthcare demands, contributing to the training of healthcare professionals dedicated to enhancing the country's health outcomes.

Addis Ababa University's College of Health Sciences, incorporating the School of Medicine, currently has a student population of 48,673, including 33,940 undergraduates, 13,000 graduates, and 1,733 PhD candidates. It employs 6,043 staff members, among whom 2,408 are academic and 3,635 are support staff. This reflects the university's vast educational and research capabilities. [35]

Saint Paul’s Hospital Millennium Medical College (SPHMMC) has made significant strides since

its inception in 2007, with the medical school launching in 2014 to alleviate Ethiopia's acute shortage of medical professionals. Currently, it employs over 2,800 staff across clinical, academic, and administrative roles and has an inpatient capacity of more than 700 beds. It attends to an average of 1,200 emergency and outpatient visits daily. The college is noted for its innovative integrated modular and hybrid problem-based curriculum, which extends into postgraduate education and broadens its undergraduate program scope. [36]

4.2 Study design

The study used a cross-sectional survey to evaluate the level of acceptance and usage of Moodle-based eLMS in medical education. The benefits of survey designs, such as their cost-effectiveness and efficient data collection process, was considered. This survey collected data at a specific moment to generalize based on a sample from a larger population.

4.4 Source population

The target population of the study were the medical educators (ME - Medical Educators) involved in teaching medical students and residents at these selected institutions. At the time of study, there were 1250 medical educators involved as teaching staff in both institutions.

4.5 Study population

The target population of the study were faculty members of two medical schools in Addis Ababa, Ethiopia. ICT directors of the selected medical schools were interviewed to support the survey method.

4.6 Inclusion criteria

All medical educators who have been involved in teaching medical students and residents in medical schools in the last 12 months.

4.7 Exclusion criteria

Instructors who are not actively involved in teaching medical students and haven't used anyform of eLearning to deliver

4.8.1 Dependent variable

- Acceptance of LMS

4.8.2 Independent variable

- ✓ Participants sociodemographic characteristics
- ✓ Perceived Usefulness
- ✓ Perceived Ease of Use
- ✓ Behavioral Intention
- ✓ Organizational Factors
    - Management Support
    - Incentives
    - Training

4.9 Sample size determination and sampling procedure

The target population were medical educators (Black Lion School of Medicine & SPHMMC). The size of the sample was determined using a formula that is appropriate for finite populations.

$$\text{no} = \frac{(z\alpha/2)^2 * p(1-p)}{\delta^2}$$

$$no = \left(\frac{z}{d}\right)^2 \times p(1-p) = \left(\frac{1.96}{0.05}\right)^2 \times 0.5 \times 0.5 = 384.16 \approx 385$$

The second part of the calculation adjusts the initial sample size to account for the finite population size (N), using the finite population correction factor:

$$n = \frac{no}{1 + \frac{(no-1)}{N}}$$

Applying the values:

$$n = \frac{385}{1 + \frac{384}{1250}} = \frac{385}{1.278} \approx 301.257 \approx 302$$

where N = 1250 total population, n = required sample size, α= 0.05= level of significant (type-I error), δ = 0.05 which is the margin of error, and P = 0.5 for sample proportion of Medical Educators.

So, the adjusted sample size considering the finite population size of 1250 staff is approximately 302. So, adding 10% none response rate to the above gave us final sample size of 336. Since both medical schools have approximately related number of medical educators it was equally split into two.

4.10 Data collection tool and procedure

The questionnaire was created using an online data collection form, which was distributed through a group email sent to the school of medicine and shared on social media groups for school medical educators. In addition to this some of the forms were physically filled by approaching medical educators in both schools randomly. Every online form submitted was meticulously reviewed to ensure that it is complete and accurately filled out according to the intended specifications. Contact information was provided on the form to facilitate prompt communication and response to any inquiries from participants. The IT directors of both institutions were contacted initially to help and ensure the efficient distribution of the questionnaire to instructors who teach medical students and residents.

4.11 Data processing and Analysis

The data collected was imported to Statistical package for social science (SPSS version 29) and it was used for the descriptive study. Further analysis was done using SmartPLS 4 software for the PLS-SEM (Partial Least Squares Structure Equation Modelling). Statistical techniques, including reliability and validity tests, was used to ensure the quality of the findings.

4.12 Ethical Consideration

An ethical clearance for the proposed study was obtained from the institutional review board of Addis Ababa University College of Health Sciences. Consent was obtained from each patient before proceeding to fill the questionnaires. Confidentiality of the information was maintained throughout the study and the data was used only for the purpose of the proposed study. Additionally, no personally identifiable data, including names, was used.

CHAPTER FIVE: RESULT

5.1 Socio-demographic characteristics

Out of a total sample size of 336, divided into two and randomly distributed among medical educators in two medical schools, 286 responded, resulting in a response rate of 85.12%. This response rate is acceptable making the non-response rate less than 15%. [34]

As shown in Table 1, the respondents from both medical schools are almost evenly split, with 51.1% from St. Paul Hospital Millennium Medical College and 48.9% from the AAU School of Medicine. Regarding academic status, 41.3% are Lecturers, 51.1% are Assistant Professors, 5.6% are Associate Professors, and 2.1% are Professors.

Table 1. Participants' Medical School and their Academic Status

Medical School	Academic Status				
	Lecturer	Assistant Professor	Associate Professor	Professor	Total
AAU	56	70	10	4	140 (48.9%)
SPHMMC	62	76	6	2	146 (51.1%)
Total	118 (41.3%	146 (51.1)	16 (5.6%)	6 (2.1%)	286 (100%)

According to the data, out of the total of 286 respondents, 44 (15.4%) were female and 242 (84.6%) were male. The results additionally indicated that a significant majority of respondents (73.2%) were young adults, specifically individuals who were under the age of 40.

Table 2. Years of Experience and Awareness Levels of Moodle-Based eLMS Implementation

Experience	Level of Awareness			
	Awared	Awared to some Extent	Not Awared	Total
< 5	34	2	6	42 (14.7)
6 - 10	123	22	24	169 (59.1%)
11 - 15	50	6	6	62 (21.7%)
16 - 20	1	4	4	9 (3.1%)
>20	0	0	4	4 (1.4%)
Total	208 (72.7%)	34 (11.9%)	44 (15.4%)	286 (100%)

14.7% of respondents in this study had less than five years of experience teaching, followed by 59.1% with six to ten years and 21.7% with eleven to fifteen years. 289 (81.2%) of the respondents were in the majority and knew that their institute had moodle based eLMS implemented.

Of the respondents, 208 (72.7%) were well-informed, and 34 (11.9%) were somewhat aware that eLMS existed. Table 2 indicates that 44 additional respondents, or 15.4%, had no knowledge whatsoever concerning the presence and significance of e-learning systems in their institution.

The survey also revealed that management's emails and notifications, as well as meetings, were the main ways that employees learned about eLMS. (54.55%), the surrounding enabling conditions (37.76%), and information from friends and colleagues (33.55%) came next.

5.2 eLMS acceptance and use in AAU and SPHMMC

The factors influencing eLMS acceptance and usage at two prestigious medical schools; Addis Ababa University's Black Lion School of Medicine and St. Paul Hopital Millennium Medical College have been determined through the application of the partial least square structural equation modeling (PLS-SEM) technique. Medical educators' behavioral intention to use e-learning systems was thought to be influenced by their perceptions of the eLMS' perceived usefulness and ease of

use. The basic TAM model features were combined with organizational characteristics, such as management support, incentive, and user training, to explain actual usage. [11]

Construct reliability and validity

Table 3. Construct Reliability and Validity Metrics for TAM Model Features and Organizational Characteristics

	Cronbach's alpha	Composite reliability (rho_a)	Average variance extracted (AVE)
Actual Usage	0.902	0.917	0.771
Behavioral Intention	0.869	0.919	0.628
Incentive	0.898	0.946	0.761
Management Support	0.937	0.959	0.765
Perceived Usefulness	0.868	0.995	0.701
Perceived ease of Use	0.873	0.979	0.712
Training	0.904	0.918	0.841

Cronbach's Alpha is a metric that assesses the internal consistency or reliability of a collection of scale or test items. The degree of similarity between a collection of items is evaluated. A Cronbach's Alpha value that is typically greater than 0.7 suggests that the items are internally consistent, which implies that they measure the same fundamental concept. It is extensively employed in the social sciences, psychometrics, and other disciplines to guarantee the reliability of tests, questionnaires, and surveys. [39]

The internal consistency of a construct in a measurement model is evaluated using composite reliability. ρa\rho_aρa (Dijkstra-Henseler's rho) is known to provide a more precise estimation of reliability, particularly in cases where the loadings of the indicators are inconsistent or the samples are small. It is the preferred method in PLS-SEM (Partial Least Squares Structural Equation Modeling) because it corrects for the assumption that all indicators are equally reliable. [40]

The composite reliability measures and Cronbach's Alpha coefficient of each construct exceeded the minimum threshold value of 0.60. [39] Table 3 indicates that the responses to the main constructs of the structural model were highly consistent (perceived usefulness=0.868, perceived ease of use =0.873, Management Support = 0.937, Incentive = 0.898, behavioral intention=0.868, actual usage=0.902, and Training = 0.904).

The average variance extracted (AVE) is a metric that assesses the convergent and divergent validity of latent variables by measuring the average communality. According to Cheung, G.W et al, the model's adequacy was guaranteed by the fact that the average variance extracted (AVE) values for all constructs were greater than the cutoff (0.50).

Fornell–Larcker criterion

The Fornell–Larcker criterion is a method used to evaluate discriminant validity in structural equation modeling. It states that the square root of the Average Variance Extracted (AVE) of each construct should be greater than the highest correlation with any other construct. This ensures that a construct shares more variance with its indicators than with other constructs. The cut-off points for good discriminant validity, according to the Fornell-Larcker criterion, is that the square root of the Average Variance Extracted (AVE) of each construct should be greater than the highest correlation with any other construct. Typically, an AVE value of 0.50 or higher up to 0.90 is considered acceptable, meaning that the construct explains more than half of the variance of its indicators. [41]

The top numbers in any of the factor columns were higher than correlations below it indicating that the model was good, as shown in Table 4.

Table 4. Fornell–Larcker Criterion: Discriminant Validity Assessment Through AVE and Construct Correlations

	Actual Usage	Behavioral Intention	Incentive	Management Support	Perceived Usefulness	Perceived ease of Use	Training
Actual Usage	0.878						
Behavioral Intention	0.789	0.793					
Incentive	0.790	0.556	0.872				
Management Support	0.684	0.615	0.567	0.875			
Perceived Usefulness	0.763	0.487	0.585	0.485	0.837		
Perceived ease of Use	0.616	0.560	0.773	0.789	0.516	0.844	
Training	0.852	0.650	0.862	0.595	0.547	0.689	0.917

Heterotrait–Monotrait ratio (HTMT)

Another method of measuring discriminant validity is heterotrait–monotrait ratio (HTMT). The Heterotrait-Monotrait Ratio (HTMT) is a measure used to assess discriminant validity in structural equation modeling (SEM). Discriminant validity ensures that constructs that are supposed to be distinct are indeed distinct. HTMT is specifically designed to evaluate whether the correlations between different constructs (heterotrait) are smaller than the correlations within the same construct (monotrait). It measures the ratio of the average correlations between constructs (heterotrait-heteromethod correlations) to the geometric mean of the average correlations within the same construct (monotrait heteromethod correlations). HTMT values below 0.85 indicate good discriminant validity, while values below 0.90 may be acceptable in some contexts, particularly in social sciences. [42]

The HTMT values indicate mostly good discriminant validity across constructs, with few values approaching the upper acceptable threshold. This suggests the constructs are distinct but related in

a meaningful way, which is typically desirable in structural models assessing complex behaviors and attitudes. The values in Table 5 ensured discriminant validity.

Table 5. Heterotrait–Monotrait (HTMT) Ratios for Assessing Discriminant Validity Across Constructs

	Actual Usage	Behavioral Intention	Incentive	Management Support	Perceived Usefulness	Perceived ease of Use
Actual Usage						
Behavioral Intention	0.745					
Incentive	0.819	0.482				
Management Support	0.696	0.545	0.581			
Perceived Usefulness	0.805	0.453	0.580	0.510		
Perceived ease of Use	0.634	0.470	0.785	0.837	0.593	
Training	0.840	0.631	0.841	0.623	0.594	0.718

R-squared, also known as the coefficient of determination, is a statistical measure used to assess the goodness of fit of a model. It quantifies the proportion of the variance in the dependent variable that is predictable from the independent variables. In essence, R-squared shows how well the data fit the regression model (the closer the value is to 1, the better the fit).

Chin et al, suggests thresholds for interpreting R-squared values: values above 0.67 are considered substantial, reflecting a strong effect size; values between 0.33 and 0.67 are deemed moderate; and values below 0.33 are regarded as weak. [43] In the case of the study model with an R-squared of 0.847, it falls into the substantial category, indicating a strong explanatory power.

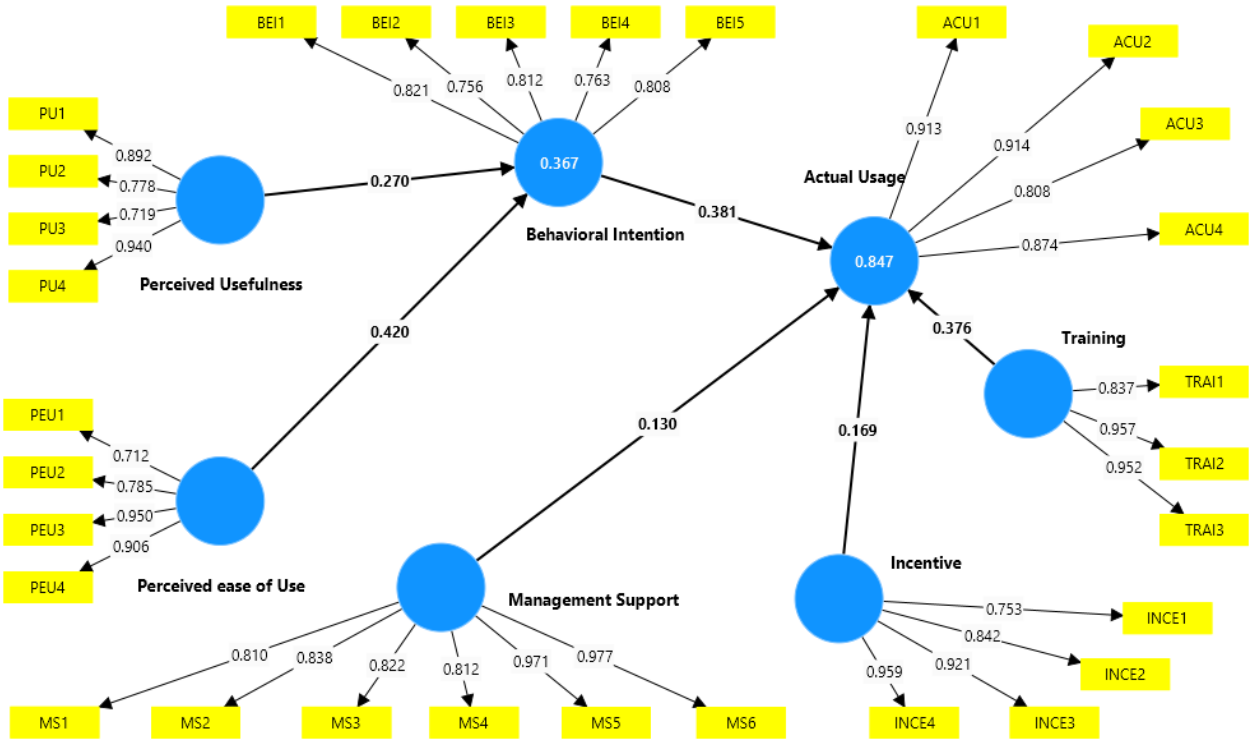

Figure 2. PLS – SEM Model

Additionally, the T-statistic is another critical measure used alongside the R-squared to determine the model's statistical significance. The T-statistic tests the null hypothesis that a parameter is equal to zero (no effect). A higher T-value indicates that it is less likely the observed result is due to chance, thus affirming the model's validity. In statistical testing, a T-statistic greater than 1.96 (assuming a 95% confidence interval) suggests a significant effect. Coupled with a P-value less than 0.05, as noted in the study, it confirms the significance of the R-squared value. These statistics validate that the model reliably predicts the dependent variable and that the results are statistically significant, as detailed in Table 6 of the study.

Table 6. Model Fit Statistics: R-Square, T-Values, and P-Values

	R- Square	T- Values	P - Values
Actual Usage	0.847	8.59	0.000

Behavioral Intention	0.367	13.74	0.000

Path Coefficients

Table 7. Path Coefficients, T-Statistics, and P-Values for Variable Relationships

	Path Coefficient	T statistics	P values
Behavioral Intention -> Actual Usage	0.381	13.831	0.000
Incentive -> Actual Usage	0.169	3.259	0.001
Management Support -> Actual Usage	0.130	4.097	0.000
Perceived Usefulness -> Behavioral Intention	0.270	8.294	0.000
Perceived ease of Use -> Behavioral Intention	0.420	19.108	0.000
Training -> Actual Usage	0.376	7.079	0.000

Behavioral intention was determined by perceived ease of use and perceived usefulness. Management support, incentive, training, and behavioral intention were all substantial determinants of actual usage of eLMS.

The T statistics and P values of all path coefficients revealed that they were significant factors. Behavioral intentions to use were positively influenced by perceived usefulness. The perceived efficacy construct was the reason for medical educators' propensity to use the eLMS, as indicated by the positive path coefficient of 0.270. This suggests that behavioral intention was solely influenced by perceived usefulness, which accounted for 27% of the variable. This suggests that behavioral intention to use eLMS is significantly influenced by its perceived usefulness. Consequently, the hypothesis was accepted.

The behavioral intentions for using eLMS were positively influenced by the perceived ease of use. The perceived ease of use construct was one of the the reasons for medical educators' inclination to use eLMS, as indicated by the positive path coefficient of 0.420. This suggests that behavioral intention was influenced by perceived ease of use, which accounted for 42% of the variable. The behavioral intention to use eLMS is significantly influenced by the perceived ease of use. Therefore, the hypothesis was accepted.

The usage of eLMS is positively influenced by behavioral intention. The behavioral intention construct substantially influenced the actual usage of eLMS, as evidenced by a positive path coefficient of 0.381. This suggests that 38.1% of the actual usage of eLMS was influenced by behavioral intention to use. This renders behavioral intention an essential indicator in the determination of eLMS usage making the hypothesis accepted.

The support from management had a favorable impact on the actual usage of the eLMS. The path coefficient of 0.130 indicates that management support has a considerable impact on the actual usage patterns of eLMS. The usage of eLMS has been attributed to a 13% contribution from management support. Therefore, it can be inferred that the backing of management is a vital factor in determining the extent to which eLMS is utilized. Thus, the hypothesis was deemed valid.

Training had a favorable impact on the usage behavior of eLMS. The training construct had a positive path coefficient of 0.376, indicating a considerable contribution to the actual usage of eLMS. The training had a significant 37.65% impact on actual usage of eLMS. This suggests that the level of training has a substantial impact on the extent to which eLMS is used by the medical educators in the study medical schools. Thus, the hypothesis was accepted.

Incentives have had a positive effect on the actual of eLMS. The path coefficient of 0.169 indicates that the incentive had a significant effect on the actual usage of eLMS. The contribution of incentive

to the actual use of eLMS amounts to 16.9%. This suggests that incentive plays a crucial role in determining the extent to which eLMS is used. Therefore, the hypothesis was deemed acceptable.

CHAPTER SIX: DISCUSSION

This study represents a pioneering effort to investigate the acceptance and usage of the Moodle-based eLearning Management System (eLMS) in Ethiopian medical schools. Since the onset of the COVID-19 pandemic, the adoption of eLearning has surged globally. However, in Ethiopia, the integration of eLearning in higher education remains nascent and significantly underutilized, particularly in medical education. This research provides crucial insights into the acceptance levels of Moodle-based eLMS among medical educators in Ethiopia.

Previous studies have explored eLearning readiness and acceptance among postgraduate healthcare students and examined the level of acceptance towards educational technology among faculty members in higher education institutions in Ethiopia. These studies have also investigated eLearning acceptance in technical universities. However, none of these studies have specifically focused on the acceptance and usage of the Moodle-based eLearning Management System (eLMS). Instead, they have generally addressed the acceptance of eLearning technologies as a broad category without delving into the specificities of Moodle-based platforms. [11, 23, 44]

The findings from this study revealed that a majority of respondents (59.1%) had 6-10 years of teaching experience, with substantial awareness of Moodle-based eLMS (72.7% fully aware, 11.9% somewhat aware). These results are consistent with studies conducted in Ethiopian technology universities, where 81.2% of respondents were aware of the existence of eLearning systems in their institutions. The high level of awareness observed in this study is indicative of the correlation between awareness and usage levels of eLearning systems. [11, 45]

In the Study only 15.4% of respondents were unaware of the eLMS, highlighting areas for potential improvement in communication and training.

The study found that the main channels for learning about eLMS included management communications (54.55%), enabling conditions (37.76%), and information from colleagues (33.55%). This contrasts with findings from teachers in technology universities in Ethiopia, where the primary source of information was colleagues, accounting for about 46%. [11] The increased role of management communications in the current study suggests a growing management interest in eLearning implementation in medical schools, reflecting a more interest in approach to disseminating information about eLMS.

Factors influencing eLMS acceptance were examined using PLS-SEM, revealing that perceived usefulness and ease of use significantly affect behavioral intention. This finding aligns with the results from studies on teachers in technology universities. Additionally, organizational factors such as management support, incentives, and training were crucial in determining actual usage. The primary difference noted was that incentives did not positively affect actual usage in technology universities, whereas they did in the current study. [11]

CHAPTER SEVEN: LIMITATION OF THE STUDY

Even though the study was conducted with a great deal of effort, it has some limitations regarding the use of Moodle-based eLMS. It was focused on two medical schools in the capital city, which likely have better internet and technology infrastructure than other regions. The small sample size may also limit the generalizability of the results. Additionally, the study was primarily quantitative, which might not capture the full range of user experiences and challenges. Despite these factors, the findings provide valuable insights into eLMS usage in these institutions.

CHAPTER EIGHT: CONCLUSION & RECOMMENDATION

Conclusion

It is necessary to assess the acceptance and utilization of eLMS in Medical Schools in order to guarantee its successful deployment in medical education. Hence, the initial step towards optimizing the efficiency and effectiveness of systems is to identify the primary determining factors that influence the intention to use and actual usage behaviors.

The TAM model's components, namely perceived ease of use and perceived usefulness, were found to influence the behavioral intention of medical educators to use eLMS. The findings revealed that the perceived ease of use (42%) and perceived usefulness (27%) of eLMS had made substantial contributions to the behavioral intention of Medical Educators to use it. Furthermore, behavioral intention (38.1%) has demonstrated a significant effect on the actual utilization of eLMS.

The original TAM model was expanded to include organizational elements such as management support, incentives, and user training in order to accurately reflect the utilization of eLMS among Medical instructors in both Medical Schools. The outcome revealed that the combination of training and incentive factors accounted for 54.6% of the usage of the eLMS. Similarly, management support was a major component, albeit it had the least beneficial impact among the constructs, accounting for only 13% of the explanation for medical educators' actual usage behavior.

Recommendation

To ensure the successful deployment and utilization of eLMS in medical schools, stakeholders must focus on enhancing the perceived usefulness and ease of use of the system. Additionally, providing strong management support, comprehensive training, and effective incentives will significantly increase the likelihood of widespread adoption and effective usage of eLMS. Regular monitoring

and responsive technical support are also critical to maintaining and improving the system's effectiveness.

- It is crucial to enhance the perceived usefulness of the eLMS by providing clear examples and case studies that showcase its benefits and successful outcomes in medical education.
- Medical school administrators should focus on strengthening management support by demonstrating a commitment to the eLMS through providing resources, regular updates, and recognizing educators who effectively use the system.
- Providing comprehensive training programs and workshops is also essential to ensure educators are proficient in using the eLMS.
- Policymakers and educational authorities are recommended to incentivize eLMS adoption by developing incentive programs such as grants, awards, or professional development credits for educators who actively use and promote the system.
- Furthermore, regularly monitoring and evaluating the usage and effectiveness of the eLMS through surveys, feedback, and performance metrics will help identify areas for improvement and ensure the system meets educational needs.
- For IT and support teams, providing accessible and responsive technical support to resolve any issues promptly is crucial.

Finally, it is essential to extend the research to include all medical schools in the country and increase the sample size for more comprehensive results. Additionally, future studies should incorporate medical students alongside medical educators, apply different models, and explore various perspectives to gain a more holistic understanding of the factors influencing eLMS usage.

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ANNEXES

ANNEX I: CONSENT FORM AND SURVEY GUIDE

Information for Participants

Greetings, I'm Dr Temesgen Endalew and doing a study on "ACCEPTANCE AND USE OF ELEARNING MANAGEMENT SYSTEM IN MEDICAL SCHOOLS IN ETHIOPIA; THE CASE OF MEDICAL EDUCATORS IN SCHOOL OF MEDICINE, AAU COLLEGE OF HEALTH SCIENCES AND SPHMMC, ADDIS ABABA, ETHIOPIA" I would like to ask you some questions about your personal background and your personal thought about eLearning management system. All information you are giving is confidential. No individual response will be reported & confidentiality will be kept. It is your full right to participate or refuse in the study. But your honest participation will have a great contribution. If there is anything that require clarification, please don't hesitate to ask.

Contact info:

temesgen.endalew@sphmmc.edu.et or +251911094126

Will you be willing to participate? 1. Yes 2. No *(This is set up as a checkpoint, marked as a confirmation of consent before proceeding, on the online version).*

Signature: _____ Date: _____

Thank you for collaboration!

QUESTIONNAIRE

Section 1: Demographics (Please tick the appropriate option)

1. Institution Name: AAU / SPHMMC
2. Department:
3. Gender: Male | Female
4. Age Group: 21-30 | 31-40 | 41-50 | 51-60 | >60
5. Highest Educational Attainment: Bachelor's | Master's | PhD
6. Academic Position: Below Lecturer | Lecturer | Assistant Professor | Associate Professor | Professor
7. Teaching Experience at this Institution: <5 | 6-10 | 11-15 | 16-20 | >20 years
8. Do you possess basic computer and internet usage skills? Yes | Somewhat | No
9. Are you aware of the eLMS implemented at your institution? Yes | Somewhat | No
10. Do you utilize the eLMS provided by your institution? Regularly | Occasionally | Never
11. Do you believe you have the necessary skills to effectively use eLMS? Yes | Somewhat | No
12. How would you assess your understanding of eLMS? Low | Medium | High

Section 2: Attitudes and Perceptions Towards E-Learning Management System

Please indicate your level of agreement with the following statements:

Please mark your level of agreement: 1=Strongly Disagree | 2=Disagree | 3=Somewhat Disagree | 4=Undecided | 5=Somewhat Agree | 6=Agree | 7=Strongly Agree

Perceived Usefulness of E-Learning Management System

1. Utilizing eLMS allows for quicker task completion.
2. My teaching performance is enhanced by eLMS.
3. eLMS simplify teaching course contents.

4. My teaching productivity is increased with eLMS.
5. eLMS boosts my effectiveness in teaching.

Perceived Ease of Use of E-learning management system

1. Learning to use the eLMS is straightforward.
2. Operating the eLMS to perform desired tasks is easy.
3. Interacting with the eLMS clear and comprehensible.
4. Becoming proficient in using the eLMS is easy.
5. The eLMS is user-friendly.

Support for eLMS from Top Management

1. Top management is actively involved with the eLMS function.
2. eLMS is of interest to top management.
3. The importance of eLMS is understood by top management.
4. Top management supports and encourages the use of eLMS.
5. E-learning is regarded as a strategic resource by top management.
6. Top management is aware of opportunities presented by eLMS.
7. There is a continuous push from top management for the use of eLMS.

Support for E-Learning Management Systems from Mid and Lower-Level Managers

1. Mid and lower-level managers are actively involved with eLMS.
2. eLMS functions interest mid and lower-level managers.
3. The significance of eLMS is understood by mid and lower-level managers.
4. Mid and lower-level managers support and motivate the use of E-learning management system.
5. eLMS is considered a strategic resource by mid and lower-level managers.

6. Mid and lower-level managers are aware of eLMS opportunities.
7. Mid and lower-level managers persistently encourage the use of eLMS.

Incentives for Using E-Learning Management System

1. My workload is reduced when I employ the eLMS.
2. Financial incentives are provided for using the eLMS.
3. Using the eLMS results in institutional recognition.
4. Continued use of the eLMS brings rewards.

Training for Using E-Learning Management Systems

1. Training on eLMS usage is offered every semester.
2. Adequate training motivates my use of E-learning management system.
3. Training assistance is available upon request.
4. Access to high-quality user manuals for the eLMS is easy.

Intention to Use eLMS in the Future

1. I plan to continue using eLMS.
2. I foresee my use of eLMS increasing.
3. I am determined to employ eLMS moving forward.
4. The use of eLMS will be a necessity for me.
5. I am already an active user of eLMS.

Actual Usage of E-Learning Management System

1. I enjoy engaging with the eLMS.
2. The eLMS make my work more interesting.
3. Once I begin using eLMS, stopping is difficult.
4. Using the eLMS is educational.

5. I spend a significant amount of time with the eLMS.
6. I interact with the eLMS at least once a week for my courses.

Perceived Benefits from Using E-Learning Management System

1. I employ eLMS so that students can access a wide range of learning resources.
2. I utilize eLMS to stay updated in my teaching field.
3. eLMS help me maintain a competitive edge in my professional endeavors.
4. Adopting eLMS has reduced my costs for printing and photocopies.
5. eLMS enable me to share knowledge effectively with peers and students.
6. eLMS have been instrumental in enhancing my productivity.
7. The interactive and contemporary teaching methods are facilitated by eLMS.

Awareness of eLMS Availability

1. Information about eLMS was conveyed by management during meetings or through emails/notifications.
2. The availability of eLMS became known to me due to facilitating conditions provided.
3. I learned about eLMS from the university's website.
4. Colleagues and friends were the source of my awareness regarding eLMS.