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Engineering students' perceptions of e-learning in higher education: A two-university comparison

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Abstract

Acceptance of e-learning among students in higher education institutions is crucial to a thriving educational environment. In this context, the present research focuses on exploring e-learning practices and perceptions in engineering colleges of Kuwait and India with the help of the adapted technology acceptance model. The survey of 270 students from the two universities showed generally positive perceptions toward e-learning. Convenience was another factor affecting actual usage in Kuwait and motivation in India. Though some differences were observed in the perceived usefulness of e-learning among Kuwaiti and Indian students, both colleges' participants recognized the benefits of e-learning and the acceptance of its application. The results stress the importance of cultural and institutional factors while implementing e-learning methodologies in engineering education. Consequently, explicit knowledge from this research extends the comprehension of e-learning effectiveness in various educative environments for educators and policymakers.

Keywords: cross-cultural e-learning, engineering education, technology adoption

INTRODUCTION

Higher education has taken a new twist across the globe, altering norms that have taken centuries to develop. In this age of rationality and technological advancement, the importance of cultivating learning and students' views on learning in higher education has dramatically boosted in terms of putting proper strategies for effective learning. This is evident in engineering education, mainly because engineering is a science and mathematics-based field that needs such advancements. School institutions, colleges, and universities are gradually integrating e-learning as one of the ways through which students can be taught. This transition is due to developments in educational technologies ensuring engineering students get access to online educational resources, including virtual tutorials, e-books, virtual reality, augmented reality, and virtual laboratories. Although e-learning may be addressed in the scholarly literature (Abdullah & Kauser, 2023; Alam & Mohanty, 2023; Šumak et al., 2011), there are limited works related to learners' perception of e-learning specifically in the field of engineering domain (Garrido-Gutiérrez et al., 2023) despite its increasing importance and use in an international context (Abbad, 2021). This quantitative study aims to determine the students' attitudes, perceptions, and preferences towards higher education within two engineering institutes, Kuwait University and KLE Technical University in India, to understand their perceptions towards higher education.

E-Learning in Higher Education

In this literature, e-learning has been described in several ways. E-learning is the teaching and learning instructions provided through the Internet (Clarey, 2008; Jenkins & Hanson, 2003). Based on this concept, e-learning is related to other terms such as virtual learning, online learning, web instruction, and web-based learning. Technologies have been integrated into institutions to make them effective in teaching and learning processes (Alenezi, 2023) for students and instructors alike. Moreover, the literature review on the state of knowledge on principles for quality delivery of online courses has been discussed (Castro et al., 2021).

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Contribution to the literature

- The study highlights the emphasis on cultural and institutional considerations to facilitate successful e-learning integration.
- Higher educations institutions should prioritise user experiences and e-learning platforms while ensuring that learners recognise the importances of enhancing learning engagement.
- The study contributes to the literature by providing insights on how technological environments may impact the acceptance of e-learning and the effectiveness of e-learning platforms.

According to Rosenberg (2001), e-learning is described as a flexible approach to learning characterized by the following:

1. It is based on a form of a network.
2. It is broad.
3. It assists people in getting information and knowledge.

It becomes difficult to define e-learning since it is all different. Sangrà et al. (2012) researched to establish a comprehensive definition of e-learning, identifying four key categories: use of technology, delivery systems, modality of communication, and educational model. They noted that they found poor and good practices in implementing e-learning mainly due to the context, teacher approach, and aspects of technology used in learning. Thus, analyzing these factors is imperative for understanding the best e-learning practices in international settings.

Relevant Research

Previous research has reviewed the literature concerning e-learning implementation in higher learning institutions, especially regarding engineering students' attitudes and usage. As in the studies of Rabaa'i (2016) and Rosaline and Wesley (2017), the application of e-learning increased the learning environment in the universities of Kuwait and India. These conclusions are consistent with a large-scale systematic review by Abuhassna et al. (2023), who reported the persistence of these trends in the studies of technology acceptance across different e-learning contexts. Even though many opportunities characterize e-learning, it is apparent that some challenges still exist, especially in developing countries. For instance, Qazi et al. (2024) noted that lacking adequate resources, weak infrastructures, and negative dispositions among the stakeholders hampers this learning mode. Failure within such issues suggests a requirement for the localization of solutions in specific learning environments (Abbad, 2021).

On the same note, one ought to respect cultural differences that define the perception of e-learning. While comparing the importance of those factors among students from Eastern and Western countries, Al-Fadhli (2008) identified cultural and gender-based restrictions in Middle Eastern societies, providing a positive outlook for e-learning, particularly for female students. In the same regard, Alhabeeb and Rowley (2018) established that Saudi Arabian students differ from their British counterparts regarding their attitude toward e-learning.

This means that students engross themselves in their studies, depending on the value and relevance of the e-learning content. According to Kapilan et al. (2021), it was established that learners doing engineering at college most valued interactive simulators or virtual labs, which best mimicked real scenarios. Therefore, the findings align with those of Garrido-Gutiérrez et al. (2023), who stressed that critical linkages must be made concerning the online material for engineers under e-learning in engineering.

The pandemic also led to a spike in online classes, also known as e-learning, which had positive and negative impacts. Thus, Mishra et al. (2020) explored this shift to emergency remote teaching during this period in Indian technical institutions, revealing students' recognition of the flexibility offered but, at the same time, low internet access and absence of practical experience.

Novelties arise as e-learning progresses in its development as an education delivery method. Radianti et al. (2020) examined in one study how virtual reality and augmented reality can enhance students' engagement and, at the same time, enable them to understand several concepts in engineering through the e-learning platform fully. To establish what the future holds for engineering education regarding e-learning, these advancements and other continued endeavors in identifying the learners' responses and cultural issues will be crucial.

Theory Development and Research Model

Different theories in instruction technologies have been formulated to explain how students, teachers, and scholars choose technologies within educational settings through which they learn. These theories include Davis's (1989) technology acceptance model (TAM), Rogers' (1995) innovation diffusion theory, and the unified theory of acceptance and use of technology by Venkatesh et al. (2003). Over the years, many adaptations have occurred; however, Davis (1989) revealed that the TAM is still the most popular theory employed to explain technology applications. In other

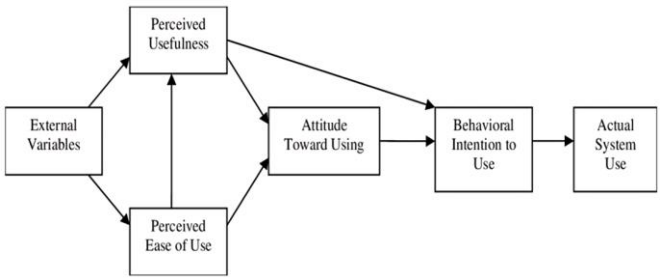

Figure 1. TAM (Davis et al., 1989)

words, TAM assesses the student's attitude and perception of e-learning as posted in **Figure 1**.

The TAM model mainly focuses on the student's perception of the technology, starching that, in most cases, the technology might be appreciated by instructors. However, learners have different perceptions of usefulness, ease of use, effectiveness, and attitude toward using the same technology. The two TAM constructs are perceived usefulness (PU), which reflects the student's attitude toward the belief that technology can help him or her learn better and more effectively, and perceived ease of use (PEU), which captures the extent of difficulty that any information technology tool can be employed by the students while learning. For instance, regarding e-learning, these variables appear very significant in the determination of the uptake of the technology among users. Besides, this survey has 22 questions that would elicit all these qualities that tell or describe the partner.

Perceived usefulness

PU refers to an individual's conviction that using a given system would increase his/her work productivity (Davis, 1989, p. 320). Mobile scholars have mentioned that PU is among the significant factors influencing technology acceptance (Habibi et al., 2019; Lee et al., 2003).

Perceived ease of use

PEU is, therefore, another perceived construct, which, according to consumers' beliefs, explains the degree of ease that is apparent with the use of a new technology or system. Previous studies have established that the PEU can be proposed as an index of PU and, therefore, the intention to use innovation (Teo et al., 2018). For example, Nikou and Economides (2019) acknowledged PEU that affected the PU (r =. 432) or the level of intention to use technology (r = . 408), which highlighted the dual role of PEU as an indicator circumventing people's attitude toward the use of technology. The literature review provided information about the unique characteristics and processes related to PEU in the context of stress, which showed the general and specific functions of PEU. For instance, Perienen's (2020) study of technology integration revealed that user-friendly interface design significantly impacts teachers' PEU of technology. Positive PEU strongly correlated with increased technology adoption and integration in teaching practices. The study highlights the importance of intuitive design in maximizing the effectiveness of technology in education, supporting the proposition that as wide as students utilize e-learning, it depends on its navigability.

Actual use

Actual use examines the ways that the population uses technology. PEU and PU are essential when predicting the technology uptake, while actual use displays these intentions. That is why knowing the determinants of actual usage is deemed necessary in evaluating the effectiveness of an implemented technology. Firstly, the current research conducted in the field has analyzed components like user satisfaction, the performance of the system, and other factors that affect the product's actual use. For instance, Deng et al. (2023) examined system reliability and technical support on users' behavior toward products, and their findings indicated that a steady presence with quick positive response would have a long-term commitment, especially in e-learning applications.

Attitude toward using

The extent to which people have a positive or negative perception of a specific technology or system is what is referred to as attitude towards usage. Some components that involve emotional, cognitive, and behavioral aspects to demonstrate users' characteristics, perceptions, and volitions about the acceptance of the technology include: The recent research has concentrated on various facets of perceived attitude towards usage, such as perceived enjoyment, PU, and perceived risks. For instance, Alshurideh et al. (2023) undertook a study that sought to establish the impact of perceived risk on the user's attitude towards adopting new technologies; responding to anxiety and inquiries to cultivate a positive attitude of acceptance becomes paramount.

Behavioral intention

Behavioral intention (BI) is the desire and preparedness to perform specific actions like adopting technology tools or practicing certain practices. This approach is one of the most important prerequisites of observable behavior and is essential in influencing the following endeavors. The authors of recent studies also helped expand the knowledge regarding BI by analyzing its antecedents and influencers. According to Harnadi et al. (2024), concerning students, they defined the group as those who accept massive open online courses (MOOCs) and e-learning acceptance behaviors; they compared the acceptance behaviors of the platforms where the authors found a positive correlation between 'PU' as an index of

BI that means if the technology is accessible, students will accept e-learning. Further, principles are provided on how the children can use these products at school. Such factors affect their behaviors and purposeful utilization of technologies at school to a considerable extent. This variable has also been discussed in other literature articles by authors such as Alassafi (2022) and Alshurideh et al. (2023).

Self-Efficacy

The concept of self-efficacy, therefore, is the extent to which a person believes in their capacity to execute a particular behavior or accomplish a specific task. It is necessary for incentives, endeavors, perseverance, and assistance in decisions and actions on several fronts. Recent research has defined self-efficiency as the key to affect intensity, patterns, and barriers to, and enhancements in, technology use. For instance, Ghali and Amari (2024) reviewed the effect of self-efficacy on user interaction with online learning environments, pointing out that e-learning effectiveness identifies online learner-content and learner-instructor interactions as critical predictors. Learner self-efficacy significantly controlled the impact of these interactions on online communication, providing valuable insights for improving e-learning systems.

Accessibility

This is how individuals can naturally procure and utilize the required equipment, programs, and solutions to engage with technology. This includes accessibility as a characteristic of information communication technologies for physical inclusions, affordability, and ease of use of technology, as well as infrastructures for cognitive and socio-economic inclusion. These dispositions have been focused in the current research on increasing opportunities in technology use to remove barriers and unfair disparities. For instance, Williams (2023) has looked at how accessible technologies and solutions are incorporated into learning technologies, focusing on UDL and assistive technologies for learners with disabilities and other users. In sum, this literature has extended extant knowledge regarding the concepts central to technology acceptance/use behavior, unraveling the dynamic relationship between individual and social contextual factors that influence perceptions, beliefs, and decisions concerning new technologies.

METHOD

Based on the TAM model, an assessment questionnaire was developed based on students' technological skills, perceived usage, usefulness of technology in engineering, and satisfaction with technology. Through Google Forms, participants were requested to complete questions on demographic information, PU of e-learning, PEU of e-learning,

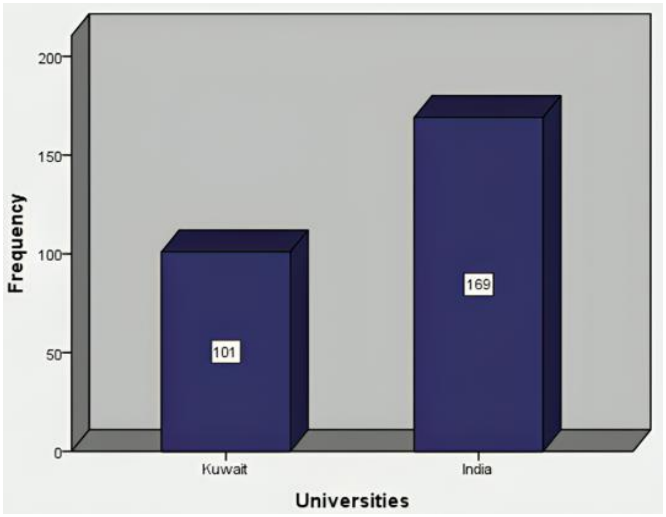

Figure 2. Distribution of respondents on universities (Source: Authors' own elaboration)

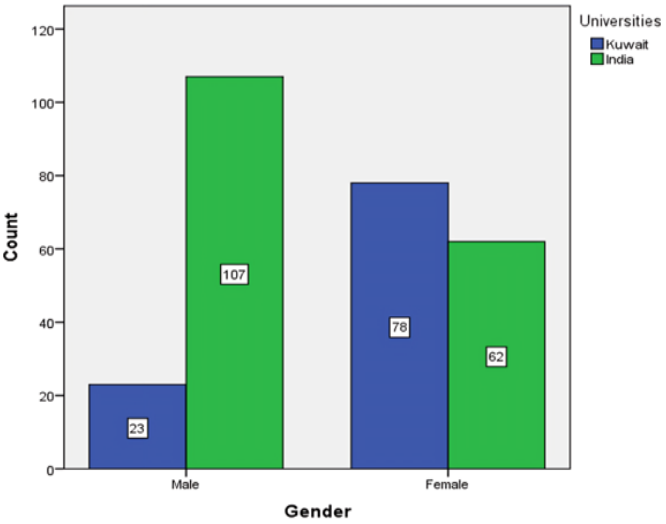

Figure 3. Distribution of respondents on gender (Source: Authors' own elaboration)

attitude towards e-learning, perceived behavioral control concerning the use of e-learning system, actual usage of e-learning systems, perceived self-efficacy, and accessibility of e-learning systems. This survey was adapted from several studies (Abdullah & Kauser, 2023; Al Amin et al., 2023; Davis, 1989; Garrido-Gutiérrez et al., 2023). The questionnaire consisted of 23 Likert scare questions that analyzed the correlation between e-learning and technology-enhanced learning experiences and perceptions in two universities: Kuwait and India. The two countries are compared in **Figure 2**, **Figure 3**, **Figure 4**, and **Figure 5**.

This study aims to:

1. The purpose of this research study will be to establish the students' views about e-learning in two university contexts.
2. To establish how students use e-learning practices.
3. This study aims to establish similarities in the e-learning practices practiced in two university higher learning settings.

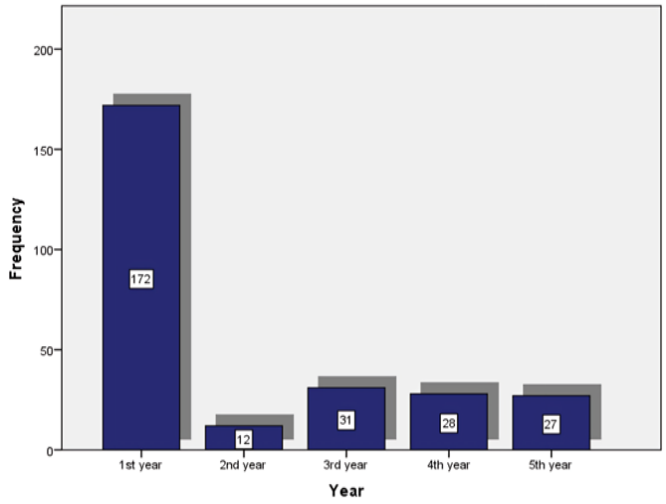

Figure 4. Distribution of respondents on academic year (Source: Authors' own elaboration)

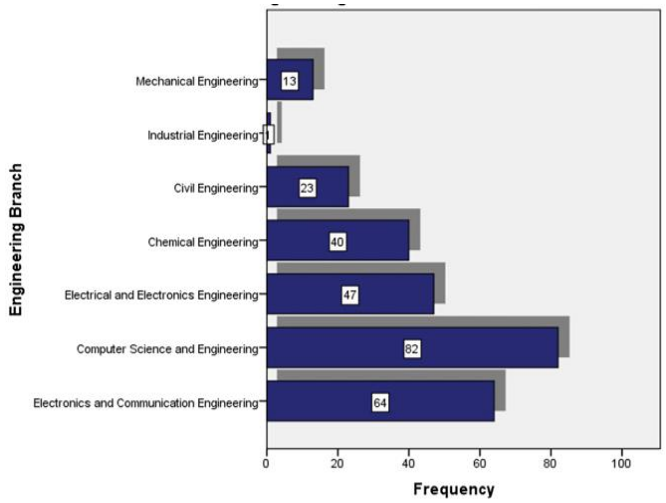

Figure 5. Distribution of respondents on the engineering branch (Source: Authors' own elaboration)

Setting

The survey was conducted on respondents from the college of engineering in Kuwait and an engineering college in South India. Kuwait university system consists of sixteen colleges, among which the college of engineering and petroleum is one. The college was established in 1974 during the phase of development and urbanization in Kuwait; this phase necessitated the qualification and training of technicians and engineers among the Kuwaiti workforces. Presently, the college delivers ABET-accredited undergraduate and graduate programs in different branches of engineering, including civil, chemical, computer, electrical, mechanical, petroleum, industrial, and management system engineering branches. The KLE Technological University is a private college founded in 1947, and some of their courses, that is, eighteen total, are undergraduate and postgraduate courses in fields like mechanical engineering, civil engineering, computer science, electronics, etc.

Sample Design

A multi-stage sampling technique was used to conduct the study. In the first stage, the purposive sampling technique was applied to identify the engineering colleges. One Kuwait engineering college and one engineering college in India were chosen. In the second stage, the online questionnaire was administered through snowball sampling, where the contact persons provided more participants for the study. Informed consent questionnaires were used to obtain it. Therefore, the total number of subjects was 270, the Kuwaiti engineering college sample was 101, and the Indian engineering college was 169. The collected data were analyzed to determine engineering students' perceptions regarding e-learning and technology-enhanced learning experiences in two universities, Kuwait and India, the countries chosen for the present case.

Research Questions

Based on the research aims, the following research questions were raised:

1. What factors affect the actual use of e-learning in higher education?
2. What is the relationship between the independent variables and the dependent variable?
3. What is the PU of e-learning among engineering students?
4. What is the attitude of engineering students toward e-learning?
5. Are there significant differences in attitudes toward e-learning between engineering students in the two countries?
6. How are students using e-learning in higher education?
7. What is the difference between male and female students in both countries?

Research Hypotheses

H1. PEU positively influences the usefulness of e-learning.

H2. PEU positively influences attitude towards e-learning in higher education.

H3. PU has a positive influence on attitude towards using e-learning.

H4. PU has a positive influence on intention to use.

H5. Attitude towards using has a positive influence on intention to use.

H6. Perceived self-efficacy toward e-learning positively influences intention to use.

Sub-Hypotheses

Ho1. There is no significant relationship between PEU and usefulness of e-learning.

Table 1. Correlations between the independent and dependent variables

	Usage of e-learning (Kuwait)	Usage of e-learning (India)	Usage of e-learning (overall)
Attitude	0.68** (p = .000)	0.62** (p = .000)	0.62** (p = .000)
Perceived ease of use	0.67** (p = .000)	0.60** (p = .000)	0.62** (p = .000)
Perceived usefulness	0.63** (p = .000)	0.65** (p = .000)	0.61** (p = .000)
Intention to use	0.62** (p = .000)	0.60** (p = .000)	0.59** (p = .000)
Accessibility	0.61** (p = .000)	0.54** (p = .000)	0.56** (p = .000)
Self-efficacy	0.61** (p = .000)	0.49** (p = .000)	0.53** (p = .000)

Note. **Correlation is significant at the 0.01 level (2-tailed)

Ho2. No significant relationship exists between PEU and students' attitudes toward e-learning.

Ho3. There is no significant relationship between PU and students' attitudes toward using e-learning.

Ho4. There is no significant relationship between PU and intention to use e-learning.

Ho5. No significant relationship exists between students' attitudes and intention to use an e-learning system.

Ho6: There is no significant relationship between perceived self-efficacy and intention to use an e-learning system.

RESULTS AND ANALYSIS

The study analyzed the questionnaire data using descriptive and inferential tests. Results are presented in tables and charts, and appropriate interpretation and discussion are provided.

Demographic Information of the Respondents

This study on e-learning perceptions surveyed 270 engineering students from universities in Kuwait (37.4%) and India (62.6%). The gender distribution varied significantly between the two institutions, with Kuwait having more female respondents (77.2%) and India having more male respondents (63.3%). First-year students comprised the majority of participants (63.7%), mainly due to the timing of data collection. Upper-year students were less available due to academic commitments like exams and projects. This skew in academic year representation should be considered when interpreting the results. Computer science and engineering students formed the largest group (30.4%), while industrial engineering had the most miniature representation (0.4%). This diversity in engineering branches provides a broad perspective on e-learning across different specializations. The sample's composition–with its variations in nationality, gender, academic year, and engineering specialization–offers valuable insights into e-learning perceptions. However, it also highlights the need to consider these demographic factors when analyzing the findings and their implications for e-learning implementation in higher education.

Research Question 1

Factors affecting the actual use of e-learning in higher education in both countries

Multiple regression analysis was conducted to determine the factors that significantly predict the actual use of e-learning in both countries. At Kuwaiti University, the results of the regression analysis indicate that two predictors explained 52.8% of the variation in the actual use of e-learning (R^2 = .528, F [2, 98] = 54.91, p < .001). It was found that Attitude toward e-learning significantly predicted actual usage (β = .47, p < .001), as did accessibility (β = .35, p < .001). In the Indian university, the regression analysis results indicate that two predictors explained 47.1% of the variation in the actual use of e-learning (R^2 = .471, F [2, 166] = 76.88, p < .001). It was found that PU significantly predicted actual usage (β = .84, p < .001), as did intention to use (β = .33, p < .001).

Research Question 2

Relationship between the independent and dependent variables

Pearson correlation analysis was conducted to determine the relationship between the independent and dependent variables. The results of the correlation analysis between the independent and dependent variables in the study are displayed in **Table 1**. A correlation coefficient (r) less than 0.4 (+ or -) indicates weak correlation; a correlation coefficient (r) between 0.4 (+ or -) and 0.6 (+ or -) inclusive indicates moderate correlation; a correlation coefficient (r) between 0.7 (+ or -) and 0.9 (+ or -) inclusive indicates strong correlation, a correlation coefficient (r) of 0 indicates no correlation while a correlation coefficient (r) of 1 (+ or -) indicates perfect correlation. Correlation results for Kuwait indicate that there was a statistically significant moderate positive relationship between the dependent variable, usage of e-learning, and the independent variables, attitude (r = 0.68, p < .05), PEU (r = 0.68, p < .05), PU (r = 0.63, p < .05), intention to use (r = 0.62, p < .05), accessibility (r = 0.61, p < .05), self-efficacy (r = 0.61, p < .05). Correlation results for India indicate that there was a statistically significant moderate positive relationship between the dependent variable, usage of e-learning, and the independent variables, attitude (r =

Table 2. Overall perceived usefulness of e-learning among engineering students

Item	SD (%)	D (%)	U (%)	A (%)	SA (%)
The e-learning applications are beneficial	5 (1.9%)	5 (1.9%)	46 (17.0%)	93 (34.4%)	121 (44.8%)
I feel using the e-learning applications makes it easy to do whatever I like to do	8 (3.0%)	10 (3.7%)	48 (17.8%)	97 (35.9%)	107 (39.6%)
Using e-learning applications allows me to accomplish learning tasks more quickly	7 (2.6%)	11 (4.1%)	61 (22.6%)	82 (30.4%)	109 (40.4%)
Using e-learning applications improves my learning performance	9 (3.3%)	17 (6.3%)	49 (18.1%)	91 (33.7%)	104 (38.5%)
Using e-learning applications enhances my effectiveness in learning	8 (3.0%)	16 (5.9%)	68 (25.2%)	88 (32.6%)	90 (33.3%)

Note. SD: Strongly disagree; D: Disagree; U: Neither agree nor disagree; A: Agree; & SA: Strongly agree

Table 3. Perceived usefulness of e-learning among Kuwaiti engineering students

Item	SD (%)	D (%)	U (%)	A (%)	SA (%)
The e-learning applications are beneficial	5 (5.0%)	4 (4.0%)	19 (18.8%)	24 (23.8%)	49 (48.5%)
I feel using the e-learning applications makes it easy to do whatever I like to do	7 (6.9%)	7 (6.9%)	17 (16.8%)	25 (24.8%)	45 (44.6%)
Using e-learning applications allows me to accomplish learning tasks more quickly	7 (6.9%)	4 (4.0%)	22 (21.8%)	19 (18.8%)	49 (48.5%)
Using e-learning applications improves my learning performance	8 (7.9%)	11 (10.9%)	12 (11.9%)	29 (28.7%)	41 (40.6%)
Using e-learning applications enhances my effectiveness in learning	4 (4.0%)	12 (11.9%)	33 (32.7%)	21 (20.8%)	31 (30.7%)

Note. SD: Strongly disagree; D: Disagree; U: Neither agree nor disagree; A: Agree; & SA: Strongly agree

Table 4. Perceived usefulness of e-learning among Indian engineering students

Item	SD (%)	D (%)	U (%)	A (%)	SA (%)
The e-learning applications are beneficial	0 (0.0%)	1 (0.6%)	27 (16.0%)	69 (40.8%)	72 (42.6%)
I feel using the e-learning applications makes it easy to do whatever I like to do	1 (0.6%)	3 (1.8%)	31 (18.3%)	72 (42.6%)	62 (36.7%)
Using e-learning applications allows me to accomplish learning tasks more quickly	7 (4.1%)	39 (23.1%)	63 (37.3%)	60 (35.5%)	60 (35.5%)
Using e-learning applications improves my learning performance	1 (0.6%)	6 (3.6%)	37 (21.9%)	62 (36.7%)	63 (37.3%)
Using e-learning applications enhances my effectiveness in learning	4 (2.4%)	4 (2.4%)	35 (20.7%)	67 (39.6%)	59 (34.9%)

Note. SD: Strongly disagree; D: Disagree; U: Neither agree nor disagree; A: Agree; & SA: Strongly agree

0.62, $p < .05$), PEU ($r = 0.60$, $p < .05$), PU ($r = 0.65$, $p < .05$), intention to use ($r = 0.60$, $p < .05$), accessibility ($r = 0.54$, $p < .05$), self-efficacy ($r = 0.49$, $p < .05$). Correlation results for all the participants indicate that there was a statistically significant moderate positive relationship between the dependent variable, usage of e-learning, and the independent variables, attitude ($r = 0.62$, $p < .05$), PEU ($r = 0.62$, $p < .05$), PU ($r = 0.61$, $p < .05$), intention to use ($r = 0.59$, $p < .05$), accessibility ($r = 0.56$, $p < .05$), self-efficacy ($r = 0.53$, $p < .05$).

Research Question 3

Perceived usefulness of e-learning among engineering students

The analysis of respondents' PU of e-learning is presented in **Table 2** for Kuwaiti participants, **Table 3** for Indian participants, and **Table 4** for all the participants. The results are consistent for the Kuwaiti and Indian participants overall. The results indicate that most of the participants (agree plus strongly agree) believe that:

- e-learning applications are beneficial,
- using the e-learning applications makes it easy to do whatever they like to do,
- using e-learning applications allows them to accomplish learning tasks more quickly,
- using e-learning applications improves their learning performance, and
- using e-learning applications enhances their effectiveness in learning.

An independent samples t-test was also conducted to determine if there is a statistically significant difference in the PU of e-learning for Kuwaiti and Indian engineering students. Independent samples t-test results indicate a statistically significant difference in the PU of e-learning among Kuwaiti and Indian engineering students. On average, Indian engineering students

Table 5. Attitude of Kuwaiti engineering students toward e-learning

Item	SD (%)	D (%)	U (%)	A (%)	SA (%)
I like using e-learning applications	8 (7.9%)	7 (6.9%)	17 (16.8%)	29 (28.7%)	40 (39.6%)
I believe the e-learning applications worth the investment	8 (7.9%)	6 (5.9%)	18 (17.8%)	23 (22.8%)	46 (45.5%)
I believe it is worth using e-learning applications in my learning	5 (5.0%)	11 (10.9%)	14 (13.9%)	24 (23.8%)	47 (46.5%)
I think e-learning applications are fun to use	9 (8.9%)	7 (6.9%)	28 (27.7%)	24 (23.8%)	33 (32.7%)
I think e-learning is an innovative concept and must be encouraged	5 (5.0%)	6 (5.9%)	25 (24.8%)	22 (21.8%)	43 (42.6%)

Note. SD: Strongly disagree; D: Disagree; U: Neither agree nor disagree; A: Agree; & SA: Strongly agree

Table 6. Attitude of Indian engineering students toward e-learning

Item	SD (%)	D (%)	U (%)	A (%)	SA (%)
I like using e-learning applications	2 (1.2%)	6 (3.6%)	31 (18.3%)	66 (39.1%)	64 (37.9%)
I believe the e-learning applications worth the investment	4 (2.4%)	7 (4.1%)	44 (26.0%)	61 (36.1%)	53 (31.4%)
I believe it is worth using e-learning applications in my learning	0 (0.0%)	4 (2.4%)	36 (21.3%)	61 (36.1%)	68 (40.2%)
I think e-learning applications are fun to use	3 (1.8%)	6 (3.6%)	44 (26.0%)	57 (33.7%)	59 (34.9%)
I think e-learning is an innovative concept and must be encouraged	2 (1.2%)	5 (3.0%)	26 (15.4%)	63 (37.3%)	73 (43.2%)

Note. SD: Strongly disagree; D: Disagree; U: Neither agree nor disagree; A: Agree; & SA: Strongly agree

Table 7. Overall attitude of engineering students toward e-learning

Item	SD (%)	D (%)	U (%)	A (%)	SA (%)
I like using e-learning applications	10 (3.7%)	13 (4.8%)	48 (17.8%)	95 (35.2%)	104 (38.5%)
I believe the e-learning applications worth the investment	12 (4.4%)	13 (4.8%)	62 (23.0%)	84 (31.1%)	99 (36.7%)
I believe it is worth using e-learning applications in my learning	5 (1.9%)	15 (5.6%)	50 (18.5%)	85 (31.5%)	115 (42.6%)
I think e-learning applications are fun to use	7 (2.6%)	11 (4.1%)	51 (18.9%)	85 (31.5%)	116 (43.0%)
I think e-learning is an innovative concept and must be encouraged	12 (4.4%)	13 (4.8%)	72 (26.7%)	81 (30.0%)	92 (34.1%)

Note. SD: Strongly disagree; D: Disagree; U: Neither agree nor disagree; A: Agree; & SA: Strongly agree

(mean [M] = 4.10, standard deviation [SD] = 0.68) reported better PU of e-learning than Kuwaiti Engineering students (M = 3.89, SD = 1.00). This difference, -0.22, 95% CI [-0.42, -0.01], was statistically significant, $t(268) = -2.11$, $p < .05$.

Research Question 4

The attitude of engineering students toward e-learning

The analysis of respondents' attitudes towards e-learning is presented in **Table 5** for Kuwaiti participants, **Table 6** for Indian participants, and **Table 7** for all the participants. The results are consistent for the Kuwaiti and Indian participants overall. The results indicate that most of the participants (agree plus strongly agree) opined that:

- they like using e-learning applications,
- e-learning applications worth the investment,
- it is worth using e-learning applications in their learning,
- e-learning applications are fun to use, and
- e-learning is an innovative concept and must be encouraged.

Research Question 5

Comparison of attitude scores of Kuwaiti and Indian engineering students

An independent samples t-test was conducted to determine if there was a statistically significant difference in the attitude of Kuwaiti and Indian Engineering students toward e-learning. Independent samples t-test results indicate no statistically significant difference in the attitude of Kuwaiti and Indian Engineering students toward e-learning. On average, Indian Engineering students (M = 4.06, SD = 0.73) indicated a better attitude toward e-learning than Kuwaiti Engineering students (M = 3.86, SD = 1.02). This difference, -0.20, 95% CI [-0.41, 0.01], was not statistically significant, $t(268) = -1.86$, $p > .05$.

Research Question 6

Usage of e-learning by engineering students in higher education

A descriptive analysis was conducted to determine how engineering students in the two universities utilize e-learning. **Figure 6** shows the e-learning usage by the

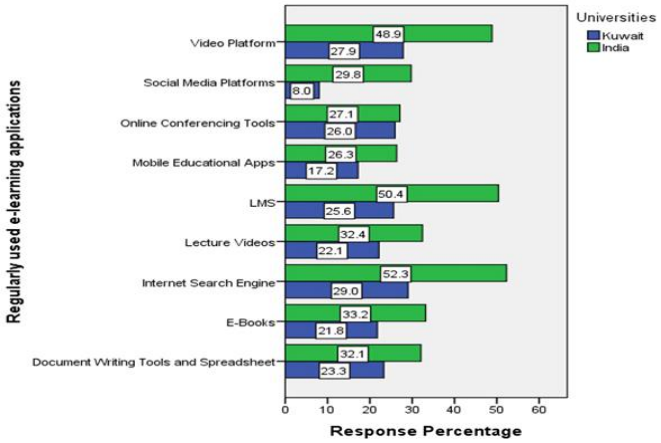

Figure 6. E-learning applications used by respondents (Source: Authors' own elaboration)

study participants. Results indicate that 48.9% of Indian university students and 27.9% of Kuwaiti university students use video platforms for e-learning. Social media platforms are used by 29.8% of Indian university students and 8.0% of Kuwaiti university students for e-learning. Online video conferencing tools are used by 27.1% of the Indian university students and 26.0% of the Kuwaiti university students for e-learning. 26.3% of Indian university students and 17.2% of Kuwaiti university students use mobile educational applications for e-learning. 50.4% of Indian university students and 25.6% of Kuwaiti university students use learning management systems (LMS) for e-learning. Lecture videos are utilized by 32.4% of Indian university students and 22.1% of Kuwaiti university students for e-learning. 52.3% of Indian university students and 29.0% of Kuwaiti university students use the Internet search engines for e-learning. 33.2% of Indian university students and 21.8% of Kuwaiti university students use e-books for e-learning. Document writing tools and spreadsheets are employed by 32.1% of Indian university students and 23.3% of Kuwaiti university students for e-learning.

Research Question 7

Difference between male and female students in both countries

Regarding gender, 23(22.8%) of the respondents from the Kuwaiti university were male, while the remaining 78(77.2%) were female. The Indian university, on the other hand, had 107(63.3%) male respondents and 62(36.7%) female respondents (**Figure 3**). Independent samples t-tests were conducted to determine if there is a statistically significant difference between the attitude, PEU, PU, intention to use, accessibility, usage, and self-efficacy of male and female participants.

Independent samples t-test results for Kuwaiti students indicate that there was no statistically significant difference ($p > .05$) between the male and female participants regarding their attitude, PEU, PU, intention to use, accessibility, usage, and self-efficacy (**Table 8**). Independent samples t-test results for Indian students indicate that there was no statistically significant difference ($p > .05$) between the male and female participants about their attitude, PEU, PU, intention to use, accessibility, usage, and self-efficacy (**Table 9**).

Independent samples t-test results for the overall participants indicate that there was no statistically significant difference ($p > .05$) between the male and female participants about their attitude, PEU, PU, intention to use, accessibility, and usage (**Table 10**). However, the results indicate a statistically significant difference in the self-efficacy of the male and female

Table 8. Comparison of male and female Kuwaiti engineering students

Variables	Male		Female		Statistics		
	M	SD	M	SD	t	df	p-value
Attitude	3.73	0.99	3.89	1.03	-0.68	99	.499
Perceived ease of use	4.00	0.87	4.08	0.94	-0.37	99	.713
Perceived usefulness	3.68	0.94	3.95	1.02	-1.14	99	.258
Intention to use	3.78	0.99	3.98	1.05	-0.81	99	.421
Accessibility	3.94	0.83	3.98	0.93	-0.17	99	.865
Usage	3.93	0.96	4.03	1.00	-0.41	99	.681
Self-efficacy	4.15	0.84	3.97	1.02	0.79	99	.433

Table 9. Comparison of male and female Indian engineering students

Variables	Male		Female		Statistics		
	M	SD	M	SD	t	df	p-value
Attitude	4.10	0.79	3.97	0.60	1.11	167	.268
Perceived ease of use	4.17	0.70	4.04	0.72	1.14	167	.257
Perceived usefulness	4.11	0.73	4.09	0.59	0.14	167	.891
Intention to use	4.17	0.82	4.02	0.67	1.28	167	.203
Accessibility	4.16	0.72	3.92	0.82	1.95	167	.053
Usage	3.85	0.92	3.66	0.78	1.33	167	.186
Self-efficacy	4.23	0.76	4.02	0.65	1.88	167	.062

Table 10. Comparison of male and female engineering students

Variables	Male		Female		Statistics		
	M	SD	M	SD	t	df	p-value
Attitude	4.04	0.84	3.93	0.86	1.03	268	.303
Perceived ease of use	4.14	0.73	4.06	0.85	0.79	268	.428
Perceived usefulness	4.03	0.78	4.01	0.86	0.19	268	.846
Intention to use	4.10	0.86	4.00	0.89	1.00	268	.317
Accessibility	4.12	0.75	3.95	0.88	1.69	268	.092
Usage	3.86	0.92	3.87	0.93	-.06	268	.955
Self-efficacy	4.22	0.78	3.99	0.88	2.28	268	.024

Table 11. Correlation between perceived ease of use and perceived usefulness of e-learning

Perceived ease of use	Perceived usefulness		
	Kuwait	India	Overall
	0.74** (p = .000)	0.72** (p = .000)	0.73** (p = .000)

Note. **Correlation is significant at the 0.01 level (2-tailed)

Table 12. Correlation between perceived ease of use and students' attitude toward e-learning

Perceived ease of use	Attitude toward e-learning		
	Kuwait	India	Overall
	0.79** (p = .000)	0.75** (p = .000)	0.77** (p = .000)

Note. **Correlation is significant at the 0.01 level (2-tailed)

participants. On average, male students (M = 4.22, SD = 0.78) reported better self-efficacy than female students (M = 3.99, SD = 0.88). This difference, 0.23, 95% CI [0.03, 0.43], was statistically significant, t (268) = 2.28, p < .05.

Hypothesis 1

Ho1. There is no significant relationship between PEU and usefulness of e-learning

Correlation results for Kuwait indicate that there was a statistically significant strong positive relationship between PEU and PU of e-learning (r = 0.74, p < .05). Correlation results for India indicate that there was a statistically significant strong positive relationship between PEU and PU of e-learning (r = 0.72, p < .05). Correlation results for the overall participants indicate that there was a statistically significant strong positive relationship between PEU and PU of e-learning (r = 0.73, p < .05) (**Table 11**). Thus, the null hypothesis is rejected, and we conclude that PEU is positively related to PU.

Hypothesis 2

Ho2. No significant relationship exists between PEU and students' attitude toward e-learning

Correlation results for Kuwait indicate that there was a statistically significant strong positive relationship between PEU and students' attitude toward e-learning (r = 0.79, p < .05). Correlation results for India indicate that there was a statistically significant strong positive relationship between PEU and students' attitude toward e-learning (r = 0.75, p < .05). Correlation results for the overall participants indicate that there was a statistically significant strong positive relationship between PEU and students' attitude toward e-learning (r = 0.77, p < .05) (**Table 12**). Thus, the null hypothesis is rejected, and we conclude that PEU is significantly positively related to students' attitudes toward e-learning.

Hypothesis 3

Ho3. There is no significant relationship between PU and students' attitudes toward using e-learning

Correlation results for Kuwait indicate that there was a statistically significant strong positive relationship between PU and students' attitude toward e-learning (r = 0.90, p < .05). Correlation results for India indicate that there was a statistically significant strong positive relationship between PU and students' attitude toward e-learning (r = 0.82, p < .05). Correlation results for the overall participants indicate that there was a statistically significant strong positive relationship between PU and students' attitude toward e-learning (r = 0.86, p < .05) (**Table 13**). Thus, the null hypothesis is rejected, and we conclude that PU is significantly positively related to students' attitudes toward e-learning.

Hypothesis 4

Ho4. There is no significant relationship between PU and intention to use e-learning

Correlation results for Kuwait indicate that there was a statistically significant strong positive relationship between PU and intention to use e-learning (r = 0.78, p < .05) (**Table 14**). Correlation results for India indicate that there was a statistically significant moderate positive relationship between PU and intention to use e-learning (r = 0.67, p < .05). Correlation results for the overall

Table 13. Correlations between perceived usefulness and students' attitudes toward using e-learning

	Attitude toward e-learning		
Perceived usefulness	Kuwait	India	Overall
	0.90** (p = .000)	0.82** (p = .000)	0.86** (p = .000)

Note. **Correlation is significant at the 0.01 level (2-tailed)

Table 14. Correlations between perceived usefulness and intention to use e-learning

	Intention to use e-learning		
Perceived usefulness	Kuwait	India	Overall
	0.78** (p = .000)	0.67** (p = .000)	0.73** (p = .000)

Note. **Correlation is significant at the 0.01 level (2-tailed)

Table 15. Correlation between students' attitudes and students' intention to use an e-learning system

	Intention to use e-learning		
Students' attitude	Kuwait	India	Overall
	0.83** (p = .000)	0.76** (p = .000)	0.80** (p = .000)

Note. **Correlation is significant at the 0.01 level (2-tailed)

Table 16. Correlation between perceived self-efficacy and intention to use an e-learning system

	Intention to use e-learning		
Perceived self-efficacy	Kuwait	India	Overall
	0.70** (p = .000)	0.73** (p = .000)	0.72** (p = .000)

Note. **Correlation is significant at the 0.01 level (2-tailed)

participants indicate that there was a statistically significant strong positive relationship between PU and intention to use e-learning ($r = 0.73$, $p < .05$). Thus, the null hypothesis is rejected. We conclude that PU positively relates to the intention to use e-learning.

Hypothesis 5

Ho5. No significant relationship exists between students' attitudes and intention to use an e-learning system

Correlation results for Kuwait indicate a statistically significant strong positive relationship between students' attitudes. Students' intention to use an e-learning system ($r = 0.83$, $p < .05$) (**Table 15**). Correlation results for India indicate a statistically significant strong positive relationship between students' attitudes. Students' intention to use an e-learning system ($r = 0.76$, $p < .05$). Correlation results for the overall participants indicate that there was a statistically significant strong positive relationship between students' attitude and students' intention to use an e-learning system ($r = 0.80$, $p < .05$). Thus, the null hypothesis is rejected. We conclude that students' attitudes positively relate to their intention to use an e-learning system.

Hypothesis 6

Ho6. There is no significant relationship between perceived self-efficacy and intention to use an e-learning system

Correlation results for Kuwait indicate that there was a statistically significant strong positive relationship between perceived self-efficacy and intention to use an e-learning system ($r = 0.70$, $p < .05$) (**Table 16**). Correlation results for India indicate that there was a statistically significant strong positive relationship between perceived self-efficacy and intention to use an e-learning system ($r = 0.73$, $p < .05$). Correlation results for the overall participants indicate that there was a statistically significant strong positive relationship between perceived self-efficacy and intention to use an e-learning system ($r = 0.72$, $p < .05$). Thus, the null hypothesis is rejected. We conclude that perceived self-efficacy positively relates to students' intention to use an e-learning system.

DISCUSSION

Today, universities and higher education institutes have been profoundly redesigned by adopting e-learning technologies. However, the study questioned engineering students in Kuwait and India about their approach to e-learning. It interpreted the factors influencing the adoption of e-learning in these exogenous learning environments (Maphosa, 2021). The study revealed interesting trends in the application of e-learning in both countries. It was also found that Kuwaiti students primarily used the Internet search engines, video-sharing websites, and conference calling tools for their educational requirements. However, the use of social media was slightly more evident.

In the same way, Indian students mostly preferred the Internet search engines and video platforms but also highly utilized the LMS. Mobile educational applications were the least used among Indian students (Chauhan &

Rani, 2021). These findings are similar to the previous works, highlighting that students usually prefer visual tools because they can address multiple learning types (Patil et al., 2022).

The participants' profiles and the system usage were examined in the context of attitude towards the system, PEU, PU, intention to use, accessibility, and self-efficacy concerning e-learning. In Kuwait, attitude and accessibility have appeared as statistically significant correlates of actual computer use for e-learning. However, in the case of e-learning adoption in India, PU and intention to use were the two determinants. These findings support other findings that have pointed at these factors as very critical motivators in the cone of e-learning acceptance (Alamri et al., 2019; Adewole-Odeshi, 2014; Al Amin et al., 2023; Al-Harbi, 2011; Humida et al., 2022; Mailizar et al., 2021).

All these factors show a moderately positive correlation with e-learning usage in both countries, indicating that enhancing engagement in any of these areas could enhance e-learning usage (Panigrahi et al., 2021). This study implies that it can benefit educators and administrators who wish to increase student engagement in e-learning. Surprisingly, and even though Indian students scored higher on the PU, the results regarding attitudes toward e-learning did not reveal significant differences between Kuwaiti and Indian students. This means that other forces, such as cultural or institutional forces, may impact how the students view e-learning's use value despite staying constant in their positive predispositions towards it (Mailizar et al., 2021).

Gender also played a role in the study, as researchers were interested in comparing the results obtained from males and females. In most aspects, there were no differences between the male and female students; however, the former had relatively higher self-efficacy. Based on this discovery, a call is made to design programs to increase female students' confidence and self-efficacy in e-learning (Salloum, 2018). The study also aimed to identify the interactions between the considered parameters. It was observed that the PEU positively correlated with the PU of the interface, supporting the previous studies (Elkaseh et al., 2016; Rahmi et al., 2018). Likewise, the measure of PU supported the students' attitude toward the e-learning systems and their BI to use them (e-learning systems) (Abdullah & Ward, 2016; Liaw & Huang, 2011; Padalia et al., 2023; Tan et al., 2023). These should be useful in policy and courses by educational institutions. According to them, to enhance e-learning utilization, studies should direct their efforts on evaluating the existing students' perceptions of the utility of e-learning, improving its accessibility, and engraining positive perceptions towards e-learning. Perhaps more importantly, increasing the availability of resources to enhance the students' self-efficacy, especially among female students, may ensure the increased utilization of these e-tools for learning (Padalia et al., 2023; Salloum, 2018).

Strengths and Limitations

Based on the research done to identify and compare Kuwait and Indian Engineering students' perceptions of e-learning, this study has some limitations. The study's strengths include using a statistically valid questionnaire and a comparison technique between two different but related universities, which can reduce the chances of bias to a large extent. However, the problem of a low participation rate because of time was the primary constraint in the current research. In the future, more extensive research can be done to overcome these limitations involving the increase of participants and inclusion of the faculty. This would give a more inclusive outlook of e-learning adoption in higher learning institutions. In the same way, it is also noteworthy that utilizing quantitative and qualitative approaches or conducting longitudinal research could provide a richer understanding of the dynamic environments of educational technology. In sum, despite the current findings suggesting detailed e-learning experiences across various contexts, future research can be oriented to uncovering the possibilities of improving the usage of technologies in higher learning institutions.

Implications for Policy, Practice, and Research

Previous studies on e-learning in higher learning institutions, especially in the engineering faculties, document the advantages of e-learning to the students and the institutions. Previous research contributes to the present knowledge of e-learning acceptance, yet it is increasingly requisite to consider the Variety of cultures' perspectives, attitudes, and preferences toward e-learning. Therefore, in that respect, policymakers and universities should focus on critical technologies and the e-learning environment. This entails enhancing publicizing LMS, multimedia resources, and other applications of specialized e-learning to enhance the student experience. In order to achieve high success, the integration of e-learning in the different training environments must be considered. This comprises formulating adequate policies, providing capacity to faculty, creating awareness among the students, and providing logistical support. The rationale is to encourage students to embrace the technologies as the learning aids provide an active setting and experience in education. It is also important to note that implementing technological solutions has many easier barriers when they occur within the stakeholders' best practices and values. Thus, the principles of e-learning must be harmonious with the goals and ethical values of learners, professors, and universities.

Conclusion

This paper fills a gap by providing insights regarding Engineering students' attitudes to and use of e-learning in Kuwait and India. They underscore major predisposing factors that cause the use of e-learning in these settings. In Kuwait, the use of e-learning depends on students' attitudes towards its accessibility. Among the two constructs, PU and intention to use strongly impacted the Indian students. The study revealed a positive path between the use of e-learning and factors such as attitude, ease of use, usefulness, intention, accessibility, and self-efficacy in both countries. Enhancing any of the three aspects might increase learners' engagement in e-learning.

Kuwaiti and Indian students generally have a positive perception of e-learning and reported that it is helpful to them in some way. However, the Kuwaiti students rated e-learning less valuable than the Indian students. The study also revealed differences in the tools used in the e-learning system in various countries.

Notably, the ideas of e-learning perception and use were not influenced by gender in most ways. Nonetheless, the mean scores for self-efficacy received from male participants were significantly higher than those received by female students. The study also revealed a positive correlation between the PEU of the e-learning tool, the PU of the tool, and the student's behavior and attitude toward the use of the tool. The generalization of students who practice a high level of technology acceptance among engineering students in India and Kuwait can be attributed to globalization. Increased use of common platforms, getting in line with educational processes, and implementing progressive policies have contributed to reducing disparities in technological advancement within the contexts of education in these countries. These can benefit educators, policymakers, and e-learning developers in designing effective future strategies and enabling e-learning in engineering education. The general idea is that if the perceived uses of the e-learning platform are helpful for an institute, the attitudes are positive, and comprehensiveness, as well as self-efficacy, are considered successful, then e-learning platforms can be adopted successfully in the higher education sector.

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