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Review Article

Toward E-learning Readiness and Maturity: The Concepts, Assessment Models, and Affecting Dimensions and Factors

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ABSTRACT

Background: The sudden adoption of e-learning as a quick alternative educational system to rescue education due to the widespread chaos to which educational institutions have been exposed due to the Covid-19 pandemic since 2020, while paying no attention to the readiness of educational institutions, learners, and instructors for these systems, led to the progress of the educational process; this happened while the two most important components of the educational process, namely the student and the instructor, suffered greatl. This study aimed to review e-learning readiness and maturity assessment models and identify the factors that affect e-learning readiness in higher education institutions.

Methods: This is a literature review of research findings empirically related to e-learning readiness and maturity; the papers related to e-learning readiness and maturity assessment were collected through various databases such as Springer Link, Google Scholar, Scopus, IEEE, and Elsevier, which were within the research scope of this study, from 1997 to 2023.

Results: Models of e-learning readiness and maturity assessment as well as the factors and dimensions are varied according to the educational environment of the country or institution; in addition to the purpose and use, many factors are affecting e-learning readiness level in educational institutions including the technological, organizational, psychological, and financial dimensions in that the factors affecting readiness still significantly affect the level of maturity, especially in developing countries.

Conclusion: The process of assessing e-learning readiness and maturity is an important and essential issue for many stakeholders and an essential step for improving and managing the educational process today and in the future.

Keywords: E-learning readiness, E-learning maturity, E-learning readiness models, E-learning maturity models, E-learning maturity assessment, E-readiness factors

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Introduction

The successful implementation of e-learning projects depends mainly on its complete readiness, as it constitutes the primary aspect for achieving success in the application of the efficient e-learning systems in educational institutions in general and universities in particular. The readiness assessment is the basic step in applying the e-learning project in a comprehensive way in a specific educational institution, so the implementation of this strategy needs full e-readiness which basically depend on e-readiness of teachers, lecturers, students, technical staff, and infrastructure (1). The objective evaluation determines the level of readiness for e-learning and the requirements of the university and also shows the information for institutions that tend to put solutions of e-learning to the requirements of universities or other educational institutions (2).

Attitudes and skills are important and influencing factors in readiness for e-learning (3). Therefore, learners' behavior and the degree of their comprehension of e-learning techniques must be evaluated because e-learning mainly depends on the learners and its main objective is effective activity of learning. (4) emphasized that the learner's characteristics were represented in their readiness for e-learning; the skills to deal with modern technology (21th century skills) are one of the basic indicators and effective elements in measuring the readiness of institutions for e-learning, which enhances the self-readiness of higher education institutions. It is the availability of infrastructure related to the technological devices and supplies required by e-learning. Many studies including (5-7) have indicated the importance of verifying the readiness of higher education institutions, especially the factors related to the material aspects of technical and technological devices, equipment and the ability of institutions to organize, analyze, develop, and implement training programs in the field of e-learning that enhance the success of this type of education and maximize its benefit in opening opportunities for joint local and international cooperation and investment in the field of education. The most prominent elements for the employment of e-learning are the teachers' readiness in terms of their satisfaction and beliefs and use of information and communication technology in education; justifications for this use is crucial to the degree of success of the adoption of e-learning (8).

Complete readiness of universities means implementing the e-learning project and achieving its goals fully. Since e-learning is a substantial chance for educational institutions to develop the skills for facing the challenges of lifelong education, it requires adequate readiness and management for its implementing and enhancing after the adoption process (9). A lot of assessment models of e-learning readiness have been suggested by researchers such as (10-13). It has been applied in a number of institutions in different countries due to the diversity of standards from one system to another that may be effective and innovative within their systems. Each institution or organization has special rules and situation that may not be commensurate with the e-learning strategy and its goals, so willingness of each organization and individual must be appropriately assessed. On the other hand, it can be unfit in a number of countries for the diversity of learners' requirements (14). The learners should be "e-ready" for implementing an integrated and achievable strategy designed to fulfill their demands. Consequently, e-readiness assessments enable the agencies and policymakers to adapt suitable policy procedures and implement development plans to help make the participants acquainted with e-learning concepts and its aims (15).

The process of improving the educational system, management and effectiveness of higher education institutions, and increase in the research output of both lecturers and students require the use of ICTs and their integration into the educational system. Therefore, it is necessary to know the e-readiness of institutions to adopt and implement modern e-educational systems (16).

Therefore, (17) concluded that the e-readiness assessment process was an improvement tool for an educational institution to adopt an e-learning program. E-learning readiness includes the readiness of educational institutions in terms of infrastructure, legislative and regulatory environment, and e-readiness of students and instructors (18). Therefore, it is important to know the ability of educational institutions to maintain an educational environment that follows an advanced strategy for the continuity of improved education for learners (19).

The success of implementing the e-learning system in educational institutions is dependent on the availability of technology, the development of skills to deal with technology, and the integration of modern ICT in the educational process (20).

The maturity of e-learning means the process of assessing the ability of the educational institution to employ technologies strategically and effectively, the assessment process is a necessary step to ensure the quality of e-learning by identifying and addressing weaknesses and shortcomings, and the processes of development and innovation, which contribute to improving the educational system (21).

The purpose of this study is to conduct a literature review of empirical research on e-learning readiness and maturity;the assessment of e-learning readiness and maturity in educational institutions is essential for advancing the education system now and in future. This paper aimed to investigate research papers to gain insights into e-learning readiness and maturity concepts, assessment models, and the factors affecting their levels. To this end, this study posed the following research questions:

QR1. What are the different models used for assessment of e-learning readiness and maturity?

QR2. What are the common and most effective factors in e-learning readiness?

The Concept of E-readiness and E-maturity

During the late nineties, the concept of readiness grew to form a framework for assessing the amount of digital use between developing and developed countries (22). E-readiness is a relatively modern concept that has been expanded due to the rapid spread of information technology (IT) and the great progress in the business and industry sector (23). Readiness was first identified in 1990s of the last century for a society that has rapid access to the competitive market and the application of technology in all institutions, schools, government offices, companies, health facilities and homes, user privacy and security by the Internet as well as appropriate government policies to promote network connectivity and use (24). E-readiness means that the community is ready and has the ability to participate in the global network (25). It is the level at which the requirements for participation in global networks are available to people; it can be defined as the level of readiness of a society or institution to access networks and technology (26).

E- Readiness is the ability of a country to create, disseminate, and use digital information for citizens in order to improve the of economic activity the country. E-learning readiness is the mental or physical readiness of an institution to educate and work (27). E-readiness is the most important aspect for the successful achievement of e-learning programs in higher education. Recognizing the role and importance of e-readiness helps the universities to effectively adopt the e-learning system (28).

Recently, attention has focused on developing and designing what is known as e-readiness assessment tools by various institutions of the country, especially higher education institutions. The development of e-readiness assessment tools has been started, various survey frameworks, which differ by country, sector or institution, to provide quantitative and qualitative measurements of the accuracy of electronic readiness assessment (29).

The rapid development of digital technology has led to the development of

strategies and methods of the educational process, so that the education system transforms the traditional system to a more sophisticated and modernized system which is considered an urgent necessity to prepare the next generations for scientific and practical requirements of the future. The process of knowing the readiness of the educational environment in the country for smart learning and the level of using digital technology in the educational process is the basis for developing successful plans for performance improvement; this is called E-Maturity which deals with how effectively technology providers use advanced technology and meet other strategic priorities (30). It can be considered as "the ability of a college or educational institution to use technology in an effective way to improve the educational process" (31).

It also includes "imitating" the effective use of IT innovations and "a strategic, coordinated, positive, and effective approach by senior leaders and managers". Consequently, a mature electronic organization not only has the appropriate infrastructure, but also uses the technology necessary to enhance operations and improve results. Moreover, it enables the managers and policy makers to manage e-learning activities more effectively (32). E-Maturity is also defined as the extent to which technology providers actively use technology in all areas of management and delivery to advance technology outcomes.

The British Agency for Communications and Educational Technology (Becta) referred to e-maturity of the institution an ability of the institution to use advanced Information and Communication Technology (ICT) (33) describes a mature online organization as the system that promotes ICT skills development, trusts the Internet, approves the inherent costs in technology, supports technology benefits, and mainstream the computer technology throughout the organization. Therefore, the E-maturity of organizations may demonstrate the potential for technology training (34). Briefly, the concept of the maturity process means the ability and performance of the institution and the quality of the actual results of the use of technology in addition to the institutional nature of the process of use in terms of style, standards, and organizational structure (35).

The maturity assessment concept originated from the information technology (IT) and software and the researchers have found that process improvement involves a series of steps rather than simultaneous activities (36, 37) defined the maturity models are common tools used to assess the capabilities of mature elements and choose appropriate procedures to movement at a higher level of maturity. On the other hand, maturity is "an evolutionary progression in showing a particular capability or in achieving an aim from the initial final stage to the desired final stage".

Most educational institutions have faced many problems and challenges in assessing the maturity of the e-learning system due to the difficulty of the task that requires technical and scientific evaluation (38). Considering the urgent necessity faced by the education sector due to Covid-19 virus to save the educational process from collapse and e-learning adoption since the beginning of 2020 as a formal educational system, it is necessary to assess the quality to enhance performance of the educational institution, identify the problems to treating, and increase the effectiveness of the e-learning system (39). Therefore, the need for frameworks for measuring and assessing the e-learning maturity has become essential to ensure the results of the educational process, in that the lack of an e-learning maturity model makes the comparison between educational institutions more difficult (40).

Methods

This study is a literature review of research findings empirically related to e-learning readiness and maturity. First of all, the researcher collected the papers related to e-learning readiness and maturity assessment through the Springer Link, Google Scholar, EBSCO and Proquest, Scopus, IEEE,

Elsevier, Science Direct, and E-Library within the research scope from 1997 to 2023; the research was conducted from September 2020 to September 2021, and updated in April, June, October 2022, and January 2023.

The research was narrowed using the prespecified search terms "E-learning readiness assessment models, E-learning maturity assessment", utilized and adapted to all the databases to get the most accurate results. The researchers read a lot of the papers that fell within the scope of this study in details; we then included the relative papers indirectly and excluded some of them which had directly adopted and tested a model mentioned in the models list which were reviewed and the studies with an unclear and complete mechanism for measuring and assessing the levels of readiness and maturity. A total of (38) studies had proposed new models which were closest to educational institutions, so they were included in this literature review.

The papers that discuss and assess e-learning readiness and maturity in higher education were addressed; then the researchers examined a lot of papers to determine the potential factors that researchers had used to assess e-learning readiness and maturity. The results of literary data were grouped and categorized by the study to identify and analyze the effecting factors that were most commonly used by academics and researchers to measure and assess readiness and maturity for e-learnin.

Results

The review of literature showed various e-readiness assessment models which were designed and developed to measure the readiness of educational institutions for adoption of different electronic educational systems. The first e-readiness assessment tool was created in 1998 by the Computer Systems Policy Project (CSPP) which is known as the Readiness Guide for Living in the Networked World. Then, different tools for e-readiness assessment (macro e-readiness assessment tools) which differ in the complexity and purpose have been developed, including E-readiness Ranking Tool, APEC E-Commerce Readiness Assessment Guide, CID e-readiness tool, the Assessment Framework, the Networked Readiness Index, and E-records Readiness Tool (41).

Recently, SELFIE has developed an e- readiness assessment tool for education which is a self-reflection tool, developed by the European Commission; it measures the e-readiness by seven main areas: teaching and learning practices, educational content and curriculum, assessment practices, cooperation and communication, professional development, infrastructure and equipment, and leadership and governance practices (42). The readiness of the institution for adoption of e-learning can be described as mental or physical readiness of institution to experience and use the e-learning system; it includes technology readiness, content readiness, training process readiness, culture readiness, human resource readiness, and financial readiness.

Therefore, there are many strategies and mechanisms for assessment due to the difference of institutions dimensions of readiness for adoption e-learning (43). Numerous researches have been carried out on the mechanism for measuring or assessing the readiness of e-learning for higher education. Table 1 shows a number of researchers and their models for readiness assessment of e-learning.

The review of the papers about the e-learning maturity and assessment models shows that the process of adopting appropriate models for higher education institutions such as the e-Learning Maturity Model (eMM), which was created by Stephen Marshall 2004, enables institutions to compare and improve learning processes, reduce the failed projects, identify quality problems, and maintain the continuity of the educational process (40). There are different models for measuring capacity maturity due to different purposes and uses (78). It' is worth mentioning that various models have aimed to facilitate the education process maturity ,and most of them have the same five levels of maturity (79).

Table 1: Previous models of e-learning readiness assessment

No.	Year	Researcher	Topic	Factors
1	1997	(44)	A specification and extension of the DeLone and McLean model of IS success.	• Effectiveness • Efficiency • Satisfaction
2	2000	(45)	Are you ready for e-learning?	• Psychological • Sociological • Environmental • Human resource • Financial • Technological • Skill • Equipment • Content
3	2001	(46)	E-learning: Strategies for delivering knowledge in the digital age.	• Technological infrastructure • Culture • Financial considerations • Human resources • Management • Organizational
4	2001	(47)	What determines an organization's readiness for e-learning.	• Organizational • Culture • Individual • Learners • Technology
5	2002	(48)	Is e-learning right for your organization?	• Technological infrastructure • Content • Culture • Financial considerations • Human resources
6	2002	(49)	Assessing organizational readiness for e-learning: 70 questions to ask.	• Human Resources • Learning management system • Learners • Content • Information technology • Finance • Vendor
7	2004	(15)	An assessment of e-learning readiness at open university Malaysia.	• Communications • Management • Content • Culture • Learner • Technical • Environmental • Personal
8	2004	(27)	E-learning readiness components: Key issues to consider before adopting e-learning interventions.	• Technological infrastructure • Content • Culture • Financial considerations • Human resources • Organizational • Pedagogy • Management • Support

9	2005	(15)	E-learning readiness model for organizations.	• Technological infrastructure • Culture • Human resources • Financial resources • Awarenes
10	2005	(45)	Are you ready for e learning.	• Technological infrastructure • Content • Culture • Financial considerations • Human resources • Awarenes • Organizational
11	2005	(50)	The e-learning readiness assessment model recommended by the Economist Intelligence Unit (EIU).	• Technological infrastructure • Content • Policy • Culture • Financial considerations • Organizational
12	2005	(51)	Managing e-learning: Design, delivery, implementation and evaluation.	• Technology • Content • Human resources • Laws and regulations • Organization and management • Services and support • Supervision and assessment
13	2005	(52)	Presumptions and actions affecting an e-learning adoption by the educational system-Implementation using virtual private networks.	• Resources • Education • Environment
14	2006	(53)	E-Learning readiness of Hong Kong teachers.	• Students' Preparedness • Teachers' Preparedness • IT Infrastructure • Management Support • School Culture • Preference to Meet Face-to-Face
15	2007	(54)	Developing an e-readiness model for higher education institutions: Results of a focus group study.	• Technological infrastructure • Content • Culture • Human resources • Policy • Organizational • Management • Pedagogy
16	2007	(55)	The readiness of faculty members to develop and implement e-learning: (The case of an Egyptian university).	• Competencies • Experience • Attitudes
17	2007	(56)	Evaluating e-learning readiness in a health sciences higher education institution.	• Business • Technology • Content • Culture • Human Resources • Financial Resources

18	2008	(57)	Readiness assessment tool for an e-learning environment implementation.	• Technology access • Technical skills • Attitude
19	2008	(58)	STOPE-based approach for e-readiness assessment case studies.	• Leadership • Technology • Organization • People • Environment
20	2008	(59)	E-learning in Malaysia: Success factors in implementing e-learning program.	• Program content • Web page accessibility • Learner's participation and involvement • Web site security and support • Institution commitment • Interactive learning environment • Instructor competency • Presentation and design
21	2009	(60)	The antecedents of e-learning outcome: An examination of system quality, technology readiness, and learning behavior.	• E-Learning System Quality • Technology Readiness • Learning Behavior • Learning Outcome
22	2009	(61)	ELearning Indicators: a MultiDimensional Model for Planning and Evaluating eLearning Software Solutions.	• Learners' education and cultural background • Learners' computing skills • Learners' learning preferences • The Quality of e-Learning content • Viable Learning environment • E-learning logistics
23	2010	(62)	Assessment of instructors' readiness for implementing e-learning in continuing medical education in Iran.	• Technical readiness • Pedagogical readiness
24	2011	(63)	E-learning readiness of Thailand's universities comparing to the USA's Cases.	• Technology • Policy • Financial • Human resource • Infrastructures • Awareness
25	2011	(12)	An eclectic model for assessing e-learning readiness in the Iranian universities.	• Regulations. • Management • Supervision • Network • Culture • Content • Support • Assessment • Human resources • Policy • Financial resources • Security • Standard • Equipment

26	2011	(64)	Measuring teachers' readiness for e-learning in higher education institutions associated with the subject of electricity in Turkey.	• Technology • People • Content • Institutions
27	2011	(65)	The role of readiness factors in E-learning outcomes: An empirical study.	• Technology • Organizational factors • Social factors
28	2011	(66)	E-learning readiness assessment model: A case study of higher institutions of learning in Uganda.	• Awareness • Culture • Technology • Pedagogy • Content
29	2012	(67)	E-learning readiness in organizations.	• Facilities and infrastructure • Management • Organization of e-learning function /department • Learners characteristics • E-Learning course and process
30	2013	(68)	Readiness for implementation of e-learning in colleges of education.	• ICT infrastructure • Human resources • Budget • Psychological • Content
31	2013	(69)	E-learning readiness assessment model in Kenya higher education institutions.	• Technological • Culture • Content • Communication Network • Financial Resources • Human Resource • Management • Pedagogy • Awarenes
32	2013	(6)	Investigation of First-Year Students' Pedagogical Readiness to E-Learning and Assessment in Open and Distance Learning: An University of South Africa Context	• Motivation • Skill • Attitude • Experience • Organizational
33	2013	(70)	The McKinsey 7S model framework for e-learning system readiness assessment.	• Strategy • Structure • Systems • Style/Culture • Staff • Skills • Shared Value
34	2015	(71)	Modeling E-Learning Readiness Among Instructors in Iraqi Public Universities.	• Technological skills • Equipment/infrastructure • Online learning style • Attitude • Human resources • Cultural • Environmental • Financial • Engagement readiness

35	2016	(72)	Measuring e-learning readiness concept: scale development and validation using structural equation modeling.	• Self-competence • Self-directed learning. • Motivation • Financial • Usefulness
36	2017	(73)	An investigation of pre-service teachers' readiness for e-learning at undergraduate level teacher training programs: The case of Hacettepe University.	• Computer self-efficacy • Internet self-efficacy • Online communication self-efficacy • Self-learning • Learner control • Motivation for e-learning
37	2017	(13)	An organizational development framework for assessing readiness and capacity for expanding online education.	• Inputs • Design • Components • Outputs
38	2019	(43)	E-learning readiness from perspectives of medical students: (case study of university of Fallujah).	• Psychological readiness • Technological readiness • Content readiness • Culture readiness • Demographics
39	2019	(74)	An Investigation of Student Perspective for E-Learning Readiness Measurement.	• Technology • Innovation • People • Self-development
40	2020	(75)	Designing a domestic e-readiness assessment model for the deployment of mobile learning.	• Policy making • Implementation of mobile e-Learning • Evaluation and oversight • The support
41	2021	(76)	Developing an Instrument to Assess Organizational Readiness for a Sustainable E-Learning in the New Normal.	• Teacher • Learner • Curriculum • Technology • Administrative support • Financial support • Learning environment
42	2021	(77)	E-readiness measurement tool: Scale development and validation in a Malaysian higher educational context.	• Innovativeness • Infrastructure • Collaboration • Student experience • Learning flexibility

One of the most important aims of developing a digital maturity model for higher education institutions is to define the areas and elements of maturity as well as identify the areas and elements that need improvement to raise the level of digital maturity for the educational institution; developing the framework requires the application of various and complex strategies such as qualitative analysis, Q sorting method, and decision-making and rubric, etc. The developed framework must contain integrated and interconnected regions. The development strategy is important for determining the level of digital maturity for a higher education instituttion as many E-maturity frameworks have been developed for educational institutions. One of the most appropriate frameworks for higher education institutions is DigCompOrg (Digitally Competent Educational Organizations) framework developed by (41) for digitally specialized educational institutions.

It covers all major areas of digitally specialized educational institutions, but the most important purpose is to work generally.

E-maturity has multiple dimensions, despite the different definitions which include issues related to Information and Communication Technology infrastructure, skills, use of ICT, and E-learning with learners (80). As shown in Table 2, a number of frameworks have been developed for assessment of E-learning maturity of educational institutions.

Discussion

The difference between maturity models and readiness models can beviewed in terms of purpose and use; readiness models are usually used to assess the status and readiness of the educational institution, as well as identify the weaknesses and gaps, develop strategies and plan for the adoption and successful implementation of a particular educational system; however, maturity models are used to assess the current situation after the implementation process and identify and

Table 2: The Frameworks of Digital Maturity Models

No.	Year	Researcher	Model
1	2010	(38)	1) Learning 2) Development 3) Support 4) Evaluation 5) Organization
2	2015	(81)	1) Leadership and governance practices. 2) Teaching and learning practices 3) Professional development 4) Assessment practices 5) Content and curricula 6) Collaboration 7) Networking 8) Infrastructure
3	2017	(41)	1) Leadership 2) planning and management 3) Quality assurance 4) Scientific-research work 5) Technology transfer and service to society 6) Learning and teaching 7) ICT culture 8) ICT resources and infrastructure
4	2018	(80)	1) Planning, management and leadership 2) ICT in learning and teaching 3) Digital competence development 4) ICT culture 5) ICT infrastructure
5	2020	(82)	1) Strategic planning 2) Curriculum design and delivery 3) Student support 4) The provision of extracurricular activities
6	2020	(79)	1) Data management 2) Administration and training 3) The pedagogical support 4) Data analysis 5) Legislation, privacy, and ethics
7	2021	(69)	1) Organization and infrastructure 2) Technology and support 3) Curriculum and Contents 4) Learning process

address the failures by comparing the good strategies of other institutions (83). As it is shown through the readiness and maturity models shown in Tables 1 and 2, it was noted that (70) proposed a new framework for assessing readiness of an institution to implement the e-learning system project on the basis of McKinsey 7S model using fuzzy logic for analysis. The study considered 7 dimensions as an approach to assessing the situation of the institution prior to system implementation to identify weakness points that may lead to the failure of the system. The study concluded that the most important indicators are trust, training, education, students' skills, and shared beliefs, affecting the decision to adopt the e-learning system in higher education institutions. The study carried out by (71) aimed to identify and model e-learning readiness among instructors as well as to provide a deeper understanding of important factors in adopting an e-learning system in Iraqi Public Universities. Several factors have been analyzed thoroughly and simultaneously, and a new model on e-learning readiness among university instructors has been proposed.

The study of (84) sought to identify the factors that affect the teachers' motivation in Mazandaran region in Iran and increase their motivation towards e-learning; the results of the study revealed that the most important factors affecting the teachers' use of e-learning were information and communications, their guidance to them regarding its use in education, their sufficient knowledge in the field of information and communication technology and their skills in using it, and the availability of the necessary resources for use. The study (85) applied a two-step methodology in private Universities of Northern Iraq by using a hypothesized model of technology acceptance model (TAM). Firstly, the readiness factors were investigated among the university staff and then the students' intention. The findings revealed that the human resource readiness factor had the lowest value. Cultural acceptance, from the instructors and students' perspective, is a quite crucial factor in adopting sustainable e-learning applications. Technically, the importance of the technological readiness factor, and the main TAM constructs of perceived ease of use (PEOU) and perceived usefulness (PU) were confirmed. According to their study (85), the main aim was to determine the medical student's readiness for e-learning at University of Fallujah in Iraq by building an assessment model. The study concluded that ICT was not sufficient to support adopting the e-learning system. The purpose of the study (86) was investigating the impact of human, organizational, and technological factors on students' e-learning readiness in a private university in the north region of Iran. The results indicated that computer self-efficacy, management support, relative advantage, compatibility, and complexity were significant factors that influence students' e-learning readiness. The findings provided a basis for assessing the determinants of e-learning readiness in developing countries.

The study of (87) revealed that the students' readiness and human resources readiness were not significant factors influencing the lecturers' opinions about readiness of Nigerian universities towards the adoption of e-learning. However, public/society readiness, financial readiness, training readiness, ICT-equipment readiness, and e-learning material/contents readiness were significant factors which influence the readiness of Nigerian universities towards the adoption of e-learning. A study (88) used the Technology Acceptance Model (TAM) for university users (instructors and students) in order to measure their readiness of higher education institutions in Iraq for adoption and interactivity with e-learning. The obtained results showed that the instructors and students' readiness for adopting e-learning was high in spite of several obstacles, such as lack of ICT hardware/software and poor Internet signal.

The study of (89) aimed to assess the readiness of faculty members and students for using ELSs in Iranian Universities. The results of this study indicated that the policy-makers

Table 3: The comparison of E-learning readiness factors of various models

No.	Researcher	Model Factors																			
		Technological	Human Resource	Content	Policy	Management	Communication Network	Culture	Financial Resources	Support	Evaluation	Security	Psychological	Sociological	Skill	Organizational	Laws and regulations	Pedagogical readiness	Awarenes	Motivation	Innovation
1	(44)		✓					✓					✓								
2	(45)	✓	✓	✓					✓				✓	✓	✓						
3	(64)	✓	✓			✓		✓	✓							✓					
4	(47)	✓						✓								✓					
5	(84)	✓	✓	✓		✓		✓	✓												
6	(94)	✓	✓	✓		✓			✓												
7	(15)		✓	✓		✓	✓	✓	✓	✓							✓				
8	(72)	✓	✓	✓		✓	✓	✓	✓	✓		✓				✓		✓			
9	(11)	✓	✓				✓	✓	✓										✓		
10	(54)	✓	✓	✓				✓	✓							✓			✓		
11	(50)	✓		✓	✓			✓	✓							✓					
12	(51)	✓	✓	✓		✓				✓	✓					✓	✓				
13	(25)	✓	✓	✓		✓	✓	✓	✓	✓						✓					
14	(53)	✓	✓			✓	✓	✓		✓											
15	(45)	✓	✓	✓	✓	✓	✓	✓								✓		✓			
16	(55)	✓	✓	✓	✓	✓		✓							✓						
17	(65)	✓	✓	✓	✓		✓	✓	✓												
18	(57)	✓				✓	✓			✓		✓			✓						
19	(85)	✓	✓		✓	✓		✓								✓					
20	(95)		✓	✓		✓	✓	✓				✓									
21	(06)	✓			✓	✓	✓		✓			✓									
22	(16)			✓				✓							✓			✓			
23	(26)		✓															✓			
24	(36)	✓	✓		✓		✓		✓										✓		
25	(21)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					✓				
26	(64)	✓	✓	✓			✓	✓		✓				✓		✓					
27	(65)	✓	✓	✓			✓	✓		✓	✓					✓		✓			
28	(44)	✓		✓			✓	✓								✓		✓	✓		
29	(67)	✓	✓	✓	✓	✓	✓									✓	✓				
30	(39)	✓	✓	✓			✓		✓			✓	✓								
31	(69)	✓	✓			✓	✓	✓	✓									✓	✓		
32	(94)														✓	✓				✓	
33	(70)	✓	✓	✓	✓	✓	✓	✓		✓						✓					
34	(71)	✓	✓					✓	✓						✓						
35	(27)		✓					✓	✓						✓					✓	
36	(73)	✓	✓			✓	✓	✓												✓	
37	(31)		✓	✓		✓		✓			✓						✓				
38	(34)	✓		✓				✓					✓								
39	(74)	✓	✓					✓													✓
40	(57)				✓		✓			✓	✓				✓						
41	(76)	✓		✓					✓	✓											
42	(77)	✓	✓							✓											✓

and deans of universities should be aware of the ELS benefits, human resources' empowerment mechanisms, and level of the instructors and learners' access of to the network facilities.

Another study (90) determined the competencies of higher education students in the 21th century and their readiness for e-learning in Turkey and revealed the relationship between these two variables. It was concluded that there were differences in the scale scores and its sub-dimensions by age, gender, and Internet use status; also, there was a statistically significant, positive and weak relationship between the competencies and level of the twenty-first century students and their readiness for e-learning.

Researchers in a study (20) aimed to develop a reliable evaluation criterion to assess the readiness for online education universities preparedness in Kurdistan Region of Iraq and compare the readiness of public and private universities. This study concluded that the adopted questionnaire used (91), which was developed in this study, worked properly in the education field and can be used to assess the readiness of educational institutions in several aspects including resource readiness, strategic readiness, cultural readiness, information technology readiness, and cognitive readiness.

The readiness factors have a major role in the mechanism of implementing the e-learning system and its results (92). Literature showed that one of the most important affecting factors was technical readiness. It is necessary that the technological method used should conform to the intended education objective, but the researchers found the most widely factors used to measure the e-learning readiness were skills and attitudes (3).

This systematic review shed light on the factors which may influence the application of the e-learning system, as illustrated in Tables 3 and 4. These factors have made a model to be used as an instrument for educational institutions to assess e-learning readiness and the knowledge of the growth level (51). Although financial and infrastructure factors have the same level of importance in e-readiness of educational institutions, other dimensions such as management support, educational content availability, flexibility in program and courses, innovation, and research must be taken into consideration (11, 75).

This review study of the specific papers shown in Table 3, which dealt with the models for assessing e-learning readiness, showed that therewas a diversity in the identification of the diverse and new influential factors in the level of readiness; it was also shown that the research papers vary based on factors as naming, divisions, and distribution, some of them identified the factors and a number of criteria or measures for each factor; others defined the dimensions, indices, or factors for each dimension and then the criteria or measures for each index or factor; this was identified in the studies within the scope of the 2014 research. According to a review study (95), the most important and influential factors in the process of assessing e-learning readiness were as presented in Table 4 and their frequency.

The analysis of the papers and examination of the models and frameworks of e-learning readiness and maturity assessment which were described and classified in previous Tables show that the most commonly used and main factors which affect the level of e-learning readiness and maturity are related to the technological, organizational, security, content, financial, communication, and cultural dimensions in addition to the human resources and evaluation, as shown in Figure 1.

Conclusion

The assessment process of the e-learning readiness and assessment of e-learning maturity for educational institutions are two paths of one goal, in that identifying the readiness of the educational environment for the implementation of an educational digital system and determining the level of the use of digital technology in the educational process are the basis for developing successful strategies and planning for advanced performance in the educational process and its requirements in the future.

Table 4: The most effective common factors in e-learning readiness with the definitions

No.	References	Readiness Factors	Definitions
1	(11-13, 15, 45, 49, 74, 77)	Technological	It refers to infrastructure planning, hardware and software.
2	(11-13, 15, 27, 45, 49, 59, 70)	Human Resource	It illustrates the level of the acceptance and using the technology. Human resources include the readiness of learners, instructors, and staff in terms of technical skills, planning and decision-making skills, and mental skills.
3	(11-13, 15, 27, 45, 49, 56, 59, 70)	Content	It refers to updating the useful content and regular evaluation of the content.
4	(54, 55, 60, 75)	Policy	It refers to the government's policy for e-learning system, university support and the commitment to implementation of the policy by senior executives.
5	(27, 49, 59, 70)	Management	It demonstrates supporting the management team of the e-learning environment and overcoming unexpected complications that slow or obscure implementation.
6	(48, 49, 58, 67)	Communication Network	It indicates the provision of an effective and secure network for the exchange of the content and information, communication and interaction as well as network infrastructure.
7	(59, 61, 66)	Culture	Culture indicates the ability of institutes to create environments that welcome e-learning.
8	(45, 48, 49, 56)	Financial Resources	It deals with the financial situation of the institution and includes the ability to allocate budget and the level of financial preparedness.
9	(49, 64, 66)	Support	It is intended to provide appropriate support in terms of hardware and software
10	(69, 75)	Evaluation	It includes evaluation of standard educational curricula, evaluation of college curricula and support for the evaluation of technology services and communications.
11	(12, 57)	Security	It indicates network and data security in terms of data privacy, accuracy of mutual educational content, electronic signing, evaluation results and database.
12	(44, 45)	Psychological	It means the mental state of individuals and its impact on the implementation of e-learning.
13	(45, 64)	Sociological	It means the personal aspect of the e-learning implementation environment.
14	(6, 72, 80)	Skill	It means the technical and technological skills of individuals and the ability to use them to deal with the electronic education system.
15	(45, 52, 67)	Organizational	It is the process of supporting the e-learning system by providing appropriate infrastructure, organizational culture, administrative organization, and compatibility between the approved strategy and the curricula of the institution.
16	(12, 13, 67)	Laws and regulations	It focuses on preparing a list of laws and regulations based on educational standards, documenting electronic files and legal transferability, while ensuring the validity of approved programs for e-learning.

17	(61, 62, 64)	Pedagogical readiness	It means the correct management of the educational strategy through the design of strategies, methods of teaching, learning and educational content.
18	(63, 66, 69)	Awareness	It means knowledge of e-learning techniques and the benefits of changing from traditional education to e-learning.
19	(72, 73)	Motivation	It means the process of stimulating individuals to use the electronic system by accepting and understanding the ease of use and the usefulness of new technologies in the educational process.
20	(74, 77)	Innovation	It means the experimentation and application of new programs and various educational curricula, improvement of the educational curriculum, modern designs and new teaching methods in teaching and learning.

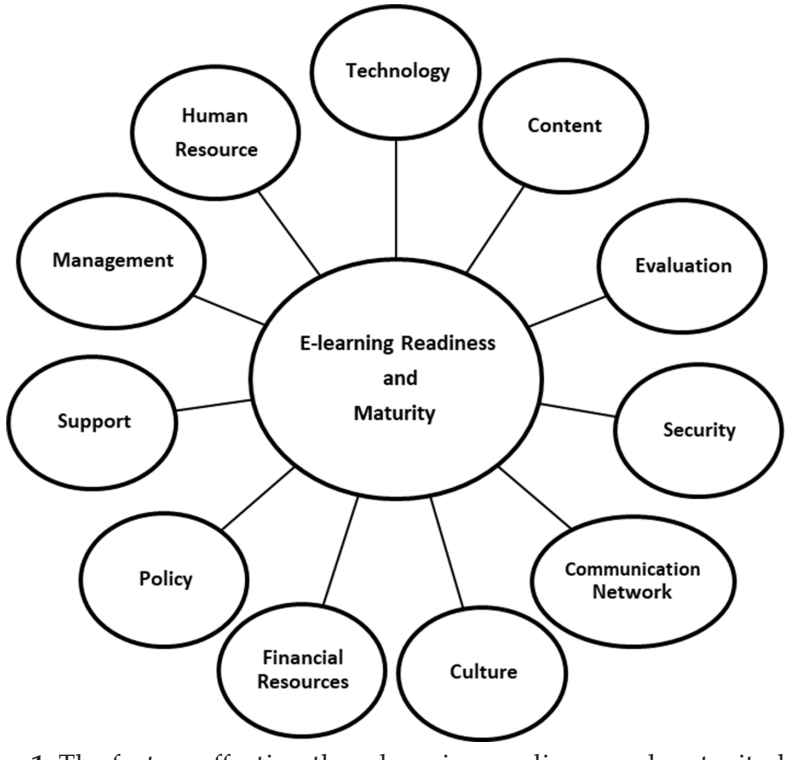

Figure 1: The factors affecting the e-learning readiness and maturity levels

Models of e-learning readiness and maturity assessments in higher education institutions are varied with different factors and dimensions based on the educational environment of the country or institution that built or developed the model; moreover, in terms of purpose and use, readiness models are used to assess the readiness of educational institutions for changing and developing the traditional educational system into digital system. In turn, maturity models contribute to determining the state of the educational institution in performance, management, organization and planning for change and development in the e-learning system.

There are many factors affecting e-learning readiness level in educational institutions; they include the technological dimension related to electronic infrastructure and the communication network; the organizational dimension that deals with administration, security, politics and even educational content, including what is related to the psychological dimension of the educational and cultural community related to human resources from mental and technical readiness

and degree of satisfaction as well as training; and the financial dimension that relates to the budget of the institution and the educational community, especially the learners. Despite different nomenclatures used by researchers for these dimensions and factors when constructing and developing various models according to the needs of the educational environment, the factors affecting readiness still significantly affect the level of maturity, especially in developing countries.

Authors Contribution

The first author collected and organized the data, designed and analyzed the study, wrote the first draft, and updated the data throughout the study period. The second author was responsible for this paper, as he developed the concepts and methodology for the study, supervised and assessed the study stages including data collection and analysis, and participated in coordinating the study and reviewing the paper throughout the study period. The authors have critically reviewed this paper and approved the final version submitted.

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