An Integrated Conceptual Model for Understanding the Adoption of Learning Management Systems in Higher Education During the COVID-19 Outbreak

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Abstract Regardless of the varying rates of the novel coronavirus COVID-19 outbreak worldwide, the vast majority of countries have deployed distance e-learning alternatives to flatten the trajectory of the disease proliferation. Despite that, various challenges emerge while endeavoring to deliver purely online education under the emergency lockdowns of all educational institutions with a specific focus on tertiary educational campuses. Online learning has fully substituted the blended modalities of learning prevalent in the period preceding the coronavirus crisis. Thence, the need to examine the factors influencing the full adoption of Learning Management Systems (LMS) in higher education institutions has become even more insisting. Higher education institutions are obliged not to compromise quality assurance benchmarks under exceptional pandemic circumstances accompanying home quarantine encapsulated with anxiety and uncertainty. This theoretical chapter’s chief objective is to construct and adopt a hybrid theoretical framework driven from the most comprehensive technology acceptance and information systems success models. This chapter’s value lies in proposing an extended model to be validated in subsequent studies to examine the factors influencing LMS adoption under epidemic circumstances.

Keywords Learning management systems · COVID-19 · Technology acceptance · Theoretical framework · Perceived user satisfaction

1 Introduction

The investments into Learning Management Systems (LMS) in higher education has been continually increasing, especially in regions that experience double-digit growth like Africa, Asia, Eastern Europe, and Latin America. Such a massive expansion of LMS in higher education has made it imperative to conduct systematic empirical investigations into the factors influencing LMS acceptance among undergraduates and faculty members [1]. Examining LMS acceptance’s decisive determinants
has also been associated with investigating the pedagogical efficiency parameters of LMS-based education [2]. LMS research has not been limited to initial LMS acceptance, but it has also extended to studying continued LMS adoption, which is considered a distinctive strand of LMS research [3].

LMS’s pedagogical and technical affordances have entitled them to function as distance learning platforms, allowing students to learn at their own pace outside spatial and temporal restrictions [4]. The current crisis of COVID-19 outbreak has made universities, and colleges worldwide adopt distance online modalities of learning, especially LMS, entirely and swiftly [5]. That is because distance online learning has the potential of preventing interruption of students’ learning and growth [6]. LMS has played a crucial role during the pandemic to mitigate the adverse effects of campuses closures on stakeholders at higher education [5]. For example, in medical education, LMS like Blackboard, Canvas, Moodle, Vista, or Angle allows interactive features like messaging systems, webinars, and pre-recorded sessions providing continuing medical education credit (CME) [4]. Although scarce, an initial trend is currently evolving towards investigating the factors influencing LMS acceptance under the epidemic restrictions enforced by the COVID-19 outbreak. Such studies rarely have adopted comprehensive theoretical frameworks, integrating perceived user satisfaction and technology acceptance approaches.

It is essential to integrate user-satisfaction approaches manifested in the Information Systems (IS) success model into technology acceptance theories to study predictors of LMS acceptance during the pandemic among students and instructors for several reasons. First, maintaining the quality of education and IT infrastructure is crucial to higher education institutions as they are shifting towards e-learning models with the enormous demand for intellectual capital [7]. Second, because of the digital divide in terms of IT infrastructure between urban and rural areas, higher education institutions globally encounter critical challenges related to the quality and sustainability of e-learning [8]. Third, faculty and students are obliged to cope with relying heavily on LMS. Simultaneously, faculty and learners must be well-trained to harness LMS effectively to meet the quality requirements of online distance education during COVID-19 spread [9]. Fourth, the healthcare system, especially front line medical specialists like Internal medicine, anesthesia, and intensive care physicians, has been severely affected by the COVID-19 crisis. This situation has necessarily influenced the quality of clinical training, due to the home quarantine policies [10].

Considering the observed gaps in the theoretical literature related to LMS acceptance during the COVID-19 spread, the current theoretical chapter aims to fulfill various objectives. First, this paper seeks to propose an integrated theoretical model that consolidates the prominent paradigms in LMS research, namely, perceived user-satisfaction, and technology acceptance. Second, the complete utilization of LMS in higher education, especially in medical education, is considered an innovative educational practice. Therefore, it is essential to implement theoretical models that scrutinize quality dimensions, comprehensive technology acceptance models, and sociological theories that examine predictors of diffusion of innovative technologies as collective social actions to combat the coronavirus. Third, the current paper attempts to pave the path for a generic line of research concerned with measuring the
success of LMS adoption in higher education institutions during and after the coronavirus crisis, as factors influencing LMS acceptance shall transform remarkably compared to the period before the disease outbreak.

2 Literature Review

The COVID-19 pandemic has provoked an urgent imperative to substitute conventional face-to-face university courses with modules delivered online [11]. One of the significant challenges is that faculty members are compelled to prepare for and deliver courses online with all that it entails knowledge and technical support. Thus, previous studies have delved into the relationship between university instructors’ pedagogical content knowledge (PCK) and their utilization of e-learning platforms. The complexity of online instructional tools to conduct web-based courses challenges instructors’ PCK and poses difficulties in planning and organizing online sessions. Although the Coronavirus crisis has been conducive to providing a plethora of pedagogical strategies, the virtual environments where online teaching occurs do not allow instructors to contextualize these pedagogies [12].

Simultaneously, educators have to live up to specific psychological challenges aggravated by the epidemic restrictions. It has been indicated that the COVID-19 pandemic is likely to affect the mental health and emotional well-being of medical educators. For instance, survey studies have found that symptoms of depression, anxiety, and distress, and burnout were increasingly reported among medical educators during the pandemic [13]. Furthermore, studies have divulged a variety of difficulties that medical students encounter because of the epidemic restrictions. Such hurdles manifest in the delay of board exams, inadequate preparedness for those exams, interruption of residency, fellowship, and clinical training programs, lack of conferences, and networking opportunities. Further obstacles encompass insufficient awareness of and training on technology use among faculty [14–19].

While previous studies have acknowledged the pedagogical powerfulness of LMS tools, such studies have also opposed the full use of LMS tools as “sole replacements” of face-to-face instruction [4]. However, scares empirical endeavors have been conducted to understand the factors affecting LMS acceptance and success during this period. For instance, it has been found that e-service quality, information quality, and system quality are significant predictors of perceived user satisfaction with LMS [8]. Although some previous studies have adopted and validated perceived user-satisfaction models as their foremost theoretical foundations, the e-learning challenges that have appeared during the pandemic have not been comprehensively addressed in integrated models.
3 The Contributions of the Current Paper

The present paper contributes to the theoretical literature connected with LMS research in several ways. First, this paper offers a comprehensive theoretical framework that addresses the salient theoretical paradigms underlying LMS acceptance and success. Second, the suggested framework anticipates determinants of LMS acceptance and success during the pandemic based on a literature survey of the most insisting concerns and obstacles that may hinder LMS acceptance and user satisfaction. Third, the proposed theoretical framework is generic in that it can be applied in studies targeting different populations of LMS end-users in higher education with a specific focus on faculty and students.

4 Theoretical Framework and Hypotheses Development

At its heart, the proposed framework embodies the updated IS Success model [20]. To address the hurdles that confront LMS acceptance and success during the pandemic, the theoretical framework of question additionally incorporates the relevant technology acceptance theories that approach such concerns, in the form of external constructs, influencing intention to LMS use. These theories include the extended version of the Unified Theory of Acceptance and Use of Technology (UTAUT2) [21], Diffusion of Innovation Theory (DOI) [22], and the Technology Acceptance Model 3(TAM3) [23], as well as Coronavirus anxiety.

4.1 UTAUT2

UTAUT2 elaborates on the UTAUT [24], commonly used to study ICT use in consumer contexts. Initially, based on sociological and socio-psychological theoretical perspectives, the UTAUT comprises four key constructs (i.e., performance expectancy, effort expectancy, social influence, and facilitating conditions) that influence intention to use technology. Subsequently, the UTAUT2 expands the original theory by integrating three new constructs, namely, hedonic motivation, price value, and habit [23].

Hedonic motivation is defined as the fun, pleasure, or perceived enjoyment gained by technology use. Previous studies have substantiated the significant positive effect of hedonic motivation on the intention of LMS use [25]. Concerning effort expectancy, it is defined as the perceived ease associated with using an application, whereas social influence refers to the extent to which a user perceives that significant referents including family, friends, and colleagues believe that they should use a particular technology [21]. Furthermore, facilitating conditions are defined as the perception that resources and opportunities are readily available to the target users.
to enable them to use the application of interest [21]. It has been found that *effort expectancy*, facilitating conditions and social influence exert significant effects on the intention to use LMS [26–28]. In light of theory and evidence-based literature, the current paper formulates the following relevant hypotheses;

**H1**: Social influence significantly and positively impacts the intention to use LMS.

**H2**: Hedonic motivation significantly and positively influences the intention to use LMS.

**H3**: Facilitating conditions significantly and positively influence the intention to use LMS.

**H4**: Effort expectancy significantly and positively influences the intention to use LMS.

4.2 **DOI**

DOI assumes that individuals or societies perceive technological innovations from a dual perspective to eliminate the uncertainty of technology use outcomes. Such a binary perspective consists of software information and evaluation information regarding the expected outcomes [22]. DOI specifies five critical characteristics of technological innovation that function as parameters of individuals’ intention to use it. These determinants are *relative advantage*, *comparability*, *complexity*, *trialability*, and *observability*. Considering LMS acceptance, compatibility with learning tasks, and technical complexity are the most extensively investigated factors. Previous studies have also verified that compatibility with learning tasks and technical complexity exert significant influences on the intention of LMS use [29–31]. Hence, the present study presumes that;

**H5**: Compatibility with learning tasks significantly and positively influences the intention to use LMS.

**H6**: Perceived technological complexity has a significant negative influence on the intention to use LMS.

4.3 **TAM3**

The original technology acceptance model (TAM) [32], has been extended to develop TAM2 by determining the factors influencing the system’s *perceived usefulness*. In this regard, TAM2 has identified five additional determinants of *perceived usefulness*, precisely, *perceived ease of use*, *image*, *subjective norms*, *job relevance*, *output quality*, and *result demonstrability* [33, 23]. Afterward, TAM3 has been developed by integrating TAM2 and the model of the determinants of the perceived ease of use [34]. Therefore, TAM3 offers a comprehensive network of the predictors of IT acceptance, adoption, and use. Accordingly, TAM3 hypothesizes three new relationships that TAM2 has not tackled. Notably, TAM3 posits that experience moderates
the relationship between perceived ease of use and perceived usefulness, the relationship between computer anxiety and perceived ease of use, and the relationship between perceived ease of use and the behavioral intention [23]. Furthermore, the anchor factors_ computer self-efficacy, perceptions of external controls, computer anxiety, and computer playfulness are significant predictors of perceived ease of use, and adjustment factors, including perceived enjoyment and objective usability, further influence perceived ease of use [23].

Previous literature supports TAM3 hypotheses in that computer self-efficacy and computer anxiety significantly influence perceived usefulness, whereas perceived interaction significantly influences perceived ease of use [35]. Furthermore, it has been found that perceptions of external controls significantly affects the perceived ease of use [36]. Accordingly, the proposed framework presumes that:

H7: Computer self-efficacy significantly, and positively influences LMS perceived ease of use.
H8: Computer anxiety significantly, and positively influences LMS perceived ease of use.
H9: Perceived interactivity significantly and positively influences LMS perceived usefulness.
H10: LMS perceived ease of use significantly and positively influences LMS perceived usefulness.
H11: LMS perceived ease of use significantly and positively influences the intention to use LMS.
H12: LMS perceived usefulness significantly and positively influences the intention to use LMS.
H13: Coronavirus anxiety significantly and negatively influences the intention to use LMS.

4.4 IS Success Model

An extensive literature review has led to the formulation of the initial IS success model, which has identified six critical quality dimensions determining IS success. These quality factors were: system quality, information quality, information use, user satisfaction, individual impacts, and organizational impacts [37]. A decade later, the updated version of the IS success model has been established as a result of successive empirical validations of the IS success prototype [20]. Delone and Mclean’s model of IS success is a process-oriented model that shows how causality flows among the interrelated dimensions of IS success in the same direction of the information process [20]. Successive studies have extended the IS success model, and hence, it has come to encompass “service quality” as an essential quality dimension [38], in parallel with the semantic and technical dimensions of IS quality, each should be measured or controlled for, respectively. Because of its loose and multiple definitions, the construct of “use” has been replaced with “intention,” a more powerful cognitive
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construct, immediately predicting actual system use. At the same time, perceived user-satisfaction significantly and positively influences the intention to use IS.

*System quality* measures the system’s desired characteristics, such as reliability, usability, availability, adaptability, and response time. Moreover, *information quality* captures the degree to which the content of an IS is personalized, interactive, engaging, relevant, and easy to understand. *Service quality* measures the overall support provided to end-users by the IS provider or by the organization’s networking department. On the other hand, *perceived user satisfaction* refers to users’ opinions of the system’s effectiveness and their entire experience with the system use. Finally, the “*net benefits*” are the most critical success measures that capture the balance between positive and negative effects of the system used on the end-users in terms of cost-effectiveness, time-saving, and attainment of learning goals [20, 39].

Studies that have examined determinates of e-learning success have found that service quality, information quality, and service quality significantly and positively influence user satisfaction, and intention to use LMS [8], and that user satisfaction significantly influences the intention to use LMS [40]. Therefore, the current paper makes the following hypotheses informed by the IS success model;

H14: System quality significantly and positively influences the intention to use LMS.
H15: System quality significantly and positively influences perceived user satisfaction with LMS.
H16: Information quality significantly and positively influences the intention to use LMS.
H17: Information quality significantly and positively influences perceived user satisfaction with LMS.
H18: Service quality significantly and positively influences the intention to use LMS.
H19: Service quality significantly and positively influences perceived user satisfaction with LMS.
H20: Perceived user satisfaction with LMS significantly and positively influences the intention to use LMS.
H21: The net benefits of LMS use significantly and positively influence the intention to use LMS.
H22: The net benefits of LMS use significantly and positively influence perceived user satisfaction with LMS.
H23: Intention to use LMS significantly and positively influences actual LMS use.
H24: Actual LMS use significantly and positively influences the net benefits of LMS use.

Figure 1 illustrates the proposed theoretical framework and hypotheses.
Fig. 1 A theoretical framework of the factors influencing LMS acceptance and success during the corona-virus pandemic

5 Discussion

LMS has proven to be the most potent technological tool in educational institutions taking into account the ever rapidly evolving instructional technologies readily available at the disposal of digital natives [25]. Albeit not being the sole medium of e-learning during the COVID-19 pandemic, almost all higher education institutions Worldwide function through E-learning platforms that are operating chiefly via LMS [41]. Thus, an intense demand emerges to evaluate the LMS success in online education delivery during the COVID-19 pandemic. The current paper has suggested an inclusive theoretical framework that can serve as a rich source of hypotheses on LMS’s pedagogical efficiency. Although the proposed model merges technology acceptance and user satisfaction theoretical orientations, user satisfaction lies at the heart of the study’s conceptual framework. On the other hand, the external factors that are presumed to affect both LMS acceptance and success have been derived from the most comprehensive technology acceptance models, i.e., UTAUT2, DOI,
and TAM3, that specifically address the challenges, concerns, or obstacles that might hinder LMS acceptance and success while learning online during the pandemic.

The IS success model, a rough proxy of the user satisfaction approach, constitutes the core of the present theoretical framework for three reasons. First, the IS success model is capable of measuring the discrepancy between users’ expectations of an IS and IS actual performance experienced by the target users [42]. In this regard, the current model awards peripheral importance to technology acceptance models compared to the IS success model because technology acceptance alone does not warrant success, since technology acceptance does not measure, IS success explicitly and directly [43]. At this critical stage, where both students and educators are overwhelmed with their initial experiences with the extensive reliance on LMS, it is crucial to examine the effectiveness of LMS performance. On the other hand, students and educators are obliged to accept LMS use and cope with it during the quarantine enforced by the epidemic circumstances. Therefore, users’ resistance has no longer been the primary concern compared to the effectiveness of LMS performance per se, which has admittedly become the most insisting concern in the potential research lines, during and post the crisis [44]. Third, the IS success model puts forth resilient overarching quality factors that can be adapted and further scrutinized to investigate layers of quality factors that are unique to LMS success in higher education institutions compared to other types of IS such as educational system quality, support system quality, instructor and learner quality.

The current model has utilized the UTAUT2 because it is the most widely used and robust model in LMS acceptance research [25]. For example, UTAUT2 explains over 74% of behavioral intentions to use technological tools [45]. Relying on the UTAUT2, the current model has integrated variables like “facilitating conditions” that encompass the availability of constant access to broadband connectivity, which are fundamental factors. Facilitating conditions are also associated with effort expectancy, the degree to which users perceive the ease of LMS use. The factors mentioned above tackle the perceived difficulties encountered by faculty and students towards the effective LMS use [24].

As far as the TAM3 is concerned, it has been incorporated in the present framework because TAM3 addresses the most pervasive factors examined in LMS acceptance research with a specific focus on computer self-efficacy and computer anxiety [5, 46]. These constructs measure a variety of volitional control aspects that users need to acquire to decide to use LMS. Furthermore, TAM3 examines the influence of perceived interactivity on LMS acceptance. It is essential to investigate perceived interactivity since e-learning, in general, has always been criticized for not securing sufficiently interactive learning experiences compared to conventional modalities of teaching and learning [5].

Simultaneously, the full adoption of LMS in higher education institutions during the pandemic represents a technological innovation; this paper opts to incorporate constructs from the DOI. As mentioned earlier, the full reliance on LMS during the pandemic is a unique, unprecedented experience for both instructors and students. Therefore, the complexity of LMS tools and their perceived compatibility with
the learning tasks and intended outcomes are the most salient factors affecting the intention of LMS use.

6 Conclusion

This paper offers a comprehensive theoretical framework examining LMS adoption during the COVID-19 pandemic. Because of the scarcity of relevant theoretical models, the current theoretical framework can catalyze researchers to examine new factors influencing LMS adoption. By integrating both technology acceptance and perceived user-satisfaction, the advised framework aims to compensate for each theoretical approach’s shortcomings.

7 Theoretical Implications

The current paper has several theoretical implications. First, the theoretical framework enables scholars to examine the relevancy and amenability of existing theoretical models for investigating LMS full adoption. Second, the theoretical framework paves the path for research studies to pinpoint LMS adoption’s most influential factors. Third, this paper opens an avenue for future studies that can validate the suggested framework empirically. Accordingly, future empirical validations of this model may help extend and further solidify the IS success model, especially in the context of LMS adoption in higher education institutions. As the current framework applies to different populations, including students and faculty, future studies can extend the framework into more specialized models to examine faculty and students’ needs and concerns.

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