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A Framework for the Impact of Human Factors on the Effectiveness of Learning Management Systems

MAJDI M. ALOMARI[1], (Member, IEEE), HANIA EL-KANJ[1], NAFESAH I. ALSHDAIFAT[2], AND AYSE TOPAL[3]

[1]Electrical Engineering Department, Australian College of Kuwait (ACK), Safat 13015, Kuwait
[2]JoVision, 22083 Hamburg, Germany
[3]Faculty of Economics and Administrative Sciences, Nigde Omer Halisdemir University, 51240 Nigde, Turkey

Corresponding author: Majdi M. Alomari (m.alomari@ack.edu.kw)

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ABSTRACT Higher education institutions (HEI) have realized the advantages of implementing a blended learning environment by using learning management systems (LMSs) to provide effective ways of learning and teaching. However, recent literature has revealed that developing countries' educational institutions fail when they adopt LMS technologies because they ignore the human factors related to these technologies. This study investigated the impact of human factors on the effectiveness of LMS in a blended learning environment at Kuwait's HEIs (KHEIs). In this paper, a pragmatic approach consisting of quantitative and qualitative methods is used. User characteristics traits from the literature review were organized into three main indicators of human impact on the effectiveness of LMS: technological characteristics, psychological characteristics, and student-instructor interaction characteristics. After these indicators were identified, a conceptual model was developed to study the characteristics. A deductive approach was used, and the model was tested for significance through receiving feedback from the universities' students and faculty members. In addition, an inductive approach was implemented through conducting interviews to explore more factors related to the effectiveness of LMS. The inductive approach's results revealed the relevant factors for the usage of the LMS, such as training, needs, expectations, and branding. The human factors that positively affect the success and effectiveness of LMS included attitude, enjoyment, experience, self-efficacy, and promptness, which had the most substantial impacts on user satisfaction. The modified conceptual model that this paper presents includes these impacting factors and provides an acceptable fit to the data. This research has developed an updated framework for demonstrating the effectiveness of LMS as it pertains to human factors, and its findings can be used to enhance user experience in a blended learning environment, thus improving the quality of Kuwaiti education.

INDEX TERMS Learning management systems (LMSs), blended learning, human factors, effectiveness of LMS, Kuwait's higher education institutions.

I. INTRODUCTION

In the last few years, the rapid development of information and communication technology (ICT) has impacted teaching and educational systems around the world [1]–[5]. Blended learning (b-learning), a combination of in-person and virtual content dissemination, emerged during this period and has been widely adopted in higher education [6]–[8].

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Earlier, these two learning approaches were separate distinctly and were used by different groups [9]. However, recent improvements in technology have also been reflected in education, and b-learning has become a common practice. Sharpe and Beetham [10] presented the b-learning model as an efficient educational format that capitalizes on ICT's ability to facilitate interaction and communication.

Advocates of traditional education insist that physical attendance in class is crucial for active learning. In contrast, proponents of b-learning recognize the importance

of physical interaction, but also believe in supplementing the traditional teaching format with e-learning alternatives. This combination can be achieved through a b-learning model [11]. When both teaching formats are utilized in a b-learning setting, a broader spectrum of learning opportunities arises [12]. Successful implementation of b-learning, requires primary requirements to be met first; these requirements consist of technological readiness of the institution, competency with technical resources, motivated faculty, and staff, open communication and feedback channels between users (instructors and students) [13].

Literature has covered the benefits of b-learning broadly. b- learning combines both technology and traditional educational approaches, thus enables having rich content in the courses, flexible way to access the content, and creating alternative communication channels [14]–[16]. B-learning also supports traditional educational in terms of management, evaluation, monitoring, and administering courses by using technology [17]. For all of these benefits, several different systems have been developed for b-learning. These systems are called the learning management systems (LMSs) and seem to provide a better solution to higher educational institutions.

Farshad [18] defined LMS as a ''software used for delivering, tracking, and managing training/education''. The LMS category encompasses minimalistic systems and software with course offerings and learning dissemination. It includes all elements needed for a course in an online source such as file, grade, email, board, announcement, assessments, and media [19]. It is available either as open-source such as Moodle and or closed sources such as Blackboard [20].

LMS is a system that facilitates the whole learning as well as the teaching process for both instructors and students. It enables instructors and administrators in many of its features to build and administer online courses quickly and easily; it enhances students learning in delivering the material as well as interacting with student implicit learning content [4], [6], [21]–[24].

LMS enables institutions to continuously improve their learning environments and bolster students' academic performances and self-learning abilities. The use of LMS in educational institutions is also expanding beyond a purely educational role to a new form of online communication and interaction [25]. B-learning enhances students' computer skills in a flexible, easy, and entertaining learning environment, which makes them feel positively towards online learning and courses [26].

Dynamic interactions between the users within LMS in a b-learning environment is crucial for learning, active participation of the instructor in the forum was found to be associated with a more student engagement (e.g., module, wiki, blog, forum), the LMS acts as a bridge between the users. References [23], [27], [28]. For these reasons, LMS has attracted significant attention in the higher education field. A vast majority of HEIs have been encouraged to use LMS as an instrument for teaching and learning interactively and collaboratively [29]–[31].

Due to these benefits, KHEIs have always been interested in adopting LMS [32]–[34]. In Kuwait, LMS was used after 2003. Kuwaiti universities and colleges are now at different stages of implementing and managing b-learning modules. A key differentiating factor between KHEIs is their respective LMS. At prestigious KHEIs, LMSs are emerging as a major method of delivery for educational content [35]. The two of the most popular LMSs, Blackboard and Moodle used in Kuwait LMSs. The Kuwait University (KU) installed Blackboard in 2005 [36]. The Australian College of Kuwait (ACK), Kuwait College of Science and Technology (KCST), Kuwait Technical College (KTC), Box Hill College, Kuwait (BHCK) and American University of Kuwait (AUK), all used Moodle as LMS. American International College (AIC) used CANVAS and Gulf University for Science and Technology (GUST) used PACE. Some KHEIs developed their own LMSs as the Arab Open University, Kuwait (AOU, Kuwait).

LMS acts as a communication tool between the student and the instructor via open, built-in forums and chat rooms [37]. Graham *et al*. [38] stated that if b-learning is not defined clearly and applied strategically when implementing an LMS, universities would face uncertainties that will affect the efficiency of b-learning. Thus, Higher Education Institutions (HEIs) face with the need of identifying different factors related to student and instructor satisfaction with LMS in a b-learning environment, as well as these factors' effects, is crucial to the success of LMSs implementation [23], [39]–[45].

The human dimension of LMSs implementation is one such pivotal factor in the uncertainty of b-learning. Research shows that developing countries instituting b-learning programs and other emerging technologies are failing due to the oversight of distinctive human elements [46]–[51].

There is an evident shortage of studies identifying human dimensions as crucial factors in determining the effectiveness of LMS in a b-learning environment, mainly studying the relationships between interaction, acceptance, and satisfaction in developing countries [45], [48], [51]–[55].

Thus, more focused research was needed to guide KHEIs and provide a more thorough understanding of the implementation of LMSs in b-learning environments on campuses. This preliminary study aims to validate the current literature and explore new areas related to the human dimensions of LMSs. The findings of the study will be incorporated into a model that KHEIs can use as a guide for future LMS planning. Overall, this study will add to existing knowledge to enhance the quality of Kuwait's educational institutions through effective use of LMSs.

The main objective of this research is the impact of human dimensions on the effectiveness of LMS used by public and private universities and colleges in Kuwait. In order to achieve the main objectives, sub-objectives identified are:

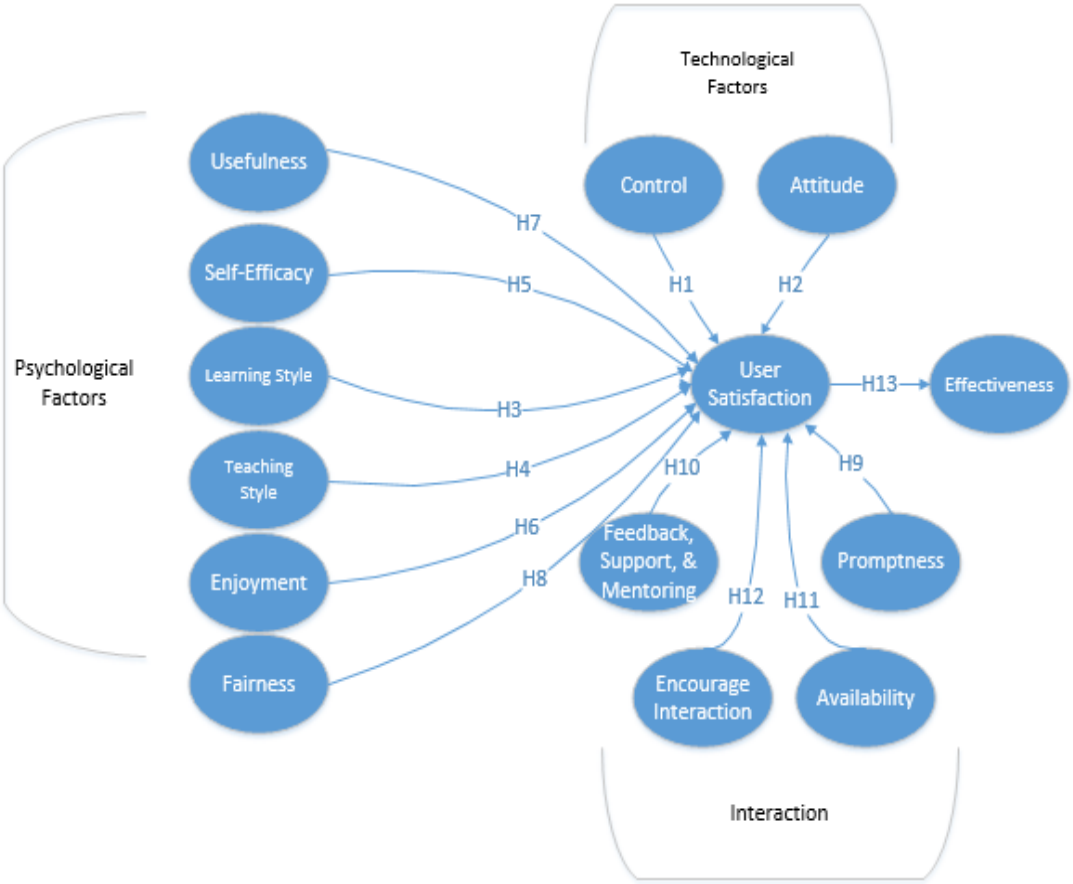

FIGURE 1. The conceptual research model.

1. Study the effectiveness of LMS through a human interaction lens, considering the users: students and faculty members.
2. Determine whether previous literature on the subject applies to Kuwait's public, private colleges, and universities.
3. Collect feedback about LMS from students and faculty members in a neutral manner.
4. Explore the main human factors impacting the effectiveness of LMS.
5. Design a new model that can be adopted by universities and colleges using LMS in their educational systems.

II. METHODOLOGY

A. RESEARCH MODEL

Figure 1 shows a proposed conceptual model based on several models described in the literature and combines multiple factors that were extracted from the virtual learning environment (VLE) effectiveness model of Piccoli *et al.* [56] and the Hexagonal E-Learning Assessment Model (HELAM) framework in higher education of Ozkan and Koseler [57]. Additional dimensions were added to the model and adapted from different other resources [23], [28], [58]–[62]. We identified different factors mentioned in Table 1 and combined them into one model to be tested for significance.

B. HUMAN DIMENSION VARIABLES

Human factors are significant predictors of b-learning effectiveness models, when these factors are included, they contributors to successful students and lecturers in improving teaching and learning outcomes [63]–[65].

Previous research was built on older e-learning models that are enhanced with an additional human dimension. Piccoli *et al.* [56] discussed this relationship between the human dimension and the effectiveness of e-learning and, proposing that previous e-learning experience is an antecedent for success in future b-learning experiences. Ozkan and Koseler [57] extended the work of Johnson *et al.* [58], adding a social factor to their model of effectiveness.

Students are the primary actors in any learning environment, including b-learning environments. Accordingly, researchers who studied the human dimension found that many characteristics of students have a direct relationship with the effectiveness of b-learning environments [39]–[41], [65]–[70].

The standard conceptual model adopted across the literature consists of a dependent variable, a mediating variable, and independent variables.

TABLE 1. Summary of the variables and referenced literature.

Factor	*Variable*	*Type*	*Literature Review*	*Literature Support to Questions*
Technological Characteristics	Control	Independent	Piccoli *et al.*, 2001 [56] Mohammadi and Fadaiyanb, 2014 [92] Oliveira *et al.*, 2016 [91]	Piccoli *et al.*, 2001 [56]
	Attitudes	Independent	Eom, 2012 [59] Trayek and Sariah, 2013 [93] Alghamdi and Bayaga, 2016 [94] Alario-Hoyos *et al.*, 2015 [95]	Piccoli *et al.*, 2001 [56]
Psychological Characteristics	Learning style	Independent	Piccoli *et al.*, 2001 [56] Sahasrabudhe and Kanungo, 2014 [96] Chaw and Tang, 2018 [107]	Piccoli *et al.*, 2001 [56]
	Teaching style	Independent	Piccoli *et al.*, 2001 [56] Sahasrabudhe and Kanungo, 2014 [96] Chaw and Tang, 2018 [107]	Piccoli *et al.*, 2001 [56]
	Self-efficacy	Independent	Compeau and Higgins, 1995 [103] Cavanaugh *et al.*, 2000 [101] Lee and Hwang, 2007 [102] Florence M. *et al.*, 2010 [104] Zheng *et al.*, 2018 [97]	Piccoli *et al.*, 2001 [56] Eom, 2012 [59]
	Enjoyment	Independent	Ozkan *et al.*, 2009 [57] Khalid, 2014 [105] Findik-Coşkunçay *et al.*, 2018 [98] Hammouri and Abu-Shanab, 2018 [99]	Piccoli *et al.*, 2001 [56]
	Usefulness	Independent	Ozkan *et al.*, 2009 [57] Ifinedo *et al.*, 2018 [70]	Piccoli *et al.*, 2001 [56]
	Fairness	Independent	Ozkan *et al.*, 2009 [57] Lin, 2018 [100]	Piccoli *et al.*, 2001 [56]
Interaction Characteristics	Promptness	Independent	Sun *et al.*, 2008 [52] Ozkan *et al.*, 2009 [57] Rashida *et al.*, 2018 [117]	Ozkan *et al.*, 2009 [57] Piccoli *et al.*, 2001 [56]
	Feedback, support and mentoring	Independent	Peltier *et al.*, 2007 [60] Eom, 2012 [59] Nurakun Kyzy *et al.*, 2018 [120]	Ozkan *et al.*, 2009 [57]
	Availability	Independent	Piccoli *et al.*, 2001 [56] Hara, 2003 [25] Ozkan *et al.*, 2009 [57] Hammouri and Abu-Shanab, 2018 [99]	Ozkan *et al.*, 2009 [57]
	Encourage interaction	Independent	Marks *et al.*, 2005 [61] Abdul Rahman *et al.*, 2010 [72] Molinillo *et al.*, 2018 [122]	Ozkan *et al.*, 2009 [57]
The Technological, Psychological and Interaction characteristics factors will affect Satisfaction that in turns affect effectiveness.	Satisfaction	Moderating	DeLone and McLean, 2003 [123] AlMutairi and Subram, 2005 [76] Naveh *et al.*, 2012 [75] Hammouri and Abu-Shanab, 2018 [99]	Piccoli *et al.*, 2001 [56] Eom, 2012 [59]
	Effectiveness	Dependent	Piccoli *et al.*, 2001 [56] Ozkan *et al.*, 2009 [57] Liaw *et al.*, 2007 [73] Johnson *et al.*, 2008 [58] Abdulrahman *et al.*, 2011 [72] Patmanthara and Nur, 2018 [71] Findik-Coşkunçay *et al.*, 2018 [98]	Eom, 2012 [59]

1) THE DEPENDENT VARIABLE

A dependent variable is a hypothetical result, effect, or outcome in an empirical study. This variable depends on the independent variable either directly or indirectly through a mediating variable. In this study, the dependent variable is LMS effectiveness, which is described as the outcome of the interaction between the user and the system. LMS effectiveness is measured in the length of time it took a user to accomplish a task and the accuracy with which the user achieved this [23], [28], [56]–[58], [71]–[74].

2) THE MEDIATING VARIABLE

A mediating, or intermediate, variable is the variable that links the dependent and independent variables, thus influencing or intervening in the two variables' relationship. In this study, the mediating variable was user satisfaction. User satisfaction is an indication of interaction between the LMS

effectiveness variable from one side and the users from the other side [69], [75]–[80].

3) INDEPENDENT VARIABLES

An independent variable is the assumed cause in an empirical study. This variable directly or indirectly impacts, through a mediating variable, the dependent variable. All other variables that may impact the dependent variable are controlled by the independent variable. In this study, the independent variables were related to user characteristics: technological characteristics, psychological characteristics, and student-instructor interaction characteristics [27]. These three characteristics are the main indicators of human impact on the effectiveness of LMS.

a: TECHNOLOGICAL CHARACTERISTIC VARIABLES

Technological characteristics reflect the extent of users' familiarity with technological innovations such as LMS and how well they can adapt to LMS. These characteristics are represented by two variables: control [52], [81]–[86] and attitude [52], [74], [85], [87]–[91]. Mohammadi and Fadaiyan [92] and Piccoli *et al*. [56] found that a user's control over the technology they are dealing with, such as LMS, is directly related to the effectiveness of a learning environment. Learner control refers to the degree of freedom. The learner control includes modifying the pace, sequence, and content of instruction in b-learning environment. The positive attitude of an instructor towards technology will also impact the degree of effectiveness of an LMS system [51], [52], [68].

The attitude of instructors in the academic institutions towards LMS use in teaching is hypothesized to be context specific. The attitude also depends on the type of LMS, the sociocultural factors of the country, the institutions and personal experiences of the instructors [89].

Moreover, the student's positive attitude towards technology will also impact effectiveness [59], [93]–[95].

b: PSYCHOLOGICAL CHARACTERISTIC VARIABLES

Psychological characteristics reflect the personality of people. These characteristics are typically related to human behavior, thoughts, feelings, and emotions. These can be categorized into five variables: teaching and learning styles, self-efficacy, enjoyment, fairness, and usefulness [56], [57], [70], [96]–[107].

Piccoli *et al*. [56] stated that the users' teaching and learning styles are a significant factor in learning effectiveness. Students and faculty may have different teaching and learning styles that have to be accommodated by the features of the LMS. Moreover, the student's self-efficacy is also a significant dimension of LMS effectiveness [101].

Self-efficacy is defined as an individual's ability to believe that they are capable of performing a particular task at the required level [97], [102]. Subsequently, researchers in the field of information management systems started introducing definitions of computer self-efficacy. Compeau and Higgins [103] described it as "*an individual's perception of his or her abilities to use computers in the accomplishments of a task*." Martin *et al*. [104] observed that the user's self-efficacy was positively related to the outcomes of the e-learning system. Therefore, as long as the user retains the belief that they can do the job using the LMS, LMS effectiveness will be positively impacted.

Ozkan and Koseler [57] also described enjoyment, fairness, and usefulness as dimensions of LMS effectiveness. A user has to enjoy working with the LMS, as this enjoyment ensures that they will spend more time with the system, and it will, therefore, be more successful. Also, when a student enjoys what they are doing, they become more engaged with their work. Khalid [105] found that enjoyment at work is positively related to career satisfaction and performance and negatively related to strain and stress. This is also supported by [98], [99].

In addition, a user has to view the whole process as fair [68], [108]–[110]. The instructor uses fairness in grading, communicating with students, and providing support and mentorship. If a student feels that the instructor is unfair by any means, this would create an unpleasant feeling towards the instructor and perhaps towards the whole environment, including the LMS [100]. The instructor has to be helpful to the student beyond merely acting as a source of communication and interaction [67], [70], [81], [106], [111]–[115]. According to Davis [116], perceived usefulness can be defined as: "*The degree to which a person believes that using a particular system would enhance his or her job performance*".

c: INTERACTION CHARACTERISTIC VARIABLES

Interaction characteristics reflect the sense of communication between students and faculty. Dias *et al*. [28] studied b-learning environment with the users' quality of interaction (QoI) and found that QoI is useful in terms of developing more dynamic educational strategies and scenarios. It shows that enhanced interactions between instructors and students encourage students to increase participation in the courses. Piccoli *et al*. [56] and Ozkan and Koseler [57] pointed to availability as the primary contributor to a learning system's effectiveness. A sense of instructor non-availability may lead the student to a feeling of isolation [25] and also may affect the student's enthusiasm.

The availability characteristic is linked to the promptness, responsiveness, and communication ability dimensions mentioned in HELAM framework by Ozkan and Koseler [57]. The student is not only expected to be available but also expected to communicate rapidly and clearly during this availability. For instance, after an exam, students expect the instructor to post the grade on the LMS as soon as possible, discuss the grade, and give reasonable answers as to why they received that grade. Hence, promptness is a user characteristic that is linked to the effectiveness of an LMS [57], [117].

The students play the primary role in LMS [118], [119], which makes the student an active rather than a passive learner. Students always aim to seek help from instructors,

and the instructor has to guide them in the use of LMS. Eom [59] found that user feedback is also a dimension of LMS effectiveness. Students are enthusiastic about receiving their feedback as soon as possible, so student should be readily available to provide this response [60], [120].

Also, Peltier *et al*. [60] proposed that support and mentoring are essential for the effectiveness of a learning system. This support and mentoring may come in many forms. Some instructors prefer to make a brief presentation to introduce the LMS used by their course. Others adopt different practices, such as preparing a manual and uploading it through the LMS. In all situations, the instructor has to be ready to provide help and support to their students.

Marks *et al*. [61] identified that for an organization to succeed in the technological change process, it has to consider interactions between different organizational stakeholders. Therefore, the interaction must occur not only between the instructor and the student, but also between the student and other students and between the instructor and other instructors [74], [121]. These forms of interaction will positively affect LMS effectiveness [71].

Interaction involves any form of contact between the instructor and the student, including replying to e-mails, questions, and queries via the LMS. Therefore, the instructor must not only upload and download data to and from the LMS, but also create an interactive environment with their students via the LMS and its built-in tools. The instructor should actively encourage interaction between students with each other through the LMS will increase their use of the system, which will render the LMS more effective [23], [74], [122]. This encouragement comes in many forms; for instance, the instructor might motivate the students to do group homework and submit it through the LMS, or form study groups to discuss lectures or reports online.

Some of the student's characteristics are under the researcher's inspection and subject to survey. A summary of the variables and referenced literature is shown in Table 1.

C. THE MODEL HYPOTHESES

The following hypotheses from the literature review and observations were adopted in the model:

H1: The user's control over technology has a positive effect on user satisfaction.

H2: The user's positive attitude towards technology has a positive effect on user satisfaction.

H3: The student's learning style has a positive effect on user satisfaction.

H4: The faculty's teaching style has a positive effect on user satisfaction.

H5: The user's high self-efficacy has a positive effect on user satisfaction.

H6: The user's enjoyment has a positive effect on user satisfaction.

H7: The usefulness perceived by the user during LMS interaction has a positive effect on user satisfaction.

H8: The fairness implemented by the user has a positive effect on user satisfaction.

H9: The degree of promptness perceived by the user has a positive effect on user satisfaction.

H10: The quality of feedback, support, and mentoring provided by/to the user has a positive effect on user satisfaction.

H11: The availability, or online status, of the user, has a positive effect on user satisfaction.

H12: The interaction encouraged by the user has a positive effect on user satisfaction.

H13: The high degree of positive user satisfaction has a direct effect on the effectiveness of LMS usage.

D. RESEARCH FRAMEWORK

A pragmatic approach was used to achieve this study's primary objective: analyzing the impact of human dimensions on the effectiveness of LMS used by all governmental and non-governmental universities and colleges in Kuwait. This approach was composed of a quantitative and qualitative method, which is shown in Figure 2.

The user characteristics impacting the effectiveness of an LMS were gathered from a comprehensive literature review. This study analyzed current theories and models, developed hypotheses, and provided evidence to support or reject these hypotheses. Through this method, previous literature theories were described as foundational knowledge for a proposed improved model. A quantitative deductive methodology was followed during multiple stages: while exploring literature theories and models, creating multiple hypotheses, and, finally, while attempting to provide evidence supporting or rejecting those hypotheses. This approach was used to describe and explain the theories adopted from previous literature. Additionally, an inductive, qualitative approach was used to explore additional factors related to the human dimension of LMS effectiveness. Data were collected from questionnaires and interviews, analyzed, and organized into a new, improved LMS model. Randomly selected students and faculty from different majors and different years at public and private colleges and universities in Kuwait were selected to constitute the sample.

The questionnaire was composed of two parts: in the first part, a collection of demographic information, and second, a survey of the various factors affecting LMS effectiveness. The second part consisted of five sections: technological characteristics, psychological characteristics, interaction characteristics, satisfaction, and effectiveness. All questions in the second part were Likert scale questions in which 1 was Strongly Disagree, 2 Disagree, 3 Neutral, 4 Agree, and 5 Strongly Agree. The questionnaire consisted of 57 items and 5 factors. Two versions of the questionnaire were prepared. One version was aimed to collect data from faculty, and the other version was aimed at students.

Before distributing the questionnaire, it was validated from at least one expert from each college or university that belonged to the sample to ensure that the questionnaire

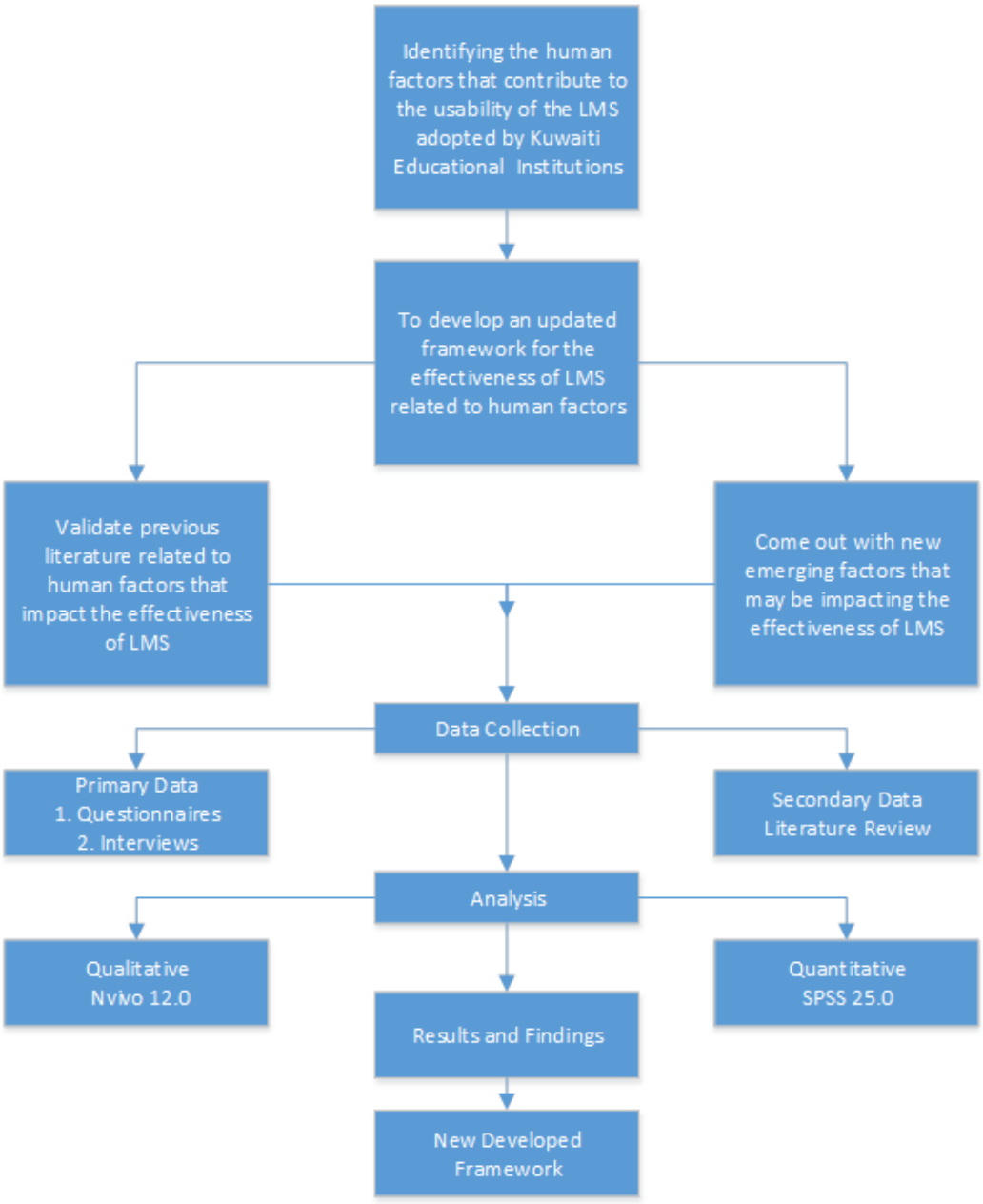

FIGURE 2. Research process flowchart to determine the impact of human factors on the LMSs at KHEIs.

is understandable by all students and faculty members. In addition, before distributing the questionnaire, we assured both the faculty members and students that anonymity to any participant. Finally, during the data collection, respondents were encouraged to communicate all their queries, if any exists. Some questions and few e-mails were sent, and all feedback was addressed.

For the qualitative part, the structured interview format was followed. Three questions were constructed to explore new human-related factors that impact the effectiveness of an LMS.

Data collected from the questionnaires were analyzed using SPSS 25.0. Frequencies and percentages were used to describe categorical data. Measures of central tendency such as mean, mode, median, skewness, and kurtosis were used to characterize scale measures of different sections. Cross tabulation was created to test the relationships between demographic variables. Moreover, a test of reliability and validity was conducted using the Cronbach's alpha test and the means of Pearson correlation coefficients for each section. Factor analysis was also implemented to reduce data and eliminate some unimportant factors.

Interviews were conducted with students and faculty from different institutions. Data collected from interviews were qualitatively analyzed using NVivo 12. Both frequency and descriptive coding were examined. Effective or emotional coding was used to determine the satisfaction levels among users.

III. DATA COLLECTION INSTRUMENTS AND SOURCES

Mixed methods of qualitative and quantitative approaches are used in this study. According to Creswell and Johnson & Turner [124], [125], implementing a mixed methods research approach would be influential. Therefore, a faculty survey and a student survey were employed for data collection purposes for the quantitative part. In addition, a qualitative research in the format structured interview was carried out.

A. QUANTITATIVE RESEARCH

The researchers constructed a quantitative survey in the form of questionnaires that contained at least three questions for each variable. These questions were collected from the literature review, then modified to suit the sample. The first part of the survey was intended to collect demographic data. The first part consisted of six questions related to gender, age, level of education, number of hours spent using LMS, nationality, and university/college. The second part consisted of five sections: technological characteristics, psychological characteristics, interaction characteristics, satisfaction, and effectiveness. In the second part, some questions were different in the student's questionnaire than the faculty's questionnaire, particularly those related to teaching and learning styles. Each factor was represented by six questions. Some questions were addressed in the opposite way to ensure the reliability of the answers.

To ensure that the questionnaires were readable, understandable, and applicable, the researcher validated. Before the data collection process was started, at least one professor from each institution (university or college) was asked to provide their opinion about the questionnaires and suggest modifications and comments. Then, the researcher modified specific questions' structure, format, and content accordingly. The researcher contacted the universities and colleges to grant permission to distribute questionnaires and conduct interviews following simple and convenient random sampling methods. An e-mail containing a brief description of the questionnaire and an online link to the survey was drafted by the researcher, then sent to students and faculty by student affairs departments. Data from the questionnaires were collected from the spreadsheet automatically linked to the online copy. This spreadsheet was exported to the statistical software package SPSS 25.0 for further in-depth statistical analysis.

For testing the relationship between demographic variables, Cross tabulation was conducted [126]. The reliability and validity was proven by using the Cronbach's alpha test and mean of Pearson correlation coefficients [127]–[129]. For eliminating insignificant factors in the data, factor analysis was used [130], [131]. Also, the tests of correlation and regression have been implemented for testing the relationship between the dependent, mediating, and independent variables [132].

B. QUALITATIVE RESEARCH

Interviews were considered beneficial in this case because they allow deeper lines of questioning than surveys [125]. For the sake of interviews, the researcher aimed at booking appointments from faculty members and randomly selected students on campus for the same purpose following the convenience sampling method. For phenomenological studies, Creswell [133] recommends between 5 and 25 interviews, and Morse [134] suggests that at least six interviews be conducted. However, it is always saturation that ultimately affects the number of interviews. In our case, 21 interviews were conducted with students and faculty.

The researcher followed a structured interview format. Three questions were constructed for the purpose of exploring new human-related factors that impact the effectiveness of an LMS. Data from interviews was transformed into transcripts and then uploaded to ''NVivo 12'', a special software used for qualitative analysis. Both frequency as well as descriptive coding, was approached in the qualitative analysis. In addition, effective or emotional coding was approached to test the level of satisfaction among the users.

IV. ANALYSIS AND RESULTS

A. QUANTITATIVE ANALYSIS AND RESULTS

1) DESCRIPTIVE RESULTS

Frequencies and percentages are used to describe demographic data. Although a sample size between 100 and 200 is sufficient for a multi-group analysis [127], a sample size of 402 users, 146 from faculty members and 256 from students, were selected from the population in this study. Six colleges and universities participated in the survey and interviews. The age category of ''Older than 34'' was the highest frequency, with a share of 67.9%. For gender, nationality, and institution, the highest frequencies were occupied by (Male=55%), (Non-Kuwaiti=60.7%), and (Kuwait University=29.9%). Additionally, for major, academic level, and the number of hours spent on LMS, the highest frequencies were (Engineering=43%), (student=70.6%), and (Less than 1 hour=61.4%).

Measures of central tendency such as mean, mode, and median are best used to describe Likert scale data. Skewness and kurtosis values were obtained to describe the lack of symmetry compared to a normal distribution curve and to check whether the data had a peak or reflected flatness compared to a normal distribution curve. Table 2 shows the average values for each section of the questionnaire.

For the technological, interaction, and psychological factors, the mean and median didn't differ that much and were almost coinciding at (3) the neutral level. As for the satisfaction and effectiveness factors, the median and the mode were coinciding at (4) which is the agree level. Both factors showed

TABLE 2. Measures of central tendency.

Variable Statistics								
Dimension	Mean	Median	Mode	Std. Deviation	Skewness		Kurtosis	
					Statistic	Std. Error	Statistic	Std. Error
Technology	3.07	3	3	1.344	0.032	0.122	-1.173	0.243
Psychology	2.61	3	1	1.498	0.336	0.122	-1.318	0.243
Interaction	3.1	3	5	1.433	-0.034	0.122	-1.291	0.243
Satisfaction	2.27	4	4	1.557	0.745	0.122	-1.026	0.243
Effectiveness	2.35	4	4	1.616	0.655	0.122	-1.226	0.243

some positive skewness to the right since the mean is smaller than the median.

All the factors showed a kurtosis which is less than 3 (the kurtosis value of a normal distribution). This means that the collected dataset has lighter or thinner tails than a normal distribution has [135].

2) ASSESSMENT OF THE CONCEPTUAL MODEL

a: HYPOTHESIS TESTING BY CORRELATION

All of the hypotheses were supported through Pearson correlation tests. The results ranged from weak to strong correlations. All values were significant at the 0.01 level (2-tailed) [128]. Table 3 shows a summary of the results.

b: CRONBACH'S ALPHA TEST AND FACTOR ANALYSIS

Cronbach's alpha test was completed for the whole questionnaire and showed a result of 0.871. This test was conducted on each set of questions related to the same variable. After the weak items were deleted, sections' reliability ranged from 0.700 to 0.950, which indicates robust reliability [136]–[138], as shown in Table 4.

The methodological framework consists of eleven independent variables: control, attitude, learning style, teaching style, self-efficacy, enjoyment, usefulness, fairness, promptness, feedback, support and mentoring, availability, and encourage interaction. These variables are used to predict the dependent variable that is effectiveness. Factor analysis is done to reduce any duplication found in the set of data of those correlated variables. In order to do factor analysis, two conditions have to be met. First, the sample size has to be big enough ($n > 300$) and the variables have to correlate but not too much ($0.5 < r < 0.9$) [139]. The two conditions are met since $n = 402 > 300$, and section correlations are more than 0.5 and less than 0.9. In addition, in order to test whether it is convenient to apply factor analysis on a group of scale measures, two tests of sampling adequacy known as Kaiser Meyer Olkin (KMO) and Bartlett's test of sphericity are generated. In order to validate the factor analysis results, two conditions must apply: KMO ≥ 0.5 and Bartlett's test must show significance at $p < 0.05$ [140].

TABLE 3. Summary of hypothesis testing by correlation.

Hypothesis	Variables	Results	Supported by Significance
H1	Control & Satisfaction	r=0.552 *** Moderate Correlation	Yes
H2	Attitude & Satisfaction	r=0.570 *** Moderate Correlation	Yes
H3	Learning Style & Satisfaction	r=0.680 *** Moderate Correlation	Yes
H4	Teaching Style & Satisfaction	r=0.548 *** Moderate Correlation	Yes
H5	Self-Efficacy & Satisfaction	r=0.625 *** Strong Correlation	Yes
H6	Enjoyment & Satisfaction	r=0.629 *** Strong Correlation	Yes
H7	Usefulness & Satisfaction	r=0.622 *** Strong Correlation	Yes
H8	Fairness & Satisfaction	r=0.325 *** Weak Correlation	Yes
H9	Promptness & Satisfaction	r=0.592, *** Moderate Correlation	Yes
H10	Feedback, Support, Mentoring, & Satisfaction	r=0.582 *** Moderate Correlation	Yes
H11	Availability & Satisfaction	r=0.509 *** Moderate Correlation	Yes
H12	Encourage Interaction & Satisfaction	r=0.465 *** Moderate Correlation	Yes
H13	Effectiveness & Satisfaction	r=0.822 *** Strong Correlation	Yes

*** p<0.001

TABLE 4. Reliability test - Cronbach's alpha test and mean correlations.

Subscale Variables	Alpha Before Item Deletion	Items Deleted	Alpha After Item Deletion	Valid N	Excluded N	Mean Correlations
Control	0.544	FT5	0.832	401	1	0.867
Attitude		FT3, FT6				
Learning Style	0.979	None	0.979	399	3	0.834
Teaching Style		None				
Self-Efficacy		None				
Enjoyment		None				
Usefulness		None				
Fairness		None				
Promptness	0.905	None	0.905	399	3	0.887
Feedback, Support, & Mentoring		None				
Availability		None				
Encourage Interaction		None				
Satisfaction	0.883	None	0.883	400	2	0.931
Effectiveness	0.987	None	0.987	402	0	0.940

None: None of the variable items has been deleted.

Table 5 shows a summary of mean correlations, KMO, and Bartlett's test values. All indicate that factor analysis is applicable.

TABLE 5. Factor analysis validation.

Dimension	*Factor*	*Mean Correlation Within Section*	*KMO*	*Bartlett's Test of Sphericity*
Technological	Control	0.867	0.627	χ^2 = 947.861 p <0.001
	Attitude			
Psychological	Learning Style	0.834	0.972	χ^2 = 9569.184 p <0.001
	Teaching Style			
	Self-Efficacy			
	Enjoyment			
	Usefulness			
	Fairness			
Interaction	Promptness	0.887	0.908	χ^2 = 5591.824 p <0.001
	Feedback, Support & Mentoring			
	Availability			
	Encourage Interaction			

For the construct validity, the Factor Analysis test was conducted. The 57-item and 5-factor structure of the scale with an eigenvalue that is greater than 1 for all of the components.

Table 6 shows how the variance is divided among five factors. Eigenvalue explains 71.168% of the total variance. The percentages of explained variance are 39.182, 11.234, 10.658, 5.423, and 4.671 respectively. The Percentage variance in Extraction Sums of Squared Loadings are identical to the Initial Eigenvalues [130].The results are summarized in Table 6.

TABLE 6. Total factor analysis variance results.

Component	*Initial eigenvalues*			*Extraction sums of squared loadings*		
	Total	*% of variance*	*Cumulative (%)*	*Total*	*% of variance*	*Cumulative (%)*
1	13.416	39.182	39.182	13.416	39.182	39.182
2	3.716	11.234	50.416	3.716	11.234	50.416
3	3.153	10.658	61.074	3.153	10.658	61.074
4	1.924	5.423	66.497	1.924	5.423	66.497
5	1.541	4.671	71.168	1.541	4.671	71.168

c: CROSS TABULATIONS

Cross tabulations were examined to obtain the joint frequency distributions between two categorical variables in the demographics section [126]. The numbers supported significance in the results of cross-tabulation of hours vs. nationality, major, and university/college. Significantly, Kuwaitis, business majors, PhD holders, and Kuwait University users used the LMS for less than 1 hour. Table 7 shows the Chi-square test summary for cross-tabulation in user demographics.

TABLE 7. Chi-square tests summary for cross-tabulation in user demographics.

Crosstab	*Pearson Chi-square* χ^2	*Asymp. Sig. (2-sided)*	*Supported by Significance The relationship is significant at the 0.05 level (2-tailed)*
Hours vs. Age	4.819	0.850	No
Hours vs. Gender	2.441	0.486	No
Hours vs. Nationality	12.763	0.005	Yes
Hours vs. Major	54.373	0.000	Yes
Hours vs. Academic Level	15.238	0.005	Yes
Hours vs. University/College	211.320	0.000	Yes

B. QUALITATIVE ANALYSIS AND RESULTS

After emotional coding was implemented, out of the 21 interviewees, 17 seemed to show dissatisfaction with the LMS, either by expressing their annoyance or by complaining. On the other hand, after the frequency and word count were run using NVivo 12, many factors related to interaction, psychology, and technology dimensions appeared. Some of these factors were already mentioned in previous literature and were validated in the initial framework. However, this study's aim, as mentioned earlier in the qualitative section, was to search for any new factors. Factors such as brand and training emerged from the technology dimension. Additionally, factors such as expectation and need emerged from the psychology dimension. Moreover, the fairness factor related to the psychology dimension was never mentioned at all and is accordingly assumed to have a very low impact; thus, it was deleted from the modified framework.

Table 8 lists each code and subcode in the model. The sources column shows how many interviews this code or subcode was mentioned in. The reference column shows how many times this code or subcode was referenced in all 21 of the user interviews. These two columns were generated from NVivo through manual descriptive coding by dragging the references into the nodes that were containers for these codes. The word, count, and weighted percentage columns were generated from two queries run in NVivo: the frequency query and the text search query. The word column represents the word for which a query was run. The count column shows how many times this word was repeated. The weighted percentage column shows what percentage of all the interviews this word accounts for.

1) THE UPDATED MODEL

The updated model is a modification of the suggested conceptual model. Fairness had a weak correlation and, thus, was eliminated in the new model. Moreover, all emerging factors that originated from the qualitative research were added to the new model. The new emerging factors are training, brand, need, and expectation. The updated model of human-related dimensions on the effectiveness of LMS at Kuwait's higher education institutes is shown in Figure 3.

TABLE 8. User interview results through frequency coding.

Name	*Sources*	*References*	*Word*	*Count*	*Weighted Percentage (%)*
Interaction	19	85	Interaction	5	0.12
Availability	3	7	Available	2	0.04
Reach	2	4	Reach	3	0.07
Encouraging Interaction	9	18	Interaction	5	0.12
Students Do Not Use It	7	8	---	---	---
Students Use It	2	2	---	---	---
Feedback, Support, & Mentoring	16	38	---	---	---
Announcements	10	11	Announcements	9	0.21
Grades	15	27	Grades	41	0.96
Promptness	11	21	---	---	---
Time-Consuming	11	21	Time	38	0.89
Psychology	18	116	---	---	---
Enjoyment	7	10	Enjoy	2	0.05
Happy	4	5	Happy	6	0.14
Punishment	3	4	Punish	2	0.05
Expectation	7	12	Expect	4	0.09
Convinced	4	6	Convinced	5	0.12
Meets	2	2	Meet	6	0.14
Unable to Meet	3	3			
Fairness	0	0	---	---	---
Need	10	37	Need	26	0.61
Obligatory	5	10	Obliged	3	0.07
Optional	15	35	---	---	---
Readiness	2	3	---	---	---
Willingness	6	13	Willing	5	0.12
Self-Efficacy	9	14	---	---	---
Good Skills	4	4	Skills	4	0.09
Unable to Use	6	8	---	---	---
Teaching Style	8	14	---	---	---
Modern	3	5	Modern	4	0.09
Traditional & Old	6	8	Traditional	5	0.12
Usefulness	12	28	Use	108	2.52
Double the Work	5	8	Double	8	0.19
Helps Me	10	15	Help	4	0.09
Technology	19	83	---	40	0.95
Attitude	9	14	---	---	---
Difficult	5	8	Difficult	8	0.19
Easy	4	4	Easy	8	0.19
Like	2	2	Like	32	0.75
Brand	6	8	---	---	---
Prefer Switching	5	6	---	---	---
With the Current	1	1	Control	5	0.12
Control	14	33	---	---	---
Data Security and Backup	7	16	Backup, Insecure, Secure	13	0.31
File Size	2	3	Files	15	0.35
Link to Other Software	5	5	Link	7	0.16
Update	6	7	Update	8	0.19
Training	10	23	Training	18	0.42
Custom	4	4	---	---	---
General	3	3	---	---	---
Knowledge Sharing	3	5	Knowledge Sharing	5	0.12

---: No word has been extracted from the interview.

V. DISCUSSION

This quantitative research results agreed with the literature and successfully categorized the factors impacting the effectiveness of LMS according to their importance. All hypotheses were supported with a significance of 0.001. Some factors such as self-efficacy (H5), enjoyment (H6), and usefulness (H7) showed strong correlation; hence, they are expected to have a strong positive impact on the satisfaction that, in turn, has a strong direct positive impact on effectiveness. Control (H1), attitude (H2), teaching style (H3), learning style (H4), promptness (H9), feedback (H10), availability (H11), and interaction (H12) had different levels of moderate correlations. Fairness (H8) was the only variable that had a weak correlation. These results are consistent with previous studies [52], [70], [91], [94], [95], [97]–[99], [107], [117], [120], [122].

The attitude toward technology was found to be the most impactful factor for the utilization of LMS. It impacts user satisfaction, which is the mediating variable that increases the effectiveness of an LMS. This finding also seems reasonable and consistent with the findings of some prior studies [93]–[95].

Additionally, enjoyment, experience, and self-efficacy had the most substantial impacts on user satisfaction. These factors were extracted from the psychological characteristics. Promptness, which is related to the interaction characteristics, is the strongest factor impacting user satisfaction. Therefore, focusing on the factors identified above will increase user satisfaction and the effectiveness of an LMS. In addition, it was noticed that fairness, which is a variable related to the psychological characteristics, had a weak correlation.

Factor analysis results revealed that the cumulative variance is higher than 60%, and this is considered to be sufficient for the sciences [130]. The 5-factor structure of the scale accounts for around 71.2% of the total variance. These results show that the human dimension has a positive impact on the effectiveness of LMSs in a b-learning environment.

While studying the relationships between demographic items and the number of hours spent on the LMS, cross-tabulations were examined to determine the joint frequency distributions among two categorical variables in the demographics section. The number of hours spent on the LMS was cross-tabulated with age, gender, nationality, educational institution, major, and academic level.

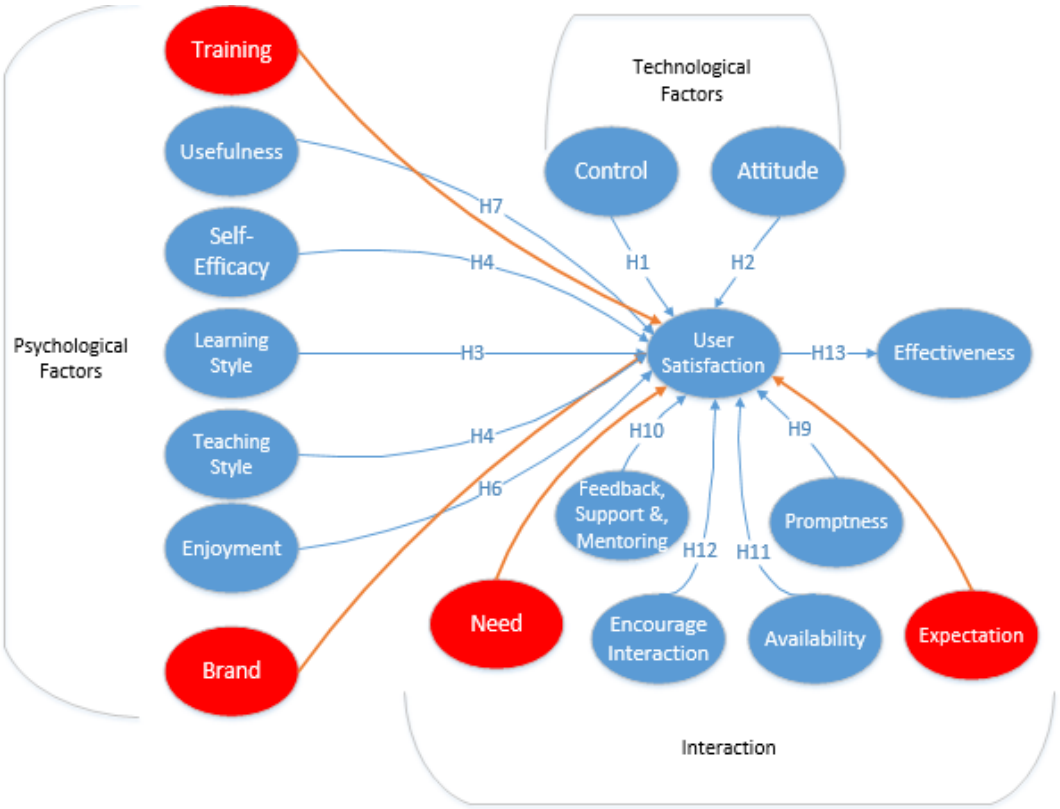

FIGURE 3. **The updated model of human-related dimensions on the effectiveness of LMS at Kuwait's Higher Education Institutes.**

Table 7 presents the Chi-square values as an index of association between the two cross-tabulated categorical variables. The numbers in the table support significance in the results of cross-tabulation of hours vs. nationality, major, academic level, and university/college. Significantly, Kuwaitis used the LMS for the least number of hours (66%). Also, business majors (72%), PhD holders (76%), and Kuwait University users (80%) used the LMS for less than 1 hour.

In terms of qualitative research, the results come to support quantitative research and identified new emerging factors. These emerging factors, including training, brand, expectations met, and need, should have increased focus directed towards them.

The first new emerging factor, training, had 47.6% coverage. Around half of the sample indicated that prior training, whether customized to their needs or more general, it would make them better users of the LMS. Also, the instructors considered that the training is essential in the early stages of the introduction of the LMS technology. One professor spoke about this: "I had so many difficulties. I did not receive any training in the beginning, and not many colleagues were available to share their experience or knowledge in Moodle with me." This outcome is in line with findings of [46], [121], [141], [142]. They reported lack of instructor appropriate training related to using e-learning technology as one of the main barriers towards e-learning integration. These studies also addressed how the overall level of training may be influenced by demographics (gender, age, years of experience), faculty's level of LMS tool use and technological skill. In this regard, universities are encouraged to consider introducing training strategies and offer multiple specialist of training sessions/workshops for both students and faculty based on their background and level of technological skill.

The second emerging factor was the expectation, which had 33.3% coverage and thus a medium impact. Notably, some users did not interact with the LMS either because it did not meet their expectations or because no one convinced them to use it. That meant that they never had the chance to see the benefits of using an LMS. One faculty member at AUK mentioned this issue: "Well, nobody convinced me to use Moodle, and I do not see the benefit of using it. I am happy with my way and how things go with my course." This implies that the students' and faculty members' negative expectancies will negatively influence their attitudes towards LMS technology for blended learning practices [46].

KHEIs must show students and faculty members the benefit of leveraging LMS. Students must stop depending on hard copies and printouts as a substitute for the LMS, and faculty members need to be introduced to all the LMS's features, and they should be convinced that using the LMS will enhance their teaching methodologies. Achieving these objectives will

increase user satisfaction, which will contribute to more prosperous and effective LMS implementation.

The third factor that emerged from this study was the need or necessity. The majority of users felt that they did not need LMS software since they either had a substitute or were not obliged to use it; they would not be motivated to do so. The sub-node ''Optional'' had 71.53% coverage, which relates to how six out of the seven strata indicated in their policies that the use of the LMS is optional. One user said: ''That is my opinion: LMS felt like a punishment. If I had the option not to use it, I would not use it. However, here in this place, it is obligatory''. This finding also seems reasonable and consistent with the findings of some prior studies [38], [74]. These studies also addressed how organizational culture may motivate user engagement in b-learning systems.

In addition, another emerging factor, brand, had a 49.66% coverage in the interviews. Many interviewees were concerned about the LMS's brand, some LMSs more familiar to them, and they seemed to be resistant to change. Any educational institution that was drifting to another brand faced disapproval from users who were unfamiliar with the new system. One user stated: ''Since I was a student, I was familiar with using Moodle as an LMS. It is a pretty flexible system, and I am now accustomed to it. Why do we need to change to a new system that will be tested? Moodle is well known worldwide, and it is number one in LMS''. These findings are in parallel with some prior studies [116], [119], [142]–[144]. Davis [116] confirmed that there is a relationship between users' acceptance and use new technologies. According to [143] ''*change is one of the top ten information technology (IT) issues*''. Meanwhile, many researchers discussed the common challenges that are faced during transitioned from one LMS to another LMS have been consistently mentioned in many studies [119], [143], [144].

VI. CONCLUSION

This research is specific to Kuwait and presents a realistic representation of the human dimensions of LMSs. Its outcomes augment the body of knowledge on enhancing and improving the quality of education in Kuwait's educational institutions through LMS.

Use and effectiveness of LMS can be amplified in universities and colleges all over Kuwait, HEIs must pay careful attention to the human dimension rather than only focusing on the technological dimension as they currently do. Institutions should construct new strategies to accommodate technological, psychological, and interaction factors. In other words, KHEIs using LMSs must not solely invest in design issues such as Internet costs or system interfaces, implementing strategies and tools that enhance the user's self-efficacy and enjoyment will positively affect the success and effectiveness of LMS usage.

To impede the successful implementation and acceptance towards LMS usage for b-learning in KHEIs, KHEIs need to pay attention to training and the selection of the LMS brand. Both students and faculty should be provided with training to enhance their usage of LMS, thus strengthening the user's self-efficacy. With proper training, students and faculty members will feel that using the LMS is a necessity. Based on the findings of the study, the authors conclude that adequate training will enhance student's performance and positively influence the b-learning environment. Also, the appropriate training for faculty members will decrease their technology anxiety and remove the attitudinal barriers of e-learning tools usage [94], [141], [142], [145].

Institutions must consider users' opinions and characteristics about the brand of LMS that they choose to implement. HEIs must not select a type of LMS that is not commonly used anywhere else, because their users will refuse to interact with the LMS. Also, universities and colleges must work on making the LMS meet their users' expectations.

In conclusion, this research provides an updated framework of the human dimensions that impact LMS effectiveness. HEIs can enhance the quality of their education through adopting this framework and implementing strategies to invest in human dimensions.

VII. LIMITATIONS AND FUTURE WORKS

This study has some limitations that need to be further explored. This study only examined the impact of human factors on the effectiveness of LMS in b-learning. Understanding how to overcome these challenges has not been investigated. Thus, it would be suggested to study on the solutions to these challenges in the future.

Future research may also consider expanding further human dimensions in LMSs of Kuwait state. The findings of this study are based on qualitative and quantitative analysis. This can be repeated with only qualitative or only quantitative analysis methods and results can be compared. Furthermore, we plan to run a detailed evaluation experiment to identify the parameter that enhance the quality of KHEIs teaching and learning.

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MAJDI M. ALOMARI (Member, IEEE) received the B.Sc., M.Sc., and Ph.D. degrees in 2001, 2004, and 2011, respectively. He was an Assistant Professor with the Electrical Engineering Department, Hashemite University (HU), from 2012 to 2015, and a Teaching Assistant with the Electrical Engineering Department, University of Technology Sydney (UTS), from 2009 to 2012. He has been an Assistant Professor with the Electrical Engineering Department, Australian College of Kuwait (ACK), since 2015. His research interests include power system analysis, power system stability and control, power system planning, power system protection, power electronics, electrical machines and drives, electric machine design, renewable energy, smart grid, energy planning and policy, control systems, optimal control, nonlinear dynamics, linear system analysis, and other related topics. Dr. Alomari is a member of the IEEE Power & Energy Society. Also, he is a Chartered Professional Engineer (CPEng) of Engineers Australia (EA).

HANIA EL-KANJ was born in Tripoli, Lebanon, in 1983. She received the B.E. degree in communication and electronics engineering from Beirut Arab University, in 2005, and the master's degree from Maastricht University, in 2014. She started teaching undergraduate courses since 2005 till present in many universities in Lebanon and Kuwait. She is currently an Instructor with the Electrical Department, Australian College of Kuwait. Her research interests include solar energy, Bluetooth development kits, and learning management systems. She has been a member of the Ordre des Ingénieurs et Architectes, Liban, since 2005, and the Kuwait Society of Engineers, since 2018.

NAFESAH I. ALSHDAIFAT received the B.Sc. and M.Sc. degrees in 2005 and 2012, respectively. She was a Lecturer with the Department of Renewable Energy Engineering, Middle East University, from 2012 to 2017. She is currently a Consultant with JoVision, Hamburg, Germany. Her research interests include energy planning and policy, environmental impact assessment, renewable energy, analysis of pollution effects and control technologies, risk analysis of energy systems, costs and benefits of environmental management, policy and planning of energy conservation, and evaluation of infrastructure investments. She is a member of Engineers Australia (EA).

AYSE TOPAL was born in Turkey, in 1983. She received the B.S. degree in business administration from Marmara University, Istanbul, Turkey, in 2006, and the Doctor of Philosophy (Integrated Ph.D.) degree in energy planning and policy from the University of Technology Sydney (UTS), Australia, in 2015. She is currently an Assistant Professor with Nigde Omer Halisdemir University, Turkey. Her research interests are decision making, renewable energy, sustainability, and energy planning. From 2015 to 2019, she supervised and completed one Masters by Research thesis, currently supervising three Masters by Research thesis, published several articles and conference papers, and teaching several courses at bachelor's, master's, and doctorate degrees. The awards she received are UTS International Research Scholarship (IRS), YLSY—International Postgraduate Research Scholarship (Turkish Ministry of Education), Istanbul Chamber of Commerce Scholarship, and Istanbul Metropolitan Municipality Educational Award.