A Theoretical Framework for the Adoption of Web-Based Learning Management Systems in Saudi Higher Educational Institution

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Abstract—This article describes the development of a theoretical framework for factors that influence adoption of web-based Learning Management Systems (LMS) in Saudi Higher Educational Institutions (SHEI). LMSs help such institutions manage the information required for planning and making informed decisions. LMSs also facilitate effective and efficient information management, allowing SHEI to improve their abilities in teaching and learning experience. However, higher learning institutions remain hesitant to adopt LMS projects. Such systems are relatively recent additions to educational institutions; thus, there are certain roadblocks to adoption. Thus, a framework is proposed to facilitate LMS adoption in SHEIs. The proposed framework considered 17 factors collected from relevant literature, with unified theory of acceptance and use of technology and technology-organisation-environment serving as the foundation. The proposed framework is expected to help SHEIs identify and comprehend the various individual, technological and environmental factors that must be considered when implementing an LMS.

Index Terms—Web-based systems, electronic management system (LMS), factors, Saudi higher education institutions (SHEI), adoption, efficient, decision, UTAUT, TOE.

I. INTRODUCTION

Teachers are turning to E-learning, which offers many potential benefits, e.g. improving student performance, boosting student confidence in their ability to learn and improving student self-esteem. In 2020, COVID-19 forced education administrations around the world to adopt E-learning in different educational environments [1]. It has been stated that the Learning Management System (LMS) is now the leading solution for the education sector, with its focus on technology and innovation, E-learning can now rescue or save our society from this emergency [2]. LMS is a web-based system for managing all aspects of training and education. Schools and colleges across the nation use this for delivering lectures and exams to their students through internet at anyplace and anytime [3].

In this context, educational environments seek to provide customised education to students, increase staff engagement, deliver, track and handle education and generate reports on student performance [4]. Although an LMS can improve access flexibility, provide easy and collaborative learning, improve processes and increases productivity, such systems also exhibit certain disadvantages. From the student perspective, these disadvantages include insufficient connection with instructors, limited peer contact, a lack of social engagement and a lack of independence, which collectively reduce the quality of education [5], [6]. From an organisational perspective, the disadvantages include high maintenance costs, the need for IT resource management, customisation learning, end-user support and other related issues as data security and training [6]. Thus, to improve E-learning adoption, there is a need to investigate way to address the aforementioned issues.

E-learning is a new technology-based learning modality that is not simply an extension of traditional teaching and learning models but rather a radical shift from such models toward more innovative and collaborative approaches. In addition, prior to the COVID-19 pandemic, studies have stated that E-learning is still poor in education [7]-[11]. According to Alotebi (2019), poor adoption of E-learning may be attributed to a variety of challenges and factors from both staff and student perspectives [12]. However, effective E-learning requires knowledge of the adoption determinants and the challenges facing existing E-learning systems. There is a lack of consensus regarding the important problems and variables that have influenced adoption of E-learning during the COVID-19 epidemic, resulting in a knowledge vacuum in terms of the critical aspects of E-learning usage during this pandemic [13]-[15]. In addition, stakeholders in higher education systems, including governments, institutions and students, require successful and effective material delivery via E-learning platforms.

Therefore, in this study, we attempted to determine the factors that affect adoption of LMSs in Saudi instruction establishments (SHEI). We then developed and evaluated an LMS adoption framework for SHEI.

Organisations are slow to embrace new technology, which can impact performance. New tools and technologies are developed for businesses every day; however, they are too busy to perform in-depth study into their requirements. Effective research can help organisations understand the factors that influence the acceptance and performance of new technologies. We believe that our findings will help educational institutions, e.g. universities, make informed decisions about how to incorporate new technology in order to improve educational outcomes. Previous studies into the issues educational organisations face in a rapidly developing countries, e.g. the Kingdom of Saudi Arabia (KSA), have
Several previous studies have investigated E-learning adoption from various perspectives; however, the current study attempts to contribute to the literature by developing an LMS adoption framework specific to KSA as a case study. We expect that the proposed framework can serve as a model for other developing nations. The findings of this study are expected to have substantial impact on educational organisations' abilities to make strategic decisions about Information and Communication Technology (ICT) innovation. In addition, cultivating a collaborative and innovative culture.

The remainder of this paper is organised as follows. Background information and related work are discussed in Section II. Section III describes the adoption of learning management systems. Section IV describes research framework and hypotheses development, and Section V presents research methodology. Section VI describes findings and discussion. Limitations and future recommendations are discussed in Section VII. Finally, conclusions are presented in Section VIII.

II. BACKGROUND AND RELATED WORK

There is no universally agreed definition of what constitutes an E-learning system. Some have defined an E-learning system as software that transmits educational resources [16]-[18], and others use words like course management system and virtual learning environment to describe E-learning systems [17]. However, each independent system is unique in terms of specifications, components and functionalities. Some systems may offer a rather limited feature set, e.g. online classes, and others may offer a wider variety of features, e.g. online courses, grade tables and student administration. Cheng et al. [19] described E-learning as a computer system that allows students to learn online.

In this paper, we define the LMS as a computer application or web technology that can be accessed by its users (students and instructors) from any location at any time. AN LMS is used to organise, deliver, track, evaluate and manage educational activities. The primary LMS components of an LMS are a server that provides basic functionality and a user interface that educators, students and administrators can utilise. The architecture of the LMS concept considered in this study is shown in Fig. 1.

![LMS Architecture](image)

Due to the rapid growth of ICT, E-learning has been included in conventional instructional systems [20], [21]. E-learning is particularly useful for delivering cost-effective education regardless of time or location [20], [22], [23]. Over the last few years, developing countries have shifted to more cost-effective and innovative methods of delivering education to students [24]. Higher Education Institutes (HEI) in developing countries have established are actively consider the importance of E-learning [25]. In addition, it is becoming increasingly important for students to complete university education to develop the technical skills required for future career advancement [26].

However, integrating ICT into HEIs does not guarantee that such systems will be accepted or used in future. Many efforts have been undertaking to establish E-learning in developing countries; however, underutilisation continues to be a challenge [27]. In addition, to date, the creation of content and infrastructure has been inadequate in terms of effective E-learning system deployment [20]. Students will not benefit from such methods and technologies unless they are willing to use them effectively, and student attitudes about embracing and accepting emerging technology influence the effectiveness and efficiency E-learning systems [20], [28], [29].

Student attitudes toward the adoption and use of E-learning systems have a significant influence on effective deployment of ELS. Numerous empirical investigations in developed countries [30], [31] have presented evidence to support these observations. However, in developing countries, issues that may affect technology adoption are more difficult to identify. To address this issue, policymakers and practitioners in developing countries must first comprehend the factors that influence the adoption and acceptability of E-learning in order to improve learner usage behaviour. Existing literature shows that individual, societal and organisational settings in a culture have a substantial impact on user adoption and acceptability [32]-[34].

III. ADOPTION OF LEARNING MANAGEMENT SYSTEMS

The adoption of LMS is still in its early stages in education sector, according to numerous studies in education; the majority of these studies are adoption technology in the healthcare sector. Both technological and organisational obstacles have been identified in these investigations [35]. Thus, the goal of this study is to identify the factors that influence LMS adoption in SHEIs. To identify the factors related to LMS adoption in SHEIs from recent studies, we have developed a theoretical framework based on the Unified Theory of Acceptance and Use of Technology (UTAUT) and the Technology-Organisation-Environment framework (TOE). This combination of UTAUT and TOE allowed us to develop a model that reflects the pre-adoption, adoption-decision and post-adoption phases of IS product adoption.

According to Taylor (1995), social science researchers begin with models and identifying which data are required to establish links between relevant concepts. Concepts become theoretical structures as they construct theory and become measurable. In contrast, theories are validated using propositions and hypotheses according to techniques that are appropriate for the given model or theory [36].
Various theories have been considered to examine the intent to use new technologies and the actual use of such technologies, including diffusion of innovation theory [37], the theory of reasoned action [38], the Technology Acceptance Model (TAM) [27], the Theory of Planned Behaviour (TPB) [39], combined TAM-TPB [40], the motivational model [41], social cognitive theory [42], the unified model of E-government adoption [43], [44], UTAUT [45], TOE [46] and a combination of UTAUT and TOE [35], [46]-[48].

According to recent studies, the UTAUT is can explain up to 70% of the variance in intended behaviour [46], [49], [50], and it has been widely used in a variety of sectors, including ERM and the education sector [46], [51]. The UTAUT model was made feasible via thorough examination of existing models in order to realise unified understanding of user acceptability [46], [52].

The TOE scheme is an organisational-stage theory that incorporates both internal and external elements into a multi-angle framework. TOE is more akin to a taxonomy for identifying factors than it is for explaining such factors. This approach makes a significant contribution in that it provides researchers with an open space to categorise the attributes of each context in a large domain. The factors in each context are regularly selected from previous studies that were determined to be appropriate for the study's situation. As a result, several studies on the adoption of Information Systems (IS) have employed TOE [46], [53], [54]. Fig. 2 shows the integrated model between UTAUT and TOE, as well as study themes.

![Integrity model between UTAUT and TOE](image)

**Fig. 2.** Integrity model between UTAUT and TOE theories.

### IV. RESEARCH METHODOLOGY AND HYPOTHESES DEVELOPMENT

In this study, we focused on factors that influence the adoption of web-based LMSs in SHEIs. We conducted a thorough literature review and utilised the findings to investigate benefits and challenges associated with deploying LMSs in SHEIs.

The factors that influence LMS adoption were determined using content analysis. Here, relevant articles were identified using relevant keywords, i.e. LMS adoption, e-records system factors, factors affecting technology adoption and factors for LMS adoption, in database, and website search processes. Note that the literature search was limited to papers written in English. The substance of all articles was evaluated and classified to guide the selection of relevant articles. In total, 197 papers were examined. In addition, relevant factors were identified and contained. To fine-tune the proposed framework, the top mentioned factors were selected. Table I shows the top-cited factors are listed, and Table II describes research hypothesis. Fig. 3 shows the proposed conceptual framework for web-based LMSs.

| Construct | Description | Studies |
|-----------|-------------|---------|
| 1. Attitude | Referred to character, behavior, or frame of mind to accept changes. | [35], [55]-[57] |
| 2. Knowledge and skills | Referred to awareness of internet skills and taking responsibility for e-learning | [35], [58] |
| 3. Computer Self-Efficacy | A one's ability to execute information technology-related tasks on a computer system is referred to as their technical skills. | [35], [49] |
| 4. Satisfaction | Response and feedback from users after using LMS. | [47] |
| 5. Language | Refers to language problems when using an LMS that do not support my language | [59], [60] |
| 6. Perceived Usefulness (PU) | The extent to which a person believes that implementing a particular system would increase his or her work performance. | [35], [61], [62] |
| 7. Perceived Ease of Use (PEOU) | Reflected on believing ease of use to users. This is made possible when the (IT) infrastructure use and management is easy due to the flexibility, scalability, and power of hosted cloud services, making the cloud a powerful tool for enabling (IT), success. | [35], [62] |
| 8. Complexity | Referred to ease in using and understanding new technology. LMS can be complicated and challenging to use because it consists of many systems, and integrating many functions. | [63], [64] |
| 9. Combability | Reflected in the fitness of the organization’s values, present needs, and previous practices like existing IT systems, methods, and requirements inside the educational institutions. | [65], [66] |
| 10. ICT infrastructure | The infrastructure is available for the organization’s operation and management like composite hardware, software, network resources, and services. | [67], [68] |
| 11. Adaptability | In e-learning, adaptability refers to a system’s capacity to change in order to meet individual academic demands. | [69], [70] |
| 12. Trust & Reliability | Referred to the user’s confidence in using the systems and was seemed like an essential factor for the successful adoption of LMS. | [71], [72] |
| 13. Government Support | Whereas, the laws’ regulations, policies, and initiatives from the government. | [12], [73] |
| 14. Laws and Regulation compliance | Referred to as abiding by government legislation and policies, especially relating to data security and privacy protection. Though data security is the concern of every user of LMS. | [35], [74] |
| 15. Polices | According to Baker (2012), depending on whether government policy supports or discourages innovation, government regulation may have a positive or negative influence on businesses. Regulatory inclinations in organizations are designed to accommodate audit trails and statutory compliance. | [35], [75] |
| 16. Management Awareness | Referred to the nature and functions of executives and managers in the organizations towards LMS. Management support includes accepting changes and providing resources for change found to be an essential determinant in adopting LMS. | [76], [77] |
| 17. Competitive Pressure | Competitive pressure arises when an institution is concerned about losing competitive advantages to rival institutions that have adopted sophisticated technology. | [35], [78], [79] |
Fig. 3. Proposed conceptual framework for web-based LMSs.

| TABLE II: RESEARCH HYPOTHESIS | Relation |
|-------------------------------|----------|
| H1 Individual Factors         | +        |
| H1a Attitude                  | +        |
| H1b Knowledge and skills      | +        |
| H1c Computer Self-Efficacy    | +        |
| H1d Stratification            | +        |
| H1e Language                  | +        |
| H2 Technology and Organization Factors | +        |
| H2a Perceived Usefulness      | +        |
| H2b Perceived Ease of Use     | +        |
| H2c Complexity                | +        |
| H2d Combatability             | +        |
| H2e ICT infrastructure        | +        |
| H2f Adaptability              | +        |
| H2g Trust & Reliability       | +        |
| H3 Environment Factors        | +        |
| H3a Government Support        | +        |
| H3b Laws and Regulation compliance | +        |
| H3c Polices                   | +        |
| H3d Management Awareness      | +        |
| H3e Competitive Pressure      | +        |
| H4 LMS adoption has a decisive role in an organization performance | + |

**Fig. 4** shows the smart-PLS model for the proposed conceptual framework.

The focus of our literature review was the use of ICT in Saudi universities. Here, ScienceDirect, Emerald, IEEE Xplore, Scopus and Web of Sciences were used to access the corresponding literature research because these sources contain major IS journals and high-quality peer reviewed IS conference papers. Using the search criteria from the specified databases, 197 articles were discovered initially. The criteria were then modified by excluding publications that were repetitive, non-English or represented research in progress. These qualifying conditions restricted the number of publications in the sample, making the research studies more achievable [80]. After the quality evaluation, a total of 20 papers were selected for further investigation. Here, the theme analysis approach [81] was used during the analysis step. In the subsequent stage, a list of the factors mentioned in the research was compiled. Note that the complete list of variables includes all suggested and used factors from the preceding study. The factors were then gathered, merged and filtered to separate similar defining factors [82]. In addition, the discovered factors were be related to the authors who utilised such characteristics as factors in their research (Fig. 4).

**B. Data Analysis Process**

In this study, we employed SPSS 20 to test the reliability and validity of factors considered in the proposed framework. In addition to smart PLS for the method of analysis, hypothesis testing, and building the framework based on the assessment theoretical framework. The data analysis process is illustrated in Fig. 5.

**C. Sampling and Survey Administration**

As stated previously the general focus of this study was HEIs in developing countries. Thus, as a case study, an online questionnaire about the use of LMSs was administered to students at Taibahu University (TU) in the KSA. Here, undergraduate students studying Computer and IS, Management, and Accounting were participated in this survey. The selected students were sent an invitation letter with a link to the survey. Google Forms was used to administer the survey, and 45 incomplete replies were rejected. As a result, 90 valid questionnaires were collected at a response rate of 66.6%, which is acceptable for internet surveys, where the typical response rate is (22–59.4%) in IT research [35], [83].

**D. Questionnaire Development**

The primary data collection technique used in this study was the questionnaire. As shown in Table III, the questionnaire instrument was created based on a study of published studies on student adoption and the use of...
web-based LMSs.

E. Sample Descriptive Analysis

The questionnaire gathered demographic data and questions about the web-based LMSs used in Saudi HEIs. Table IV details the demographics of the respondents.

### Table IV: Respondent Demographics

| Gender       | Frequency | Percent |
|--------------|-----------|---------|
| Male         | 17        | 18.9 %  |
| Female       | 73        | 81.1 %  |
| Total        | 90        | 100 %   |

| Age          | Frequency | Percent |
|--------------|-----------|---------|
| 18 to 22 Years | 71       | 78.9 %  |
| Up to 23 Years | 19      | 21.1 %  |
| Total        | 90        | 100 %   |

| Qualifications | Frequency | Percent |
|----------------|-----------|---------|
| Diploma degree | 77       | 85.6 %  |
| Bachelor degree | 13     | 14.4 %  |
| Total          | 90        | 100 %   |

| Computer Experience | Frequency | Percent |
|---------------------|-----------|---------|
| Less than two years | 31        | 34.4 %  |
| 2 - 4 Years         | 49        | 54.4 %  |
| 4 - 6 Years         | 10        | 11.1 %  |
| Total               | 90        | 100 %   |

| English Level | Frequency | Percent |
|--------------|-----------|---------|
| Poor         | 7         | 7.8 %   |
| Medium       | 70        | 77.8 %  |
| Good         | 13        | 14.4 %  |
| Total        | 90        | 100 %   |

VI. FINDINGS AND DISCUSSION

A. Analysis of Measurement Model

The reliability, convergent and discriminant validity of the measuring model were evaluated in a pilot study. Pre-testing allows the researcher to examine a number of important aspects of the questionnaire [93]. For example, consider the clarity of the instructions and questions, the cover letter, the likely response rate and the cost of administering the questionnaire. According to the Dashti (2017), a necessary pilot study should be conducted for original questionnaires [94]. All constructs in this study were tested by several researchers worldwide.

Here, reliability analysis was applied to assess the internal validity and consistency of the constructs used for each variable. The degree to which the measurement values are consistent and error-free is referred to as ‘reliability’ in this context. Measuring construct dependability or internal consistency determines the similarity of the survey instrument’s items [93].

In addition, Cronbach’s alpha coefficient was employed to assess the construct’s internal consistency. Cronbach’s alpha coefficient values are in the range of 0 to 1.0 [95], and the reliability of the survey items was assessed using Cronbach’s alpha scale [96], [97]. This value should be greater than 0.7 that indicate acceptable internal consistency. The five-point Likert scale runs from (1) to (5), where (1) represents strong disagreement and (5) represents strong agreement. Throughout the paradigm, the Likert scale was used to measure variables. In addition, standard deviation measure the departure from the mean. The results of the reliability analysis of items for all model variables are summarised in Table V.

### Table V: Measurement Model Results (Reliability Analysis & Convergent Validity)

| Latent Variable | Items | Item Loading | Cronbach’s alpha | Composite Reliability CR | Average Variance Extracted (AVE) |
|-----------------|-------|--------------|------------------|--------------------------|---------------------------------|
| Attitude        | ATT1  | 0.631        |                  |                          |                                 |
|                 | ATT2  | 0.912        | 0.923            | 0.963                    | 0.929                           |
|                 | ATT3  | 0.928        |                  |                          |                                 |
| Knowledge and skills | KSK1 | 0.855        |                  |                          |                                 |
|                 | KSK2  | 0.722        |                  |                          |                                 |
|                 | KSK3  | 0.735        | 0.847            | 0.891                    | 0.622                           |
|                 | KSK4  | 0.818        |                  |                          |                                 |
|                 | KSK5  | 0.759        |                  |                          |                                 |
| Computer Self-Efficacy | SEF1 | 0.927        |                  |                          |                                 |
|                 | SEF2  | 0.895        |                  |                          |                                 |
|                 | SEF3  | 0.921        | 0.894            | 0.928                    | 0.764                           |
|                 | SEF4  | 0.740        |                  |                          |                                 |
|                 | STF1  | 0.818        |                  |                          |                                 |
|                 | STF2  | 0.722        |                  |                          |                                 |
|                 | STF3  | 0.792        |                  |                          |                                 |
|                 | STF4  | 0.782        |                  |                          |                                 |
|                 | STF5  | 0.762        |                  |                          |                                 |
|                 | STF6  | 0.752        | 0.914            | 0.930                    | 0.626                           |
|                 | STF7  | 0.667        |                  |                          |                                 |
|                 | STF8  | 0.762        |                  |                          |                                 |
|                 | STF9  | 0.547        |                  |                          |                                 |
|                 | STF10 | 0.883        |                  |                          |                                 |
|                 | STF11 | 0.792        |                  |                          |                                 |
|                 | STF12 | 0.736        |                  |                          |                                 |
| Language        | LAG.1 | 0.761        |                  |                          |                                 |
|                 | LAG.2 | 0.849        | 0.773            | 0.864                    | 0.679                           |

593
The degree to which the observed variable is connected to the latent variable it is expected to measure is shown by item loading, which also shows the item's level of dependability. In other words, the relationship between each variable's measured indication and the reflecting concept [98]. The indicator reliability was investigated using indicator loadings, which are also referred to as factor/outer loadings in PLS-SEM. Stevens (2012) advises eliminating entries with factor loading less than 0.3 [99]. If the model's fit remains poor, elements with the lowest factor loading should be removed until the model's fit improves. Hair et al. (2014) proposed that the scale's problems with factor loadings less than 0.40 should be eliminated. Note that items with factor loadings between 0.40 and 0.70 should only be removed if removing the indicator results in an increase in the Average Variance Extracted (AVE) value over the suggested threshold. The researcher used the PLS algorithm to evaluate the model's item loadings [100]. Then, all items with low factor loading values were eliminated, as shown in Fig. 7.

Fig. 6. Proposed conceptual framework for web-based LMSs (after deleting factor loading <0.70).

B. Discriminant Validity

The final stage of verifying the quality standards under the measurement model was discriminant validity. The objective of discriminant validity testing is to verify that a reflective construct's connections with its indicators are as strong as possible [101]. The traditional methods of measuring discriminant validity are the Fornell-Larcker criterion (i.e. the squared root of AVE) and the items' cross-loadings. In this study, discriminant validity was assessed using these two methods, along with the recently advanced HTMT criterion [102]. Each of these criteria is explained in the following sections. Discriminant validity was investigated using the Fornell–Larcker criteria by comparing the correlation estimates between components with the square root of the AVE of the relevant constructs [103]. Here, discriminant validity is established if the correlation estimates between components do not exceed 0.85 and the square root of each construct's AVE value is greater than its correlation with another construct [103]. In this investigation, discriminant validity was proven, as shown in Table VI. Here, the off-diagonal correlation values with other constructs are less significant than the squared roots of the AVE for each construct (i.e. the diagonal values shown in bold). As a result, these findings provide adequate proof that the constructs' discriminant validity has been demonstrated sufficiently.
PLS-SEM provides the cross-loading values for all items by correlating each latent variable's component scores and their relationships in the model [104]. To achieve discriminant validity, an indicator's loadings on its assigned latent variable should be greater than all other latent variables' loadings [104], [105]; otherwise, the cross-loading problem may be present among the indicators, which may indicate a problem within the items [104]. From the results of assessing the cross-loading values, we found that each issue of the respective construct has higher loadings compared to others in their relative rows. Thus, adequate discriminant validity was confirmed between all constructs [98].

**C. Structural Model Analysis**

The study hypotheses and the connections between constructs were explored. Here, the Smart-PLS algorithm (version 3.0) was used. Fig. 4 and Fig. 6 show the findings in terms of path coefficients and hypotheses, respectively. The UTAUT and TOE models were used in this investigation. The findings outline the connections between exogenous and environmental elements to pinpoint factors that influence LMS adoption. The hypotheses were tested against the structural sub-models that make up the proposed framework. Here, the content validity and construct reliability were checked, and the results exhibited a good fit. The existence of discriminant validity, convergent validity and composite reliability was used to assess the validity of the proposed framework. In addition, the value of Cronbach's alpha for each component was computed to assess its internal consistency. The goodness-of-fit estimates of the correlations among exogenous variables was estimated using SEM analysis. We found that all measurement requirements were satisfied satisfactorily. The findings of the hypothesised connections are shown in Table VII. Overall, the results support the hypothesis. The findings indicate that the endogenous factors considered in this study have a substantial impact on whether the hypotheses were accepted and supported.

**Table VIII: Endogenous Latent Variables (R²)**

| Constructs Relation | R²   | Result    |
|---------------------|------|-----------|
| Intention to adopt LMS | 0.677 | Moderate  |
| Organization Performance | 0.535 | Moderate  |

The effect size, as measured by changes in the R²[106], reflects the relative influence of a specific external latent variable on endogenous latent variables. It is computed as the proportion of unexplained variance in the latent variable to which the path is connected multiplied by the rise in the R-squared value of the latent variable to which the path is related [106]. Table IX shows how changes in the R² represent the relative influence. In summary, Cohen (1988) considered that f² values greater than 0.35 are significant effect sizes [108]. The impact size of f² ranges from 0.15–0.35. Note that small impact is defined as an f² value of 0.02–0.15. No impact is considered for f² values that are less than 0.02. The f² variables, i.e. individual and environment, show substantial impact sizes of 0.357 and 0.997, respectively. Note that the technology and organisation variable exhibited a modest impact size (f²).

**Table IX: Construct Redundancy Using Cross Validation**

| Constructs Relation | f²   | Result          |
|---------------------|------|-----------------|
| Individual          | 0.357| Large effect size |
| Technology & Organization | 0.301 | Medium effect size |
| Environment         | 0.997| Large effect size |

Table VIII shows the results of the R-squared (R²) dependent variables in this context. According to Chin (1998), R² levels greater than 0.67 are considered strong, R² values between 0.33 and 0.67 are moderate, R² values between 0.19 and 0.33 are weak and R² values less than 0.19 are unsatisfactory [100], [106]. In addition, Falk and Miller (1992) identified a minimum acceptable threshold for R² of 0.10 [107]. We found that the R² values for the intention to adopt LMS and organisational performance variables indicate a moderate impact.
the model is predictively relevant, whereas a value of 0 indicates that the model is not predictively relevant [112]. Table X shows that the model considered in this study has appropriate predictive relevance.

| Constructs | SSQ | SSE | Q² | Acceptable/ Predictive relevance |
|------------|-----|-----|----|----------------------------------|
| Intention to adopt LMS | 270 | 134.821 | 0.591 | Acceptable/ Predictive relevance |
| Organization Performance | 450 | 254.036 | 0.435 | Acceptable/ Predictive relevance |

VII. LIMITATIONS AND FUTURE RECOMMENDATIONS

Even though this study followed a strict research methodology, here, we identify potential limitations or flaws that can be investigated in future. As a case study, participants from TU students in Saudi Arabia. The results were based on the number of students who utilised E-learning technologies. As a result, the findings’ generalizability to other educational institutions should be approached with care due to variations in the setting. In addition, in this study, we focused on student intent to utilise web-based LMSs; however, the role of staff and faculty in predicting the intent to use LMSs is equally important. Thus, staff and faculty should be considered in future investigations of LMS adoption. Finally, the present study was cross-sectional in nature, with a specific focus on intention at a given time. However, individual views can change over time, which must be considered in future. Thus, a longitudinal study is required to improve our knowledge about causation and the interrelationships among factors that are essential to the adoption LMSs in HEIs in the KSA.

VIII. CONCLUSION

Due to the importance of web-based LMSs, academics have investigated the various factors that influence LMS adoption in order to enhance management and decision-making in companies in terms of both efficiency and effectiveness. From a student’s viewpoint, in this paper, we have presented insight into the elements that most affect adoption of LMSs in the Saudi context. The findings of this study are expected to increase student awareness by highlighting the importance of adequate individual, technological and environmental variables for effective web-based LMS adoption. In addition, our findings are expected to increase awareness of the value of LMSs in terms of maintaining educational records and the need for adequate appropriation of individual, technological and environmental aspects relative to effective LMS implementation. SHEI institutions should be aware of the variables that can drive the creation of strategies and establish recommendations for students to adopt an LMS and use it consistently in their studies. We believe believed that our findings may also provide organisations in other fields better understanding of the factors that must be considered for effective system adoption. However, we acknowledge that additional work is required to understand the function of LMSs in decision-making and provide a solid foundation for broad LMS implementation. Nonetheless, we believe that framework proposed in this paper can function as a guide to effective LMS system implementation and acceptance.

CONFLICT OF INTEREST

The author declares no conflict of interest.

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