FACTORS AFFECTING THE QUALITY OF E-LEARNING DURING THE COVID-19 PANDEMIC FROM THE PERSPECTIVE OF HIGHER EDUCATION STUDENTS

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ABSTRACT

Aim/Purpose	The objective of the research was to study the relationship of seven independent factors: administrative support, course content, course design, instructor characteristics, learner characteristics, social support, and technical support on quality of e-learning in higher education during the COVID-19 pandemic. Further, the study analyzes the moderating effect(s) of gender and level of the course on the quality of e-learning in higher education during the COVID-19 pandemic.
Background	The COVID-19 pandemic situation has impacted the entire education system, especially universities, and brought a new phase in education "e-learning." The learning supported with electronic technology like online classes and portals to access the courses outside the classroom is known as e-learning. This study aimed to point out the variables influencing the quality of e-learning, such as administrative support, course content, course design, instructor characteristics, learner characteristics, social support, and technological support.
Methodology	An inferential statistics cross-sectional study was conducted of the students of higher education institutions in India and the Kingdom of Saudi Arabia with a self-administered questionnaire to learn the students' perception of e-learning. All levels of undergraduate and postgraduate students took part in the study with a sample size of 784. Ultimately, this study used a Structural Equation Modelling (SEM) approach to find the positive relationship between the quality of e-learning and the seven independent variables and two moderating variables in the higher education sector.
Contribution	The study aims to explore the quality of e-learning in higher education from the students' perspective. The study was analyzed based on the student's data collected from the higher educational institutions of India and Saudi Arabia. The study will support the top management and administrators of higher educational institutions in decision making.
Findings	The findings revealed that there is a positive relationship between the set of variables and the quality of e-learning in the higher education sector. Also, there is a significant difference in the perception of the students between gender, level of the course, and quality of e-learning in the higher education sector during the COVID-19 pandemic.
Recommendations for Practitioners	The results of the study can help top management and administrators of higher educational institutions to improve their actions. Higher educational institutions need to concentrate on the study outcomes related to administrative support, course content, course design, instructor characteristics, learner characteristics, social support, and technological support to enhance the quality of e-learning. The study revealed that there should be a difference in the procedure of providing e-learning based on the level of the course and gender of the students.
Recommendations for Researchers	The results were examined and interpreted in detail, based on the perspective of the students, and concluded with a view for future research. The study will be beneficial for academic researchers from different countries with a different set of students and framework.

Impact on Society	The study revealed that the positive results of the students' perspective on the quality of e-learning would help the policy-makers of the country in providing the learning process during the COVID-19 pandemic. Also, the result explored the importance of the quality aspects of e-learning for improvement.
Future Research	There is a need for future studies to expose the quality of e-learning in higher education in the post-COVID-19 pandemic. Further researchers will bring the performance level of e-learning during the COVID-19 pandemic.
Keywords	e-learning, quality, students' perspective, higher education, COVID-19 pandemic

INTRODUCTION

Education is the central concern of the individuals, institutions, and countries for their development. It is a system that helps to build a relationship between institutions and various countries. The result or outcome of the education system is the critical factor that determines the quality of education. Moreover, hence, there should be clarity on the curriculum for an in-depth understanding of the course content. The quality of education must be evaluated from the students' perspective because they are the end-users of the product. High quality of higher education is a prerequisite component in delivering knowledge and skill development. The quality of education comprises the visible (course materials) and invisible (delivery to the students) elements. The developing and developed countries need to ensure the quality of education to equip the students to face the competitive world. Educational institutions focus not only on education but also on involving the students in research, creativity, and innovation. Educational institutions need to come up with an exciting way of learning and work closely with the industries to bring innovative ideas for the changing environment.

Internet technologies and mobile applications have transformed the education system from the traditional structure to the modern method of teaching. Self-efficiency of the teachers in terms of technology, subject knowledge, and content developments reflect on the students' attitude towards the teachers. Technological advancement has evolved the face of education in creating learning opportunities. Technology in education is not only beneficial for the students but also the teachers in subject delivery and makes the classroom environment more enjoyable. Also, the advancement in educational technology has crossed the classroom boundaries and ensures the learning available all the time. Educational technology helps students in distance learning and mobile learning. Also, educational technology enables the teachers to access the students at any time across boundaries and vice versa. Many educational institutions, like universities, colleges, and training centers, adopt online education and create a virtual classroom environment. Online education supports the students in attending the classes during their free time even they are at any other work.

Several social supporting sites such as Twitter, Instagram, Facebook, WhatsApp have been beneficial to the teacher and students to have supportive, collaborative learning with knowledge sharing. Even though social support provides a positive effect on team sharing, there is no evidence to prove that it has an impact on knowledge sharing (Liu & Lee, 2012). The higher education systems opted for e-learning to replace the face to face classroom teaching; there is a relationship between students' motivation and e-learning (Harandi, 2015). The platform of e-learning is more suitable for university students as it facilitates student engagement (Hussain et al., 2018). E-learning supports higher education students in effectively utilizing the time and getting them committed to the courses. E-learning could bring more confidence, reduce stress, and enhance concern and empathy (López-Catálan et al., 2018). There are some difficulties with the material preparation for e-learning as the students may not be able to access the modules or lack understanding of the contents in the modules (Bovill, 2020; Bovill & Woolmer, 2018). However, the teachers find the e-learning platform very interactive as the lessons can be mapped with visual aids and engaging learning (Marutschke et al., 2019; Tomas et al., 2019).

Management of educational institutions should provide a feedback form to the stakeholders with which the teaching quality, administrative support, and resources to support the learning can be analyzed (Raju & Phung, 2018). The rating of the institutes fluctuates between lower and higher based on the increasing number of positive and negative comments (Shah & Cheng, 2019). Focusing on the importance of employees by measuring their knowledge delivery to the students and the value they add to the organization's growth is an essential process in higher education (Körkkö et al., 2016). The culture of the organization is the combination of structure, ideas, and high quality, which make a pathway for the students to become high-tech employees in the future (Martin & Leurent, 2017).

In a total of 195 countries all over the world, 191 counties were affected by COVID-19 (UNESCO, 2020b). Around 429 universities across the world were shut down and started conducting online classes and e-learning (UNESCO, 2020a). COVID -19 has changed the complete phase of the education sectors. At this global pandemic time, administrators, teachers, and students had the dilemma of how to achieve the overall objectives of the institutions and individuals. In March 2020, the Centers for Disease Control and Prevention (CDC, 2020) issued guidelines on the alternative teaching methods to communicate the class works and assignments to the students. The popular virtual classroom applications are ZOOM, Google Classroom, Moodle, and Blackboard and play a vital role in the transition from face-to-face classes to online and e-learning system (Stone, 2020). The COVID -19 pandemic situation has impacted the entire education system, especially universities, which brought a new phase in education "e-learning." Learning supported with electronic technology such as online classes and portals to access the courses outside the classroom is known as e-learning (Ngampornchai & Adams, 2016). Though adopting e-learning is a challenge for the teachers and students (Kuhad, 2020), academicians are incorporating this phase of e-learning by equipping the gadgets and internet facilities for the smooth flow of e-learning.

The higher education sector needs to upgrade the technological facilities continuously as per the change of the trends. Also, there is a need for financial aid for the transformation from the traditional education system to modern e-learning; the quality of information mapping on the students has become more complex (Darling-Hammond et al., 2020). It is also necessary to stress the importance of the curriculum and its alignment with e-learning. It is mandatory to connect e-learning with the essential qualities such as reading, writing, logic, and numerical skills, which are the essential outcomes for the students to sustain in the competitive environment (Madani, 2019). Therefore, in this research study, we consider seven of the independent factors: administrative support (Aung & Khaing, 2016), course content (Makokha & Mutisya, 2016), course design (Makokha & Mutisya, 2016), social support (Queiros & de Villiers, 2016), technical support (Queiros & de Villiers, 2016), instructor characteristics (Makokha & Mutisya, 2016), and learner characteristics (Makokha & Mutisya, 2016). Each of these variables will be tested to find a relationship with the quality of e-learning. An extended relationship is measured with gender and the level, of course. The framework was developed from the high indexed journals, published data, and research discussed using the various definitions and on practical experience. The results were analyzed, interpreted in detail, based on the perspective of the students, and concluded with a view for future research.

The purpose of the study is to bring out the importance of quality of e-learning in the higher educational instructions and its importance during the COVID-19 pandemic. Further, the study aimed to stress the use of technology in satisfying the needs of quality education and expectations of the students. Moreover, the study is limited to the students of India and the Kingdom of Saudi Arabia. The travel restrictions and closed-down universities are the significant limitations of the study. The results of the study can help decision-makers of the university, policy-makers of the government, teachers, and students to plan their actions for enhancing the quality of e-learning. The importance of the study aimed to identify the quality of e-learning in the higher educational institutions from the perspective of the students, and many researchers represented the administrative support, course content, course design, instructor characteristics, learner characteristics, social support, and technological support and expressed the importance and critical role in the quality of e-learning. There are studies

related to the quality of e-learning based on the students' perspective. However, studies related to the Indian and Saudi Arabian students, specifically in the higher educational institutions during the COVID-19 pandemic, are rare. So, the study addresses the existing research gap. Various e-learning initiatives in the higher educational institutions are grappling with providing the quality education (Aung & Khaing, 2016; Chawinga & Zozie, 2016; Makokha & Mutisya, 2016; Queiros & de Villiers, 2016). This motivated the study to review the existing literature bring out the variables of e-learning, and use the variables in establishing the quality of education.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

COVID-19 has affected education all over the world. Universities and schools are remained closed (Murphy, 2020). Consequently, the upsurge of e-learning is happening in the education system (Bozkurt et al., 2020). Though online learning helps to teach or learn in the pandemic period, implementation of a planned and structured online learning system is essential to have a successful e-learning system. Many universities already have a significant transition to e-learning in the pandemic period.

Administrative support is a pivotal factor in implementing an innovative e-learning system in Higher education (Meyer & Barefield, 2010). Administrators will manage the schools, including higher education systems', policies, teachers' drive, and students learning environment (Strike, 2018b). Administrators have a strong influence on the overall development of the institutions (Yang, 2010). Administrators can be involved vigorously in the preparation and management of the online program to ensure the quality of e-learning (Strike, 2018a). Since technology adoption in higher education is inevitable in online courses, a cohesive backing structure with a collaborative environment is very much needed in universities and schools (Barefield & Meyer, 2013; Bolden et al., 2015). Meyer & Barefield (2009) developed an Administrative Support Matrix (ASM). The ASM contains evolving and nourishing factors of effective e-learning programs from the perspective of administrators and teachers. Therefore, it is hypothesized that:

> *H1. There is a positive relationship between administrative support and the quality of e-learning in higher education.*

The pedagogy and course design of the e-learning environment in higher education is in the form of a learner-centered approach rather than a teacher-centered approach (Debattista, 2018). Effective course content in e-learning would include an emphasis on dynamic learning and student engagement (Ashwin & McVitty, 2015). Creating an appropriate course content has a significant impact on the execution of effective e-learning (Little & Knihova, 2014). The content of e-learning involves learning materials and supporting materials available online to the students. The online course content can be framed with various types of assignments, quizzes, and projects. This feature facilitates improvement in students' analysis, critical thinking, and problem-solving skills (Akyüz & Samsa, 2009). Accordingly, it is hypothesized that:

> *H2. There is a positive relationship between course content and the quality of e-learning in higher education.*

A well-structured and appealing e-learning course design with visual information facilitates students learning through online classes (Oh et al., 2019). The course design interface showcases the course content. It should be designed according to the students' competence and apprehension level (Ricart et al., 2020). The e-learning system is better than the traditional face-to-face classroom learning (Ong & Manimekalai, 2015) in terms of time, space, and self-learning (Ahmad et al., 2018). In the e-learning approach, the course is designed with multimedia resources, which make learners show interest in learning and easily understand the concepts (Khamparia & Pandey, 2017). At the same time, the course design for conventional learning can use minimum multimedia content due to time constraints. Additionally, appropriate course design of e-learning supports teamwork, and learners find a fun environment during their learning (Liao et al., 2019). Therefore, it is hypothesized that:

H3. There is a positive relationship between course design and the quality of e-learning in higher education.

Instructors should take essential measures for refining the quality of e-learning to facilitate students with better learning during the COVID-19 curfew period (Abbasi et al., 2020). The empowerment of teachers in generating, shaping, and incorporating different ideas and practices in the development of online course content helps to achieve successful e-learning in higher education (Kebritchi et al., 2017). The authors Ellis and Goodyear (2010) suggested that the instructor should give appropriate feedback on time to the students. In turn, this approach improves the e-learning quality in higher education. As the instructor is an essential element in education, observing instructor performance and gratification through peer evaluation to check the proficiency of instructors and conducting a survey for their gratification is essential to improve the quality of e-learning (Alrefaie et al., 2020). Taha et al. (2020) provided guidelines to establish a working team that includes experts from the curriculum committee, instructional material committee, faculty development committee, and continuous quality improvement committee to design, implement, monitor, and assess the transition of e-learning. Further, in connection with the ICT, assessment evaluation techniques play a vital role in the teaching-learning methodology (Malik et al., 2018). Accordingly, it is hypothesized that:

H4. There is a positive relationship between instructor characteristics and the quality of e-learning in higher education.

Achievement of skills and knowledge using digital tools with collaborative learning, blended learning, measuring learning outcomes, and more in-depth learning trends are reported in the NMC Horizon Report 2017 (HE Edition) (Adams Becker et al., 2017). Cheng et al. (2019) and Peltier et al. (2007) recommended a few features in successful e-learning: communication between students, teachers and students communication, course design, course content, quality of teaching, and administrator support. In a traditional classroom approach, communication between teachers and students happens directly (Martínez-Argüelles & Batalla-Busquet, 2016). Nevertheless, e-learning delivers a diversity of options, which includes multimedia for teaching and learning to achieve learning outcomes (Sarabadani et al., 2017). Also, interaction with peer students in the e-learning system enhances the quality of learning (Goh et al., 2017). Therefore, it is hypothesized that:

H5. There is a positive relationship between learner characteristics and quality of e-learning in higher education.

Social support has a considerable impact on the quality of e-learning. Family, peers, and instructors should provide a favorable and encouraging atmosphere in the course of e-learning classes (Andersson & Grönlund, 2009). Kemp and Grieve (2014) made studies on two different groups of psychology students' activities during traditional classroom and e-learning courses. The students are more comfortable in class discussions with instructors and their peers in the classroom rather than online, whereas they are interested in doing written work like assessment and projects through online rather than the classroom. Social interaction with teachers and collaborative interaction with peer students is imperative to achieve a better quality of e-learning. Through intense interaction and consistent practice, the effectiveness of e-learning can be accomplished (Jung et al. 2002; Noesgaard & Ørngreen, 2015). The researchers Shih et al. (2018) proposed a new algorithm to establish an active group to improve communication and teamwork among peers. Accordingly, it is hypothesized that:

H6. There is a positive relationship between social support and quality of e-learning in higher education.

As course design and course content are associated with the quality of e-learning, e-learning platforms are useful tools for higher education in online classes (Chivu et al., 2018). Technological platforms (Ali et al., 2018) used in the e-learning environment should be user friendly in order to achieve the learning outcome (Goh et al., 2017). Installation and operation of e-learning applications should be easy to use (Ching-Ter et al., 2017; Kimathi & Zhang, 2019). Providing a coherent structure of the application for e-learning makes students shift to online classes with greater enjoyment and satisfaction (Al-Rahmi et al., 2019). Moreover, it is essential to give adequate training of technical skills to

the learners and teachers before the transition to online courses (Roddy et al., 2017; Shahmoradi et al., 2018). Therefore, it is hypothesized that:

> H7. *There is a positive relationship between technical support and the quality of e-learning in higher education.*

E-learning quality varies, and there are a few learning approach differences between genders (male and female students) (Cuadrado-García et al., 2010). The relationship between learning persistence and student interaction in online learning environments revealed a moderating effect (Yu et al., 2020). There is a moderating effect on e-learning experience and relationship with the level of the course and campus-based experience (Ellis et al., 2009). Further, there is a relationship between the perceived usefulness and students' perceived playfulness with the moderating effect of e-learning content (Calli et al., 2013). Moreover, there is a moderating effect of the level of course and experience and relationship with the e-learning (Binaymin et al., 2018). Accordingly, it is hypothesized that:

> H8. *The extent of the relationship between (a) gender and (b) level of the course and the quality of e-learning in higher education.*

Based on the literature about e-learning and the factors of Chapnick's Criteria for E-Learning Readiness (Chapnick, 2000), seven crucial factors that control the quality of e-learning in higher educational institutions are summarized in Table 1

Table 1: Key Determinants of Quality of E-learning

Construct	Authors
Administrative Support	(Aung & Khaing, 2016)
Course Content	(Makokha & Mutisya, 2016)
Course Design	(Makokha & Mutisya, 2016)
Social Support	(Queiros & de Villiers, 2016)
Technical Support	(Queiros & de Villiers, 2016)
Instructor Characteristics	(Makokha & Mutisya, 2016)
Learner Characteristics	(Makokha & Mutisya, 2016)

Strategies need to be adopted in the education section during the COVID-19 pandemic because the higher education sector plays a crucial role in the economic future of a country (Choudhary, 2020). Also, COVID-19 affected the classroom studies of the students at a global level, but the education did not halt. Transformation towards e-learning supported the education process with the internet and suitable technology (European Data Portal, 2020). Even though e-learning facilitates continuing education, there is a lack of adequate instructions. Also, instructors were facing difficulty in providing learning materials (Allo, 2020). Since the majority of the higher educational institutions moved to distance education, there is an opportunity to increase the flexible learning model and set standards in e-learning (United Nations, 2020).

Figure 1 represents the research model consisting of 7 independent variables (administrative support, course content, course design, instructor characteristics, learner characteristics, social support, and technological support) and the relationship with the dependent variable (quality of e-learning) with two moderating variables (gender and level of course). The framework was developed based on different research from the high indexed journals, published and unpublished data, and based on practical experience and various e-learning definitions. The research model consists of a direct relationship with independent and dependent variables and an indirect relationship with the moderating variables.
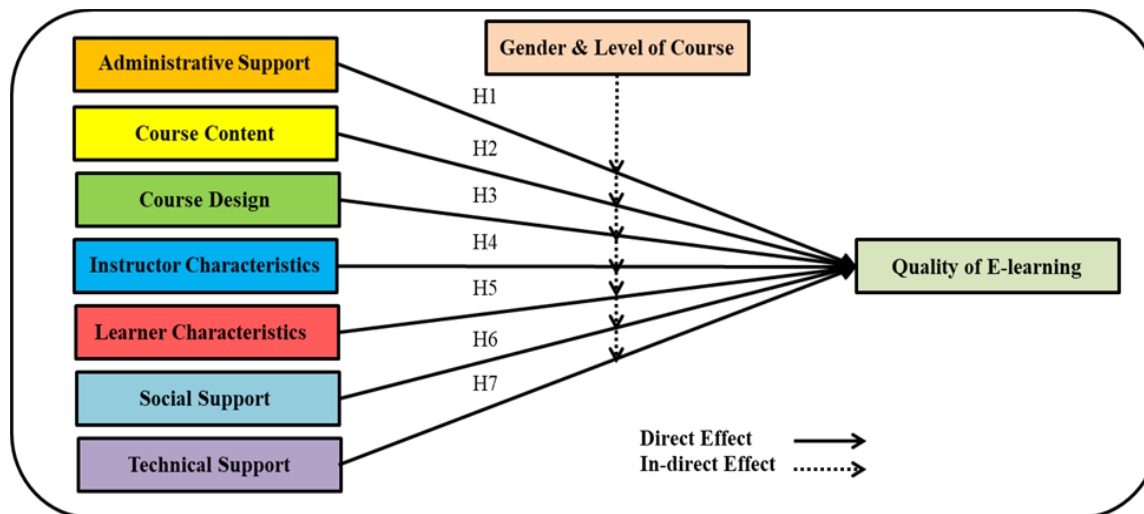
Figure 1: Research Model

METHODOLOGY

The study population consisted of students attending online classes during the COVID-19 period in the education sector in India and the Kingdom of Saudi Arabia and includes bachelors (1st, 2nd, 3rd & 4th year) and masters (1st & 2nd year). The self-made questionnaire was utilized for this study with three parts.

Gender

◯ Male   ◯ Female

Level of Course

◯ Level 6 (Bachelors 1st Year)

◯ Level 7 (Bachelors 2nd Year)

◯ Level 8 (Bachelors 3rd & 4th Year)

◯ Level 9 (Masters 1st & 2nd Year)

Administrative Support
AS1. The institute provides online portals to access the textbooks and reference materials
AS2. The administrators adequately address constructive feedbacks of e-learning
AS3. Adequacy of support and encouragement from the administration to participate online
Course Content
CC1. Proper learning materials provided in the e-learning
CC2. The supporting modules given in e-learning for the content are simple to understand
CC3. E-learning enhance the student in critical thinking, analysis, problem-solving
Course Design
CD1. The course design is suitable for the e-learning
CD2. There is a suitable learning outcome to the course can be done through e-learning
CD3. The sufficient classwork and assignments conducted by e-learning
Social Support
SS1. Equal chance of participation in Q&A and class discussion
SS2. The home environment gives the ambiance of the classroom
SS3. E-learning will encourage cooperation among the students through online classes

Technical Support

TS1. The e-learning platform is user-friendly to install and operate

TS2. Minimum system requirements and proper technical support provided for e-learning

TS3. E-learning orientation and manual provided to both instructors and learners

Instructor Characteristics

IC1. Availability of teachers to provide the needs of learners during discussions

IC2. The feature of e-learning allows instructor for more interactive teaching during classes

IC3. E-learning facilitate instructor in precise conducting of summative assessments

Learner Characteristics

LC1. Course materials are helping students to achieve the course intended learning outcomes

LC2. E-learning is easy and quick to get adapted to the new technology

LC3. Enhanced motivation and learning style provided by the e-learning

Quality of e-learning

EL1. E-learning raises the level of students' attainment and makes it enjoyable

EL2. E-learning improves the instructor's presentation of contents and activities

EL3. E-learning enhances the bonding between instructors and learners

EL4. E-learning is more user friendly and convenient for instructor and learner

EL5. E-learning enables the instructor to record the lecture and listened again by learners

EL6. E-learning provides two-way communication and cooperation among students

The questionnaire utilized a 5 point Likert scale (5-strongly agree, 4-agree, 3-neutral, 2-disagree, 1-strongly disagree). Part 1, with the demographic details like gender and level of course, to evaluate the moderating effect. Part 2 with seven variables (administrative support (Aung & Khaing, 2016), course content (Makokha & Mutisya, 2016), course design (Makokha & Mutisya, 2016), social support (Queiros & de Villiers, 2016), technical support (Queiros & de Villiers, 2016), instructor characteristics (Makokha & Mutisya, 2016), learner characteristics (Makokha & Mutisya, 2016)) with three questions for each variable, and Part 3 quality of e-learning with six questions for the direct effect. The data were collected through the online survey interview method to understand the quality of e-learning. As the data collected through the Google form and all the questions were required, there is no missing data. The study utilized the A-Priori sample size calculator for structural equation modeling (SEM) (Soper, 2020). The required information consists of 0.5 anticipated effect sizes (Cohen's d), 95% desired statistical power level, 0.05 probability level. The size of the sample needed determines to be 176, 88, 212, and 106, respectively, for all effect sizes. The sample size of the study 784 met the requirements sufficiently enough to reflect the total population.

Table 2: Sample Characteristics

	Items	Respondents	Percentage	Cumulative Percentage
Gender	Male	276	35.2	35.2
	Female	508	64.8	100.0
Level of Course	Level 6 (Bachelors 1st Year)	349	44.5	44.5
	Level 7 (Bachelors 2nd Year)	58	7.4	51.9
	Level 8 (Bachelors 3rd & 4th Year)	234	29.8	81.8
	Level 9 (Masters 1st & 2nd Year)	143	18.2	100.0

To find the goodness of model fit, composite reliability, and discriminant validity, Synergetic PLS was utilized in the first level to check the validity and reliability of the instrument. SmartPLS was adopted to test the goodness of model fit, sign indeterminacy, and Dijkstra-Henseler's ϱ as the most critical reliability test. To prove the positive hypothesis influence of construct, SmartPLS 3.3.2 was utilized in the second level to analyze the measurement model and structural model. Also, the PLS-MGA

tool was utilized to test the hypothesis on moderating variables. Therefore, the study utilized the combinative PLS method that fulfills the characteristics of the structural equation model.

RESULTS

GOODNESS OF MODEL FIT

The assessment using the goodness of model fit needs to be done in the initial level of model assessment, before the analysis of the measurement and the structure model (Henseler et al., 2016). It is compulsory to report the model fit using inference statistics or the use of fit indices. The researcher should report the model fit through the test of model fit or assessment of the approximate model fit (Dijkstra & Henseler, 2015).

Table 3: Goodness of Model Fit

Fit criteria	Value
SRMR	0.066
d_{ULS}	1.649
d_G	0.955

Data shown in Table 3 reveals that the appropriate measure of model fit using standardized root mean square residual (SRMR) (Dijkstra & Henseler, 2015). Other model fit criteria using PLS Algorithm bootstrap to determine unweighted least squares discrepancy (d_{ULS}) and geodesic discrepancy (d_G) (Hair, Hollingsworth, et al., 2017). Less than 0.1 of SRMR value is a conservative view; the calculated result of 0.066 is a good fit for SRMR. d_G and d_{ULS} < 95 percent of bootstrap quantile considered as a conventional view; the computed result of 0.955 and 1.649 reflect the met criteria; therefore, the model attains a good fit.

Table 4: Indicator Reliability, Internal Consistency, Convergent Validity, and Fornell-Larcker Test of Discriminant Validity

	Alpha	CR	AVE	AS	CC	CD	IC	LC	QEL	SS	TS
AS	0.728	0.847	0.648	**0.805**							
CC	0.750	0.857	0.666	0.767	**0.816**						
CD	0.798	0.881	0.712	0.670	0.710	**0.844**					
IC	0.765	0.865	0.681	0.765	0.712	0.743	**0.825**				
LC	0.765	0.865	0.681	0.771	0.741	0.674	0.790	**0.825**			
QEL	0.871	0.903	0.608	0.778	0.740	0.716	0.839	0.832	**0.780**		
SS	0.708	0.836	0.630	0.693	0.694	0.714	0.732	0.735	0.739	**0.794**	
TS	0.775	0.870	0.690	0.764	0.720	0.694	0.712	0.728	0.750	0.621	**0.830**

To check the internal consistency reliability, composite reliability value, and Cronbach's alpha, all the value should be higher than 0.70 (Hair, Hult, et al., 2017). In the measurement evaluation, the study deems composite reliability, average variance extracted (AVE=convergent validity), outer loadings, Cronbach's α, and discriminant validity. Table 4 revealed the average variance extracted AVE values were above the minimum required level of 0.50, reflecting that the questionnaire represents the characteristics of the model and each research variable (Hair et al., 2010). Fornell-Larcker criterion is commonly used to evaluate the degree of shared variance between latent variables of the model (Fornell & Larcker, 1981). The square root comparison is made using the latent variable correlations with AVE values (Hair, Hult, et al., 2017). The calculated values are less than 0.9, so the discriminant validity was accepted. The results proved that the measurement scales are reliable and valid.

Table 5: HTMT Results

	AS	CC	CD	IC	LC	QEL	SS	TS
AS								
CC	.841							
CD	.881	.816						
IC	.829	.844	.849					
LC	.832	.877	.860	.833				
QEL	.879	.813	.857	.826	.819			
SS	.858	.840	.836	.888	.888	.829		
TS	.818	.850	.884	.826	.845	.813	.824	

Heterotrait-Monotrait Ratio of Correlations (HTMT) criterion to assess discriminant validity, if the value is below 0.90, reflects the discriminant validity has been accepted between two reflective constructs (Henseler et al., 2014). Table 5 represents the value less 0.90 proved that the measurement scales are reliable and valid.
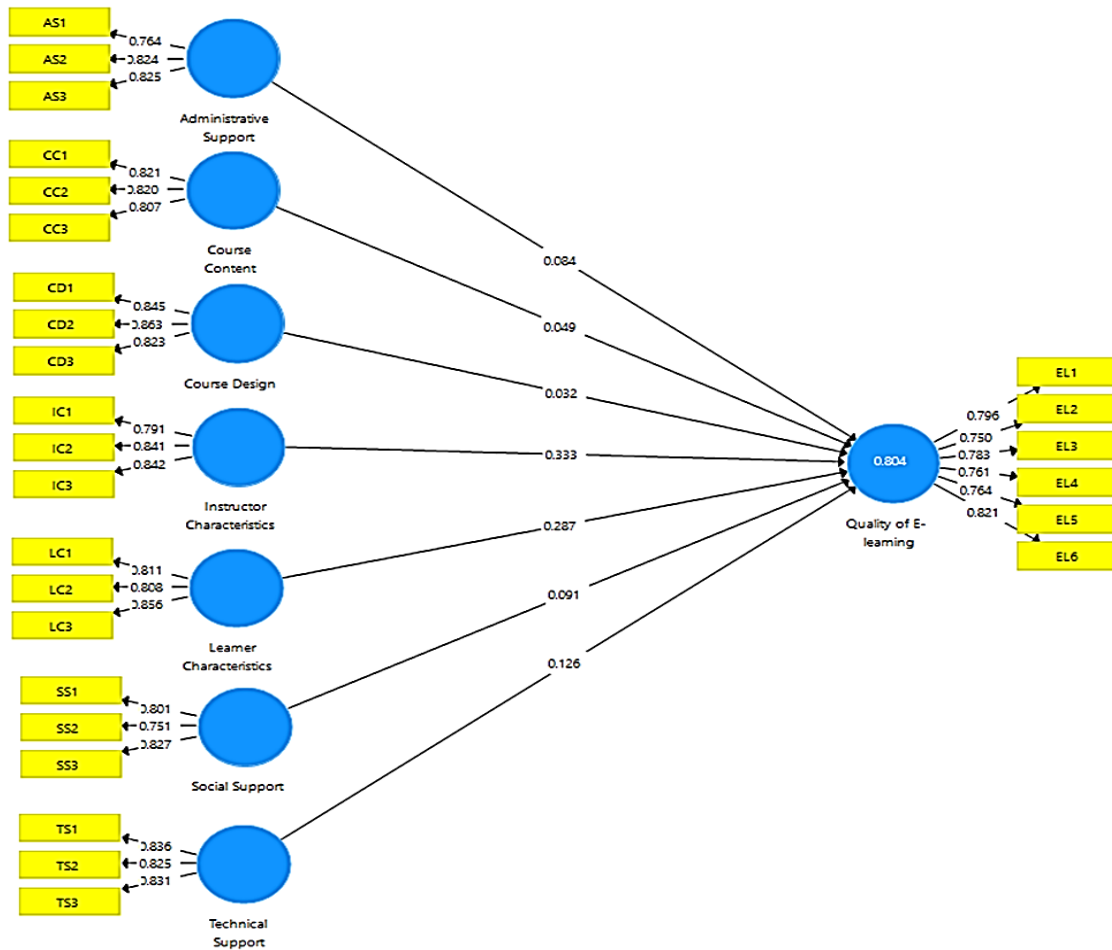
STRUCTURAL EQUATION MODELING (SEM)

Figure 2: PLS Result

Figure 2 represents that the R² value for the estimated equation is 0.804. It shows that 80.4 percent of the quality of e-learning is described by course design, course content, technical support, social support, administrative support, instructor characteristics, and learner characteristics.

Table 6: Structural Hypothesis

	Beta	SE	P-Values	VIF
Administrative Support → Quality of E-learning	0.084	0.034	0.014	2.817
Course Content → Quality of E-learning	0.049	0.030	0.036	2.005
Course Design → Quality of E-learning	0.032	0.033	0.000	2.007
Instructor Characteristics → Quality of E-learning	0.333	0.029	0.000	2.843
Learner Characteristics → Quality of E-learning	0.287	0.029	0.000	2.808
Social Support → Quality of E-learning	0.091	0.024	0.000	2.912
Technical Support → Quality of E-learning	0.126	0.023	0.000	2.084

Table 6 clarifies that the obtained results using the PLS Algorithm of the structural relationship. Tolerance and Variance Inflation Factors (VIF) are found by multicollinearity calculation. The problems with the multicollinearity will be reflected in the values of VIF is more than 4.0 or less than 0.2 tolerance (Hair et al., 2010). The Collinearity Statistics (outer VIF values) of administrative support 2.817, course content 2.005, course design 2.007, instructor characteristics 2.843, learner characteristics 2.808, social support 2.912, and technical support 2.084 were less than four represents that there is no multicollinearity effect among the variables.

Table 7: Hypothesis Testing

	Beta	t-Statistics	P-Values	Decision
Administrative Support → Quality of E-learning	0.084	2.467	0.014	Supported
Course Content → Quality of E-learning	0.260	2.098	0.036	Supported
Course Design → Quality of E-learning	0.430	3.716	0.000	Supported
Instructor Characteristics → Quality of E-learning	0.333	11.338	0.000	Supported
Learner Characteristics → Quality of E-learning	0.287	9.786	0.000	Supported
Social Support → Quality of E-learning	0.091	3.699	0.000	Supported
Technical Support → Quality of E-learning	0.126	5.461	0.000	Supported

The evidence revealed in Table 7 expresses the excellent results of testing of the hypothesis using bootstrapping. To test the hypothesis, using the analytical bootstrapping technique expressed the level of significance of the path between the variables, 5000 re-sampling methods of bootstrapping procedure was utilized while calculating by SmartPLS. The results indicate that administrative support has a positive relationship with the quality of e-learning ($\beta=0.084$, $p<0.05$); therefore, H_1 is accepted. The findings revealed that course content has a positive relationship with the quality of e-learning ($\beta=0.260$, $p<0.05$); therefore, H_2 is accepted. The results expressed that course design has a positive relationship with the quality of e-learning ($\beta=0.430$, $p<0.05$); therefore, H_3 is accepted. The values indicate that the instructor characteristics have a positive relationship with the quality of e-learning ($\beta=0.333$, $p<0.05$); therefore, H_4 is accepted. The results indicate that the learner characteristics have a positive relationship with the quality of e-learning ($\beta=0.287$, $p<0.05$); therefore, H_5 is accepted. The findings revealed that social support has a positive relationship with the quality of e-learning ($\beta=0.091$, $p<0.05$); therefore, H_6 is accepted. Finally, the findings indicated that technical support has a positive relationship with the quality of e-learning ($\beta=0.126$, $p<0.05$); therefore, H_7 is accepted. E-learning is the best technique in the education and learning process to enhance the quality of education and understanding of the course (Yanuschik et al., 2015). The different methodologies used for e-learning will enhance the quality of e-learning the understanding. The students' involvement in the systematic approach of e-learning is appropriate (Vasconcelos et al., 2020).

PARTIAL LEAST SQUARES - MULTIPLE GROUP ANALYSIS (PLS-MGA)

As per the guidelines of Henseler et al. (2009), a percentage higher than 0.95 and smaller than 0.05 indicate the significant difference between the group in the specific PLS path coefficient. The results are significant at the error level of 5 percent if the p-value is higher than 0.95 or smaller than 0.05. Table 8 revealed a significant difference in the quality of e-learning between the male and female: therefore, $H8_a$ is supported. The p-value 0.001 of learner characteristics is less than 0.05 reflects that there is a significant difference between the students' gender. In e-learning activities, there is a significant difference between male and female students. Also, there is an amount of difference between female and male students in the quality of e-learning, satisfaction, and motivation (Cuadrado-García et al., 2010).

Table 8: Significant difference between genders

	p-value (male vs. female)
Administrative Support → Quality of E-learning	0.717
Course Content → Quality of E-learning	0.372
Course Design → Quality of E-learning	0.311
Instructor Characteristics → Quality of E-learning	0.773
Learner Characteristics → Quality of E-learning	0.001
Social Support → Quality of E-learning	0.119
Technical Support → Quality of E-learning	0.210

Table 9: Significant difference between levels of course

	p-value (G1-G2)	p-value (G1-G3)	p-value (G1-G4)	p-value (G2-G3)	p-value (G2-G4)
Administrative Support → Quality of E-learning	0.247	0.005	0.001	0.413	0.007
Course Content → Quality of E-learning	0.397	0.000	0.009	0.052	0.162
Course Design → Quality of E-learning	0.090	0.230	0.001	0.198	0.668
Instructor Characteristics → Quality of E-learning	0.027	0.142	0.011	0.061	0.005
Learner Characteristics → Quality of E-learning	0.830	0.004	0.027	0.197	0.335
Social Support → Quality of E-learning	0.070	0.010	0.000	0.030	0.374
Technical Support → Quality of E-learning	0.003	0.943	0.148	0.012	0.056

Based on the guidelines of Henseler et al. (2009), a percentage higher than 0.95 and smaller than 0.05 indicate the significant difference between the group in the specific PLS path coefficient. The results are significant at the error level of 5 percent if the p-value is higher than 0.95 or smaller than 0.05. Table 9 represents a significant difference in the quality of e-learning between the level of courses: therefore, $H8_b$ is supported. The p-value of (G1-G2) 0.027 of instructor characteristics is less than 0.05, reflects that there is a significant difference between level 6 and level 7 courses. The p-value of (G1-G3) 0.005 of administrative support, 0.000 of course content, 0.004 of learner characteristics, and 0.010 of social support are less than 0.05 reflect that there is a significant difference between level 6 and level 8 courses. The p-value of (G1-G4) 0.001 of administrative support, 0.009 of course content, 0.001 of course design, 0.011 of instructor characteristics, 0.027 of learner characteristics, and 0.000 of social support are less than 0.05 reflect that there is a significant difference between level 6 and level 9 courses. The p-value of (G2-G3) 0.030 of social support and 0.012 of technical support are less than 0.05, indicates that there is a significant difference between level 7 and level 8 courses. The p-value of (G2-G4) 0.007 of administrative support and 0.005 are less than 0.05 reflects

that there is a significant difference between level 7 and level 9 courses. There is a difference between the level of the course and the quality of e-learning and other learning strategies. Also, there is a difference between the study habits, satisfaction, and learning strategies based on the level of the course (Peixoto, Peixoto, & Alves, 2012).

DISCUSSION AND IMPLICATIONS

The findings show that the hypothesis H_1 is supported; administrative support has a positive relationship on the quality of e-learning by the 5% (1.96) level of significance—administrator influence the learning atmosphere, institutional policies, and instructor's morale. Also, there is a relationship with the administrative support and quality of online learning (Yang, 2010). H_2 is supported; course content has a positive relationship with the quality of e-learning by the 5% (1.96) level of significance. Course content act as a primary consideration in e-learning; there is a similarity in the pattern of online courses (Jordan & Mitchell, 2015). H_3 is supported; course design has a positive relationship with the quality of e-learning by the 1% (2.58) level of significance. Course design supports the students understanding and involvement with the course.

The course design acts as an essential consideration in framing e-learning (Lister, 2014). H_4 is supported; instructor characteristics have a positive relationship with the quality of e-learning by the 1% (2.58) level of significance. Instructor characteristics are considered as a vital strategy adopted in the e-learning. Quality lies in satisfaction (Sankar, 2018). In the students' perspective of the quality of e-learning, the instructor can reflect the course quality and their academic achievement (Hoey, 2017). H_5 is supported; learner characteristics have a positive relationship with the quality of e-learning by the 1% (2.58) level of significance. Students' satisfaction is considered as an outcome of learner characteristics. The learner characteristics are the significant predictors of the quality of e-learning (Kintu et al., 2017). H_6 is supported; social support has a positive relationship with the quality of e-learning by the 1% (2.58) level of significance. Social support is one of the advantages of encouraging the students in e-learning participation and promote the completion of their course (Munich, 2014). H_7 is supported; technical support has a positive relationship with the quality of e-learning by the 1% (2.58) level of significance. There is a need for the necessary infrastructure of computers, networks, and technical teams with expert professionals in maintaining technical support. Sustainable technical support plays a vital role in the quality of e-learning (Nawaz & Kundi, 2010).

The results revealed a significant difference in the quality of e-learning between the male and female; therefore, $H8_a$ is supported. In e-learning activities, there is a significant difference between male and female students, and there is an amount of difference between female and male students in the quality of e-learning, satisfaction, and motivation (Cuadrado-García et al., 2010). Also, there is a significant difference in the quality of e-learning between the levels of courses; therefore, $H8_b$ is supported. There is a difference between the level of the course and the quality of e-learning and other learning strategies. Also, there is a difference between the study habits, satisfaction, and learning strategies based on the level of the course (Peixoto et al., 2012).

The study provides decision-makers with suggestions for the quality of e-learning based on the perspective of male and female students. The perception of male and female students' varies because of the external environment. There is an equal opportunity for male and female in e-learning, but female students use e-learning platform very well. Young generations are well versed in digital competency; it is the responsibility of the institutions to integrate the digital competency with the learning activity (Hong & Kim, 2018). Designing the e-learning system easier for male students is the key to enhance the students' experience of both the gender in providing effecting learning activity. The results also revealed that the students' perception of e-learning varies based on the level of course. Level 8 (Bachelors 3rd and 4th year) and level 9 (Masters 1st & 2nd Year) students can be given less contact or lecture classes and more directed and independent learning. Level 6 (Bachelors 1st Year) and Level 7 (Bachelors 2nd Year) can be given more of contact or lecture classes and less directed and

independent learning. Different support systems for the different levels of courses using information technology will enhance the quality of e-learning.

Therefore, during the COVID-19 pandemic, the e-learning needs to focus on the variables (administrative support, course content, course design, instructor characteristics, learner characteristics, social support, and technological support) and different strategies for the students based on gender and level of course. It is essential to have flexibility in the delivery of courses and instructions will enhance the quality of e-learning. Also, there should be proper development tools (training path and e-learning portals). Further, improved communication is needed in a technology-based system and brings an opportunity for creating their style of teaching and communication. Moreover, proper management tools will support the progression of the instructors in the quality of e-learning. Overall, e-learning plays a vital role in continuing education during the COVID-19 pandemic.

CONCLUSION

In line with the procedures implemented in this study, the findings are systematized to check validity and reliability. Structural hypothesis and hypothesis testing using Smart PLS 3.3.2, PLS-MGA was done to analyze the measurement model and structural model to maintain coherence in the progress of arguments and the demonstration of findings. Structural Equation Modelling is used in this research exposed that there is a positive relationship between the quality of e-learning and the considered seven factors: administrative support, course content, course design, instructor characteristics, learner characteristics, social support, and technical support from the perspective of the students. However, in the view of gender and different course levels comprising undergraduates and postgraduates, the study revealed that there is a significant difference between the gender as well levels, of course, with the quality of e-learning.

The findings clearly stated that administrative support and course content are accepted, and the value reflects that there is a need for improvement in these areas to enhance the quality of e-learning. Further, there should be some improvisation in the course content accompanied with the technology to support blended e-learning. Moreover, the implementation of the e-learning procedure is in the hands of administrators, so the educational institutions need to consider the extent of the administrative support to enhance the quality of e-learning. Based on different findings using different methodologies, the proposed research model enhances the understanding of the quality of e-learning from the perspective of students. Moreover, it is proved that the systematic approach of e-learning is an appropriate tool to educate the students during COVID-19.

LIMITATIONS AND FUTURE RESEARCH

The study is limited to the students of India and the Kingdom of Saudi Arabia. The travel restrictions and closed-down universities are the significant limitations of the study. Moreover, this study lays the groundwork for future research in designing of e-learning system in higher education, includes establishing a working team of instructors, the collaboration of students, handling psychological pressure and anxiety, dealing student motivation and engagement, managing expected challenges, and continuous improvements to enhance the students' learning outcome and satisfaction. Besides, it is essential to consider in the design of e-learning is how students need to self-regulate their learning. Moreover, the improvement of each factor considered in this research to attain a high degree of quality of e-learning can be endeavored by decision-makers in the educational institutions. Despite all the factors, designing post-pandemic pedagogy in securing higher education is an essential factor to be addressed.

ACKNOWLEDGMENT

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