



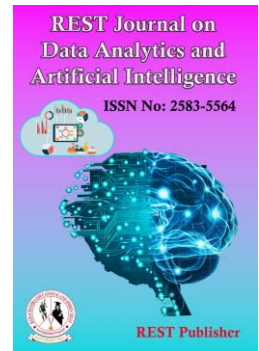
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Learning Management Systems Evaluation Using Frizzy DEMATEL

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Abstract. *E-learning is the process of learning through digital instruments. One of the most common tools is distance learning, followed by learning management systems. However, hybrid interactions and partnerships are reshaping the world of online learning. The emergence of social networking and online learning groups, the widespread use of smartphones, and a growing understanding of the potential for computer games to revolutionize learning are recent developments. Other significant breakthroughs include improvements in Intelligent Tutoring Systems, the free Open Educational Resources movement, and the development of immersive environments that let users interact with virtual worlds and enhance their perception of the physical world through technology.*

1. INTRODUCTION

Teachers and students have access to an online classroom using learning management systems (LMS), which promotes learning procedures. Learning Management Systems (LMS) support teachers and students in the learning process in virtual classroom settings. With intervening mechanisms that encourage online collaborative-groupings, professional training, discussions, and communication among other LMS users, a typical LMS promotes an inclusive learning environment for academic development (Dias & Dinis, 2014; Jung & Huh, 2019; Oakes, 2002). According to Nasser, Cherif, and Romanowski (2011), the use of an LMS gives online learners reliable information about their performance. Independent learning is made possible for online students by using LMSs (Blau & Hameiri, 2010; Nasser et al., 2011; Strayhorn, 2010; Wood et al., 2011). As long as online users use an LMS to track their development, learner engagement can be sustained (Al-Fraihat, Joy, Masa'deh, & Sinclair, 2020; Selwyn, Hadjithoma-Garstka S, & Clark, 2011). Computer designers dating back to the 1950s believed in applying an LMS for educational purposes as conceivable and necessary (Watson & Watson, 2012). There were different strategies for using an LMS as an educational resource with multiple vocabulary words that relate to computer use (Kehrwald & Parker, 2019). Through time, the technology and tools which support online learning structures were progressing since the advent of online learning in the mid to late 1990s (Kehrwald & Parker, 2019). (Kehrwald & Parker, 2019). LMS compositions include a range of communication and media resources, and encouragement of learner choice (Kehrwald & Parker, 2019).

2. HISTORY AND DEFINITION OF LMS

As general terms to describe the historical adoption of computers, Watson and Watson (2012) list computer-based instruction (CBI), computer-assisted instruction (CAI), and computer-assisted learning (CAL). Computer application programmes, instruction, and design planning all fall under these terms. The terms can also be used to describe observing, approving, and disseminating information (see Appendix for the key terms and definitions). An LMS functions as a framework to capture various layers of progressive learning and has multiple online operations (Jung & Huh, 2019; Kuosa et al., 2016; Oakes, 2002; Watson & Watson, 2012). An LMS functions as a platform to manage and disseminate educational content (Watson & Watson, 2012). LMS functions include promoting specially designed information for capturing learner progress in meeting expectations (Oakes, 2002; Watson & Watson, 2012). An LMS platform cultivates an environment for engagement and learner achievement, allowing learners to register for classes, track their grades, and check updates and course announcements (Al-Fraihat et al., 2020; Oakes, 2002; Watson &

Watson, 2012). An LMS offers users a beneficial learning environment where they can absorb various elements of systematic applications (Jung & Huh, 2019; Watson & Watson, 2012). Users of computers can access non-traditional operations in educational settings, and many of them may have access to applications that use difficult-to-understand acronyms and non-traditional terms (Kuosa et al. 2016; Watson & Watson, 2012). Users might not comprehend which interpretations are appropriate to employ as a result; it is crucial to distinguish an LMS from related technologies (Watson & Watson, 2012).

3. COURSE MANAGEMENT SYSTEM

An assortment of operational tools that organise online interactions are made available to users through a course management system (CMS) (Evolving Technologies Committee [ETC], 2003; Jung & Huh, 2019; Watson & Watson, 2012). It offers a method for controlling data in a central area (Jung & Huh, 2019; Watson & Watson, 2012). CMSs offer online and blended learning courses where users can access folders of course materials, along with tools and other materials that contain essential course information. Examples include checking progress, tracking grades, and communicative platforms for group discussions, chats, and posting information (Watson & Watson, 2012). While CMSs and LMSs have some features in common, a CMS focuses on managing and producing educational content, whereas an LMS offers a comprehensive training platform that facilitates online courses and keeps track of students' course completion and test results (Jung and Huh, 2019; Watson and Watson, 2012).

4. MATERIALS AND METHODS

Learning Management Systems (LMS) and Challenges: LMS refers to the use of web-based technologies for gathering and sharing knowledge [27]. Additionally, it is described as a device that offers an e-learning podium and makes use of extranet, intranet, and internet networks to disseminate learning materials and support other administrative tasks associated with teaching and learning [28,29]. Additionally, LMS allow students to customise the learning process to meet their individual needs and develop their own teaching rhythm. Moreover, LMS help teachers deliver lesson plans, track student progress, and give students access to learning resources for their online education [30]. Dias [2] and Ghazal [31] both cite expediency and suppleness as two of the LMS's most important qualities. Though LMS offers many opportunities and benefits to education stakeholders around the world, it is also important to look at the problems and difficulties that come with its deployment, acceptance, use, and management [32], particularly in developing countries like those in Africa where colleges and universities were shut down entirely as a result of school closures brought on by the COVID-19 pandemic [20]. Moreover, Garca [33] investigated the elements influencing LMS adoption and use in developing Caribbean countries. The authors discovered that the main obstacles to LMS deployment and use in Caribbean English-speaking countries are people's social norms, restricted access to computers, and system availability. The authors made the case that these elements had a major impact on perceived value and perceived usability, which in turn affected LMS adoption and growth. Similar to El-Masri [34], who discovered that in most developing countries but not in advanced ones, societal impact and effort expectation are the key factors influencing LMS growth.

Artificial Intelligence (AI) Techniques: The most common empirical models used to measure factors influencing the development of eLearning technologies (LMS) in both developed and developing countries include covariance, least square, and partial least square structural equation modelling, to name a few. Unfortunately, predictions made using these methods can occasionally yield inaccurate, unreliable findings, time-consuming and biased [36,37]. As a result, it is necessary to use AI techniques like SVM, GPR, ANN, and BRT to get beyond the constraints of the traditional models [23]. These methods give researchers in the engineering, scientific, and social sciences the chance to validate their study models [38]. Moreover, Mohamadnejad [39] suggested that AI methods had demonstrated superior performance in studies. Similar to Yang [40], who stressed the significance of AI techniques for complicated nature research like studying people's attitudes, actions, and emotions due to its robustness, flexibility, and generalisation skills in terms of predictions. Due to this, four AI-based techniques—namely, SVM, GPR, ANN, and BRT—were used in this work in order to produce a reliable and accurate prediction of LMS determinants in Nigeria.

Technology Acceptance and Adoption Models in eLearning: Many studies have been conducted recently using various fictitious models to gain a thorough understanding of the factors that influence users' adoption, use, and continued usage of technology. These models include the "Technology Acceptance Model" (TAM) by Davis [41], the "Information Systems Success" (D&M Model) model revised by Delone [42], the "Unified Theory of Acceptance and Use of Technology" (UTAUT2) model updated by Venkatesh [43], the "Innovation Diffusion Theory" (IDT) for IT adoption reviewed by Zhang [44], the "Theory of Planned Behavior" (TPB) model revised by Smith (TRA). In order to investigate factors that influence the adoption and use of learning management systems (LMS) in developing countries, particularly in Nigeria where colleges and universities were shut down entirely due to the COVID-19 pandemic, this research uses the constructs from three of these models (i.e., D&M, UTAUT2, and TAM) and recommendations from earlier LMS studies. The Davis [41] technology acceptance model (TAM) is one of the well-liked models that academics use to assess how users perceive, accept, and feel about technologies in the context of web-based learning. TAM has been utilised in a number of studies to examine user acceptance and LMS use, for example, see [17,47,48,49]. Another

model frequently used to express opinion on users' acceptance and intention to employ new technology is the UTAUT2, which Venkatesh [43] revised. Due to TAM's limitations in understanding why people embrace technology, UTAUT2 has also been utilised extensively to explore the elements that affect LMS acceptance. The UTAUT2 now has three extra variables—habit, hedonic drive, and price value—that make it more user-focused than TAM. Although monetary value could not be attached to LMS usage [34], Ain later substituted the pricing value concept with the learning value construct [50] to further explain why people adopt technology. The Delone [42] updated model of information systems success is another model that is often utilised in the eLearning space. Scholars have also used the D&M model to describe the significance and influence of system dependability, usability, efficiency, functionality, and maintainability on administrators', students', and tutors' adoption and use of various LMS [51].

Hypotheses Formulation:

Perceived Enjoyment: The purpose of this study's perceived enjoyment (PE) component is to investigate how the pleasurable features of eLearning technologies actually affect utilisation. According to Moorthy [52], perceived enjoyment in the context of LMS refers to how much users find various LMS to be enjoyable. One of the major influences on behavioural intent to adopt and use new technology is thought to be this [27,47]. Moreover, Wasko [53] contended that in a digital world, subjective enjoyment had a favourable association with knowledge acquisition. To our knowledge, no previous LMS studies in Nigeria or other developing nations investigated this component using AI approaches, and D&M, TAM, and UTAUT2 models did not cite it. The inclusion of the perceived enjoyment construct into the research AI model makes the current study more significant.

Hypothesis 1 (H1): Perceived enjoyment will have a positive and significant influence on behavioral intent to use LMS in Nigerian context during COVID-19 pandemic.

Attitude towards Technology: In their study, Magen-Nagar [54] looked at the effects of online learning technology in Israel. The major causes of Israeli college students' and instructors' aversion to online courses, according to the authors, are fear of utilising technical devices, a lack of technological self-possession, and negative views towards eLearning and other collaborative learning technologies. According to Yakubu [17] and Jacob [20], this element, attitude towards technology (ATT), was included to the study model. The authors made the case that the deployment and use of LMS in Nigeria, like other developing countries, has failed and that further LMS research are required to look into students' attitudes regarding LMS acceptance and use. Hence, I posited,

Hypothesis 2 (H2): The behavioural intent to use LMS in the Nigerian context during the COVID-19 epidemic would be positively and significantly influenced by attitude towards technology.

Perceived Usefulness: Perceived usefulness (PU), a construct derived from TAM, is comparable to the performance expectancy construct from UTAUT (PE). Similar to this, Baki [55] emphasised that learning performance and grades improve in direct proportion to students' level of LMS belief. Moreover, previous LMS studies shown that PU might significantly and positively influence users' behavioural intent to adopt and use LMS [50]. If learners feel that a particular eLearning tool will help them reach their academic objectives, they are more likely to accept and use it. We predict that PU will have a considerable impact on learners' behavioural intent to adopt and use various LMS in Nigeria based on prior literature. Thus, we state the following:

Hypothesis 3 (H3): In the Nigerian context during the COVID-19 epidemic, perceived usefulness will have a favourable and large impact on behavioural intention to use LMS.

Perceived Ease of Use: Perceived ease of use (PEOU), like PU, is derived from TAM. In order to acknowledge the significance of the perceived ease of use construct, much effort has been put into developing a user-friendly interface for web-based learning systems [56]. PEOU is the degree to which someone thinks using a specific web-based technology, like an LMS, will be free of mental and/or physical effort. According to Joo [57], PEOU significantly affects students' behavioural intention to utilise LMS. LMS should be created in an intuitive way, and using the systems shouldn't require technical knowledge. therefore, proposed that,

Hypothesis 4 (H4): In the Nigerian setting during the COVID-19 epidemic, perceived ease of use will have a favourable and large impact on behavioural intent to use LMS.

System Quality: System quality (SQ), which was derived from the D&M model of IS success, is used in this study to examine the impact of system quality on LMS adoption and use. Ramrez-Correa [58] defined the idea as the functionality, stability, usability, and other software criteria of a certain piece of software (in this case, the LMS).

Hypothesis 5 (H5): The behavioural intent to utilise an LMS in the Nigerian setting during the COVID-19 epidemic would be positively and significantly influenced by the systems quality.

User Satisfaction: User satisfaction (US), according to Yuen [61], is the degree to which students feel that the information systems (IS) at their disposal suit their needs for academic and other informational purposes. Several academics hold the opinion that an IS is used more frequently the higher the level of enjoyment it produces [62]. On the other hand, users will become dissatisfied if the system fails to match their informational needs [63]. Prior research [33,35,50] have demonstrated that many students, particularly those in higher education from poor countries, are dissatisfied with the online classroom because of their personality types, technological skills, and lack of experience with the setting. Students' behavioural intent to utilise LMS is impacted as a result. Thus, the research proposed the following hypotheses:

Hypothesis 6 (H6): In the Nigerian setting during the COVID-19 epidemic, user satisfaction will have a favourable and large impact on behavioural intent to use LMS.

Facilitating Conditions: Venkatesh [64] defined facilitating conditions (FC) in the context of technology adoption and use as the extent to which individuals perceive the availability of technological and other organisational resources required to employ a particular technology. Tarhini [65] made the case that resources like the internet, availability of computers and other devices, and access to electricity had a substantial impact on students' intentions to utilise LMS in the context of eLearning. The authors found that insufficient access to computers and other portable devices, slow internet speeds, and a lack of technical support have a detrimental impact on students' intentions to utilise learning management systems (LMS) in Africa. Al Amoush [66] and Yakubu [17] both emphasised how lacking access to these materials will make students less likely to use LMS. So, suggest:

Hypothesis 7 (H7): In the Nigerian context during the COVID-19 epidemic, resource-facilitating conditions will have a favourable and large impact on behavioural intent to utilise LMS.

Social Influence: Social influence (SI) was described by El-Masri [34] and Tarhini [67] as the results of social pressure on people's behaviour and perception towards taking a certain action. SI, according to Venkatesh [64], refers to how much a person takes into account the opinions of others who think they should apply the new system. Similar to the "social norm" element in the Theory of Planned Behaviour, the factor is developed from UTAUT (TPB), Theory of Reasoned Action (TRA) and the most recent version of the Technological Acceptance Model (TAM2). The purpose of this study is to determine how peer pressure from senior lecturers, school administrators, and students from other institutions affects learners' willingness to accept and use alternative learning management systems (LMS). As a result, we posited:

Hypothesis 8 (H8): In the Nigerian context during the COVID-19 pandemic, social influence will have a favourable and large impact on behavioural intent to use LMS.

Behavioural Intentions and Actual Usage: The degree to which a person intends to use a specific technology for various tasks is known as behavioural intention (BI). According to Sánchez-Prieto [68], BI is a measure of how strongly students intend to use various LMS to further their education in the context of eLearning. The authors made the case that once students' intentions to use a system are formed, they will really use it. The researchers suggest that as a result:

Hypothesis 9 (H9): 9th Hypothesis (H9). During the COVID-19 epidemic, behavioural intention will have a favourable and significant impact on LMS actual usage in Nigeria.

5. EXISTING SYSTEM

It could take a long time to learn how to establish an LMS system. It will take time to switch all of your instructors to e-learning. Many educators will still favour the traditional teaching method of using a whiteboard and handouts over an LMS that is fully functional. Although the IT staff and LMS software are responsible for making the interface simple to use, teachers may nevertheless experience issues while teaching. The system will need to be trained on, and there will be continuing administration fees to maintain the interface to meet your demands.

Disadvantage:

1. Students can access all of their course materials from any device with the help of a learning management system, and they can go back to the material whenever they need to. Sadly, a major disadvantage of using a learning management system is that your company will need IT and coding expertise to tailor the platform to your training requirements.
2. It could not be as simple as changing the colour palettes or moving text blocks. For many systems to be able to govern the user experience, genuine backend code is necessary.
3. Several learning management systems operate on a "freemium" model, which gives you access to a constrained number of functions.
4. You might need to pay a subscription fee in order to have full access to the system. A reporting system and additional support are typically expensive features.

6. PROPOSED SYSTEM

The issue of wasting time on pointless duties like grading papers and saving time on travel is resolved by an LMS programmed. On the distant cloud-based server, create or upload a course and watch as your students move through the

lessons. From there, you may keep tabs on their development and offer further assistance as required. Creating your curriculum and getting every student on the same page is simple.

Advantages:

1. Students can access all of their course materials from any device with the help of a learning management system, and they can go back to the material whenever they need to.
2. With the use of an LMS, you can centralise all of the educational resources for easy student access. These resources can also be sent out according to individual requirements.
3. Online education presents a financially advantageous learning option for corporations and educational organisations. Your business can save money by using a learning management system to do away with costs like renting classrooms, travel and lodging, paying instructors, buying textbooks, supplies, and physical printouts.
4. Your course can easily be updated. No need to completely rewrite the course; just make modifications to the forms, specs, product forms, and requirements. Simply make adjustments based on new knowledge. Students have instant access to these changes.

7. SYSTEM CONFIGURATION

1. Xampp – 8.2 Version
2. PHP
3. Web – Server
4. MySQL

8. CONCLUSION

By using this Learning Management System (LMS) Students can enhance the learning and they can develop the new skills by using the tool.

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