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Evaluating Success of E-Learning in Different Faculties of a University

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ABSTRACT

The success of e-learning is still a challenging issue. This study presents a model for the evaluation of the success of e-learning in three different faculties. More specifically, the present article answers the question of whether e-learning success variables are different in different faculties. The method of this study was descriptive-survey research. Evaluating research validity was conducted through confirmatory factor analysis, and Cronbach's alpha was used to measure the reliability of the research instrument. The method of the structural equation was used for modeling. The findings reveal that the students' opinions in the three faculties about the success variables were significantly different. In the Faculty of Engineering, teaching with a coefficient of 0.93, in the Humanities, service quality with a coefficient of 0.9, and in the Arts Faculty, support quality with a coefficient of 0.82 were identified as the highest impact factors. On the other hand, significant commonalities were observed.

Keywords*— *E-Learning, E-Learning Success, Success Model, E-Learning Satisfaction

1. Introduction

Education has long been one of humankind's most important concerns. The emergence of the information age and the advent of new technologies such as the Internet have transformed the foundations of education and made it possible for more people to easily benefit from e-learning, widely referred to as e-learning. A new paradigm in the domain of education, e-learning can resolve many limitations of traditional learning by responding to the major challenges of the traditional world, namely lack of educational resources in parallel with societies' increasing demands for learning. One of the main changes in the methods of e-learning has been the replacing of teacher-fronted classes with learner-centered procedures. Employing e-learning tools, students can expand their activity and practice types and play a more active role in education. Therefore, when designing an e-learning system, students' viewpoints about all aspects of learning should be solicited and considered. Despite the great effort that has been made to expand and popularize e-learning, there are still many students who do not choose this emerging educational method as their first learning option. An effective solution to improve the status quo is to design a suitable system for evaluating existing e-learning systems.

2. Statement of the Problem

The rapid evolution and growth of e-learning, together with the considerable benefits it offers, has resulted in its adoption and application in many education centers and universities worldwide. Various studies including [1], [2], [3] and [4] indicate that e-learning has been widely used in higher education. Sun [5] shows that the sudden and unexpected nationwide school closures in Singapore accelerated the application of technology in classrooms.

For readers to learn through reliable Internet information, they should have the critical skill to judge the credibility of content [6]. Therefore, it is necessary to investigate whether, in any particular e-learning course, the learners can retrieve from the Internet the correct information for their study course in order to be provided with the quality and satisfaction they expect [7]. Moreover, despite the great potential of e-learning, sometimes learners decide to drop out of their courses because they feel reluctant to continue their studies. As such, it is paramount to identify the variables which play key roles in making students pursue their education in cyber space. Among these variables, satisfaction is a key variable and one of the important indicators of the quality of education [8].

Pure e-learning in developing countries has not performed well due to obstacles such as lack of face-to-face interaction and non-existence of cooperative activities compared to traditional education [9]. The more important issue is that some instructors are not familiar with e-learning and although it can be held that the culture of e-learning has progressed over the past years, it has not yet been fully integrated at the level of society [10] . One of the solutions to these challenges and obstacles involves investigating and identifying modern methods of e-learning implemented in developed countries' education systems, which can improve the level of knowledge in universities. This research, thus, sought to analyze and arrive at a model of e-education success in a university.

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In order to achieve this goal, the researchers, employing structural equation modeling, investigated the relationships between the variables and dependent and independent variables, as well as other variables, effective in the success of e-learning in different faculties of the university. Put in concrete terms, this research study aimed to answer the following important question: Do students in different faculties have the same opinions about the success variables of e-learning? It follows that the quintessential questions of this research are as follows: How can the relationship between the success variables of e-learning in different faculties in the same university be modeled? What is the weight of e-learning success variables from the point of view of students in different faculties? What follows is a brief review of the literature related to the evaluation of e-learning satisfaction.

3. Related Works

Nuncio [11] presented an e-learning expanded learning opportunities program (ELOP) for short-term courses. The purpose of this study was twofold: analyzing a process-based exploratory method in determining the different stages of planning and evaluating students' learning skills and experiences. Cidral [12] provided a model for considering the variables of user satisfaction such as understanding the quality of information, the quality of the system, the instructor's attitude towards e-learning, interaction with others, and diversity in evaluation. [13] described the views of staff and students about the variables that lead to successful e-learning in universities. Student and instructor characteristics, ease of accessibility, and support and training were among the variables evaluated.

Ouajdouni [14] pointed out that the COVID-19 pandemic forced universities to revisit their long-established teaching approaches. In response to this emergency, Moroccan universities turned to an e-learning approach as an alternative to face-to-face education. Their research project aimed to identify the determinants of success of e-learning systems during the pandemic. Their findings revealed that university administrators can use their local datasets to identify the key variables to increase the success of e-learning systems. Likewise, another research study [15] proposed a model to analyze the role of students' long-term orientation in the Brazilian e-learning context. The results showed that the quality of information, in conjunction with the collaboration and satisfaction of e-learners, can justify the use of e-learning systems. In another study, [16] used the TAM model to compare e-learning intentions and decisions between anxious and non-anxious students. This research investigated the role of positive and negative emotions in students' satisfaction with e-learning and showed that the e-learning experience of students is related to positive and negative emotions in various ways and can affect satisfaction. Based on structural modeling, another investigation [7] found the role of such variables as technology anxiety, instructor, course quality, technology quality, and ease of use to be very important. Moreover, [17] indicated that technological affordances and the interaction of electronic content have an important impact on the use of e-learning. In yet another study, [18] investigated the success rate of e-learning by using data collected from 563 students in a UK university and analyzing it through structural equation modeling and partial least squares method. The results of the study indicated that the quality of the technical system, the quality of information, the quality of services, the quality of the support system, the quality of the learner, the quality of the instructor, and perceived usefulness had the greatest impact on the success of e-learning. The present study expanded the model presented by Al-Fraihat [18] and, as stated above, tried to answer the questions which follow: Do students in different faculties consider the weight of e-learning success variables to be the same? Are there any significant differences in the views of students of different faculties?

4. Research method

The present study is classified as a descriptive research type and is applied in terms of its purpose. The statistical population of the research was composed of three faculties of a university in Iran; including faculty of Engineering, faculty of Humanities, and faculty of Art. The reasons why the participants were sampled from the same university were that they experienced learning through the same e-learning system and that their perceptions of e-learning were similar to the extent possible. Simple random sampling was used to include 210 students from each faculty, according to Cochran's correlation, hence a total of 630 students for all faculties. The validity of the research instrument was proved based on construct validity requirements, and its analysis technique was confirmatory factor analysis. Furthermore, Cronbach's alpha method was used to calculate the reliability of the research instrument, and the resulting coefficient was computed to be 0.964 for all the factors of the research problem. The conceptual model of the research, which was obtained and developed from library and field studies, is based on the research model of Al-Fraihat [18] (see Figure 1). Additionally, it should be noted that descriptive statistics were used to measure the demographic characteristics; inferential statistics were used to calculate the hypotheses. Also, SPSS software was used to calculate descriptive statistics and reliability coefficients, and Amos software was used to check the validity of variables and items through factor analysis procedures.

As previously stated, confirmatory factor analysis (CFA) was used to check construct validity. In so doing, the researchers ensured that the available data could be used for analysis. Kaiser-Meyer-Olkin (KMO) index and Bartlett's test were used to check the adequacy of the data. Because the significance level in Bartlett's test was less than 0.05, the hypothesis of the coefficient matrix being known was rejected, and it was concluded that factor analysis was suitable for identifying the underlying structure. In Table 1, the results of the sampling adequacy test are displayed.

The result of the confirmatory factor analysis for the items of the research variables is presented in Figure 2 and Table 2. As the result shows, the factor loading of all the items was more than 0.3, so none of the items were removed from the analysis process.

The reliability of the research tool was investigated using Cronbach's alpha coefficient. The values of the coefficient obtained for the research variables are presented in Table 2.

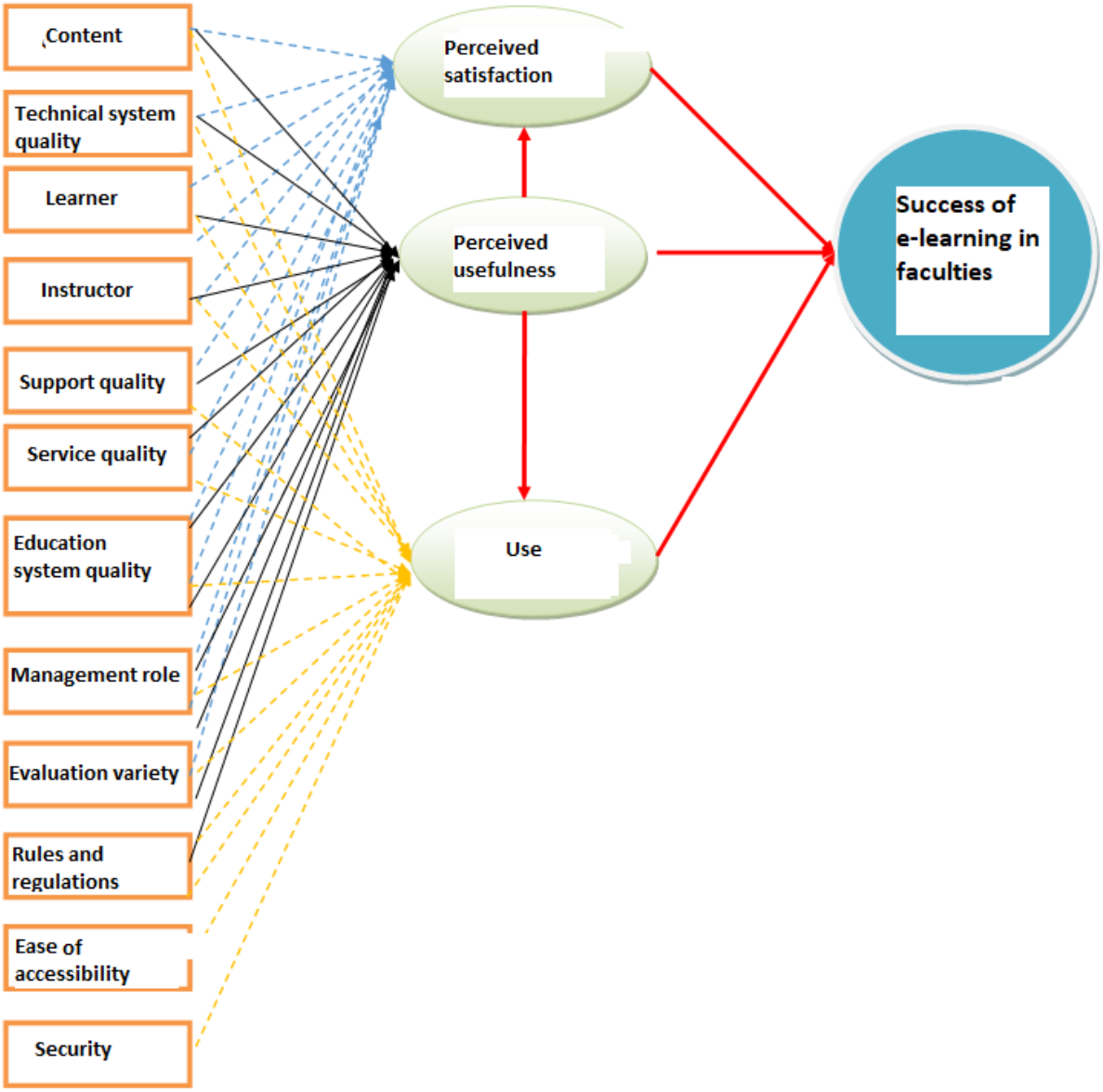

Figure. 1. Conceptual model of research study

Table 1. Results of data adequacy test

	KMO index	**0.925**
Bartlett's test	***Chi-squared***	3396.677
	Degree of freedom	120
	Significance level	000/0

As can be seen, for all the factors, the coefficient is above 0.7. Thus, it can be held that the instrument has adequate reliability.

5. Results and Discussion

In order to analyze the obtained collected data, the researchers used inferential statistics. The prerequisite for performing parametric tests is proving the normality of the statistical distribution of the variables. In general, it can be maintained that parametric tests are run on means and standard deviations. Obviously, if the population distribution is not normal, it is not possible to draw correct conclusions from parametric test results. To test the normality of the variables, the researchers investigated skewness and kurtosis, the results of which are presented in Table 3. As can be observed in this table, the skewness and kurtosis for all the variables were between the numerical range of 2 and -2. Thus, the assumption of normality of the data was confirmed.

Furthermore, structural equation modeling was used to examine the hypotheses that focused on the direct effects and interactions between the research variables, the results of which are presented below. To analyze the hypotheses, the researchers first processed the theoretical model developed for each hypothesis, thereby determining how much the collected data supported the theoretical model. To this aim, quantitative indicators of model fit were considered. If the general indicators were acceptable, i.e., if the theoretical

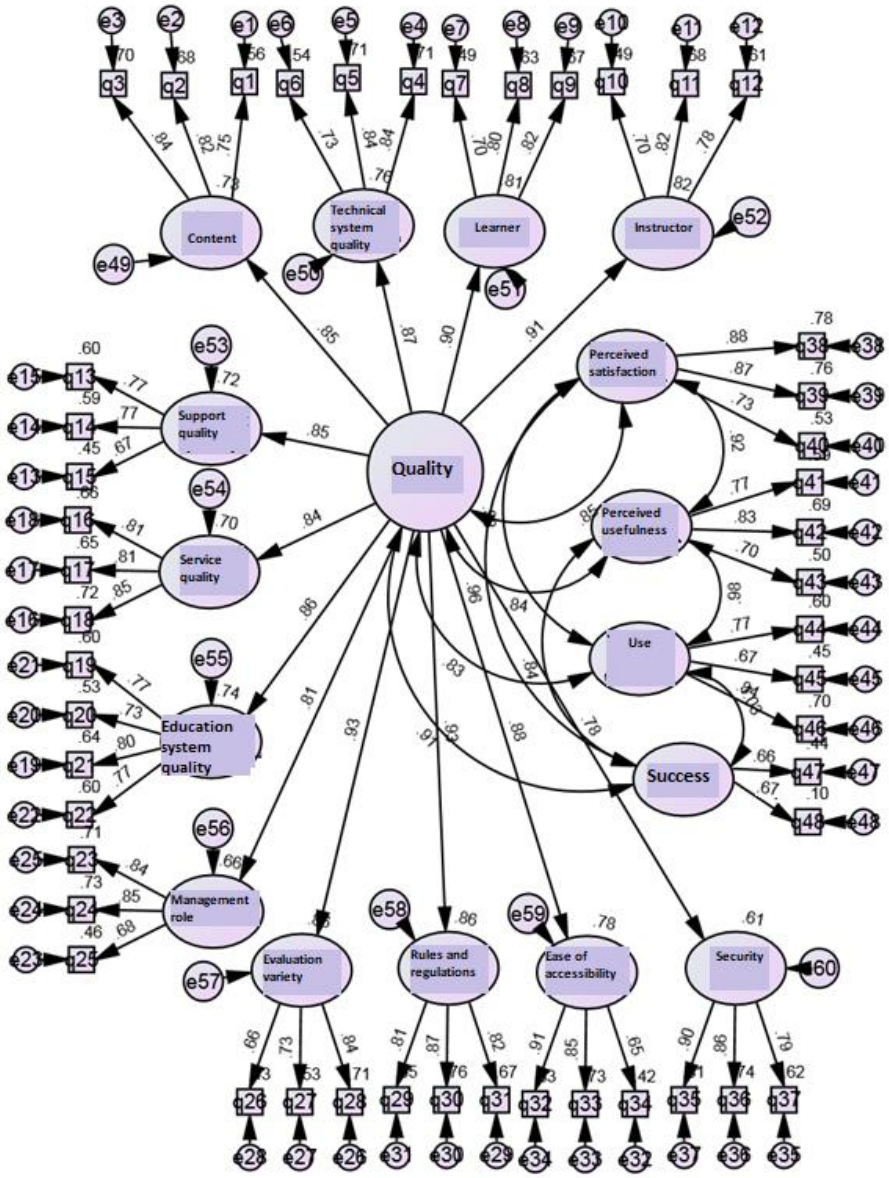

Figure. 2. Confirmatory factor analysis of items of research variables

Table 2. Results of calculating reliability coefficients for research variables

Variable	***Cronbach's alpha for variable***	***Variable***	***Cronbach's alpha for variable***	***Total Cronbach's alpha***
Content	0.842	Evaluation variety	0.788	0.964
Technical system quality	0.845	Rules and regulations	0.867	
Learner	0.814	Ease of accessibility	0.827	
Instructor	0.799	Security	0.883	
Support quality	0.781	Satisfaction	0.859	
Service quality	0.864	Usefulness	0.807	
Education system quality	0.853	Use	0.813	
Management role	0.824	Success	0.704	

model was confirmed, the relationships within the model could be addressed. Table 4 shows the quantitative indicators of model fit along with the desired values.

According to the quantitative indicators of model fit, it was concluded that the theoretical model of the present research study was an acceptable model. As such, the relationships within the model and the values of the regression coefficients between the hidden variables could be investigated. To test each hypothesis, the researchers calculated a partial index (i.e., a p-value) and a significance index (i.e., a t-value). The conditions for a relationship to be regarded as statistically significant is that the value of the former for the relationship in question is less than 0.05 (p-value < 0.05). Alternatively, if the value of the latter index is greater than ±1.96 (t-value > ±1.96), the relationship can be considered statistically significant. After examining the research hypotheses, the researchers could reach a conclusion about the research hypotheses and model. The results of research hypotheses are presented in Table 5.

The results obtained from testing the hypotheses in the Faculty of Arts revealed that the variables of support quality, instructor, using e-learning system, and content were the highest path coefficients compared to other variables. Moreover, the variables of perceived obtained satisfaction,

Table 3. Normality of statistical distributions of research variables

Variable	*Kurtosis*	*Skewness*	*Average*
Content	0.996-	0.350	2.5048
Technical system quality	0.924-	0.116	2.7556
Learner	0.890 -	0.337	2.6333
Instructor	0.886 -	0.260	2.6016
Support quality	0.929 -	0.238	2.7968
Service quality	0.486 -	0.742	2.3222
Education system quality	0.748 -	0.459	2.4690
Management role	0.097	0.895	2.1381
Evaluation variety	0.638 -	0.324	2.5111
Rules and regulations	0.991 -	0.047 -	2.8651
Ease of accessibility	0.852 -	0.222	2.6429
Security	0.741 -	0.608	2.3857
Satisfaction	1.046 -	0.291	2.6968
Usefulness	0.966 -	0.059	2.7524
Use	1.110 -	0.082	2.8111
Success	1.094 -	0.003 -	2.7762

Table 4. Quantitative indicators of research model fit for different faculties

Indicator	*Faculty of Arts*		*Faculty of Engineering*		*Faculty of Humanities*	
	Desired value	*Obtained value*	*Desired value*	*Obtained value*	*Desired value*	*Obtained value*
Degree of freedom (df)	-	1064	-	1064	-	1064
Chi-squared (χ2)	2 df ≤ χ2≤ 3 df	751.1076	2 df ≤ χ2≤ 3 df	2569.765	2 df ≤ χ2≤ 3 df	2793.172
Optimized Chi-squared (χ2/df)	Less than 3	366.2	Less than 3	306.2	Less than 3	714.1
Goodness-of-Fit Index (GFI)	More than .80	867.0	More than .80	842.0	More than .80	822.0
Comparative Fit Index (CFI)	9.0	966.0	9.0	985.0	9.0	921.0
Root Mean Square Error of Approximation (RMSEA)	Less than .80	076.0	Less than .80	083.0	Less than .80	035.0
Parsimonious Goodness-of-Fit Index (PGFI)	0.6 ≤PGFI≤ 1	675.0	0.6 ≤PGFI≤ 1	615.0	0.6 ≤PGFI≤ 1	498.0
Parsimonious Normal Fit Index (PNFI)	0.6 ≤PNFI≤ 1	661.0	0.6 ≤PNFI≤ 1	694.0	0.6 ≤PNFI≤ 1	510.0

Table 5. Summary of results of hypotheses in different faculties

No.	Hypothesis	Path value	P-value	T-value	Path value	P-value	T-value	Path value	P-value	T-value	Average total of path values	Test result
		Faculty of Arts			Faculty of Engineering			Faculty of Humanities				
1	Support quality → Success of e-learning	82.0	0.000	8.922	0.84	0.000	9.374	82.0	0.000	9.994	0.82	Significant
2	Instructor → Success of e-learning	78.0	0.000	11.724	93/0	0.000	8.431	0.38	0.000	3.952	0.77	Significant
3	use → Success of e-earning	75.0	0.000	9.077	0.51	0.000	4.575	0.18	0.000	1.494	0.75	Significant
4	Content → Success of e-learning	67.0	0.000	8.954	90/0	0.000	8.534	0.74	0.000	8.896	0.73	Significant
5	Evaluation variety → Success of e-learning	63.0	0.000	6.145	0.79	0.000	9.761	0.44	0.000	5.345	0.69	Significant
6	Technical system quality → Success of e-learning	61.0	0.000	2.865	0.74	0.000	9.465	0.84	0.000	4.763	0.68	Significant
7	Learner → Success of e-learning	61.0	0.000	8.922	0.87	0.000	9.521	0.77	0.000	6.796	0.67	Significant
8	Perceived usefulness → Use	57.0	0.000	7.095	0.6	0.000	7.131	0.71	0.000	9.106	0.62	Significant
9	Perceived usefulness → Perceived atisfaction	48.0	0.000	6.286	0.54	0.000	6.901	0.69	0.000	9.237	0.62	Significant
10	Management role → Success of e-learning	46.0	0.000	6.474	0.82	0.000	8.021	0.75	0.000	8.795	0.62	Significant
11	Ease of accessibility → Success of e-learning	41.0	0.000	2.459	0.82	0.000	7.695	0.31	0.000	4.730	0.57	Significant
12	Service quality → Success of e-learning	33.0	0.000	5.089	0.83	0.000	8.027	0.90	0.000	4.350	0.51	Significant
13	Education system quality → Success of e-learning	30.0	0.000	5.001	0.83	0.000	11.242	0.75	0.000	3.108	0.50	Significant
14	Rules and regulations → Success of e-learning	30.0	0.000	4.254	0.85	0.000	9.060	0.37	0.000	5.602	0.50	Significant
15	Obtained satisfaction → Success of e-learning	27.0	0.000	3.736	0.15	0.000	1.538	0.250	0.000	2.001	0.48	Significant
16	Obtained usefulness → Success of le-earning	26.0	0.000	2.631	0.01	0.000	7.133	0.27	0.000	2.264	0.22	Significant
17	Security → Success of e-learning	22.0	0.000	2.780	0.89	0.000	8.125	0.40	0.000	2.721	0.18	Significant

perceived usefulness, and security with values lower than 0.3 had the lowest path coefficients and t-value indices. In the Faculty of Engineering, it was found that instructor, content, security, learner, rules and regulations, and support quality were identified as the variables with the highest path coefficients and t-values. Furthermore, perceived satisfaction and perceived usefulness with values lower than 0.2 had the lowest coefficients and t-value indices. In turn, in the Faculty of Humanities, it was proved that the variables of service quality, technical system quality, and support quality had the highest path coefficients and t-values, whereas the variables of perceived usefulness, perceived satisfaction, using e-learning system with coefficients lower than 0.3 were identified as the lowest path coefficients and t-value indices.

Based on the data and results of the present study, it can be asserted that students in different faculties had different opinions about the weight of the success factors of e-learning. In the Faculty of Engineering, the factor of instructor exceeded any other factor in terms of importance. One possible reason why this factor was regarded by engineering students to be the most important one is due to the nature of their technical courses, where the skills of instructors are critically important. In turn, in the Faculty of Humanities, service quality was shown to be more important for students. The reason why humanities students gave more importance to service quality could be that they have less technical skills than engineering students. In the case of the Faculty of Arts, the factor of support quality received the highest weight, and it shows that these students attach great importance to the quality of support and responsiveness of the e-learning systems.

Based on Figure 3, the factor coefficients, and the total averages, it was found that support quality, content, learner, and technical system quality had the highest coefficients, with all the values exceeding 0.7. In addition, perceived satisfaction and perceived usefulness with total average coefficients falling below 0.3 were the lowest ones, compared to the other factors. Figure 4 shows the summary of the results of testing the hypotheses based on the averages of all the three faculties.

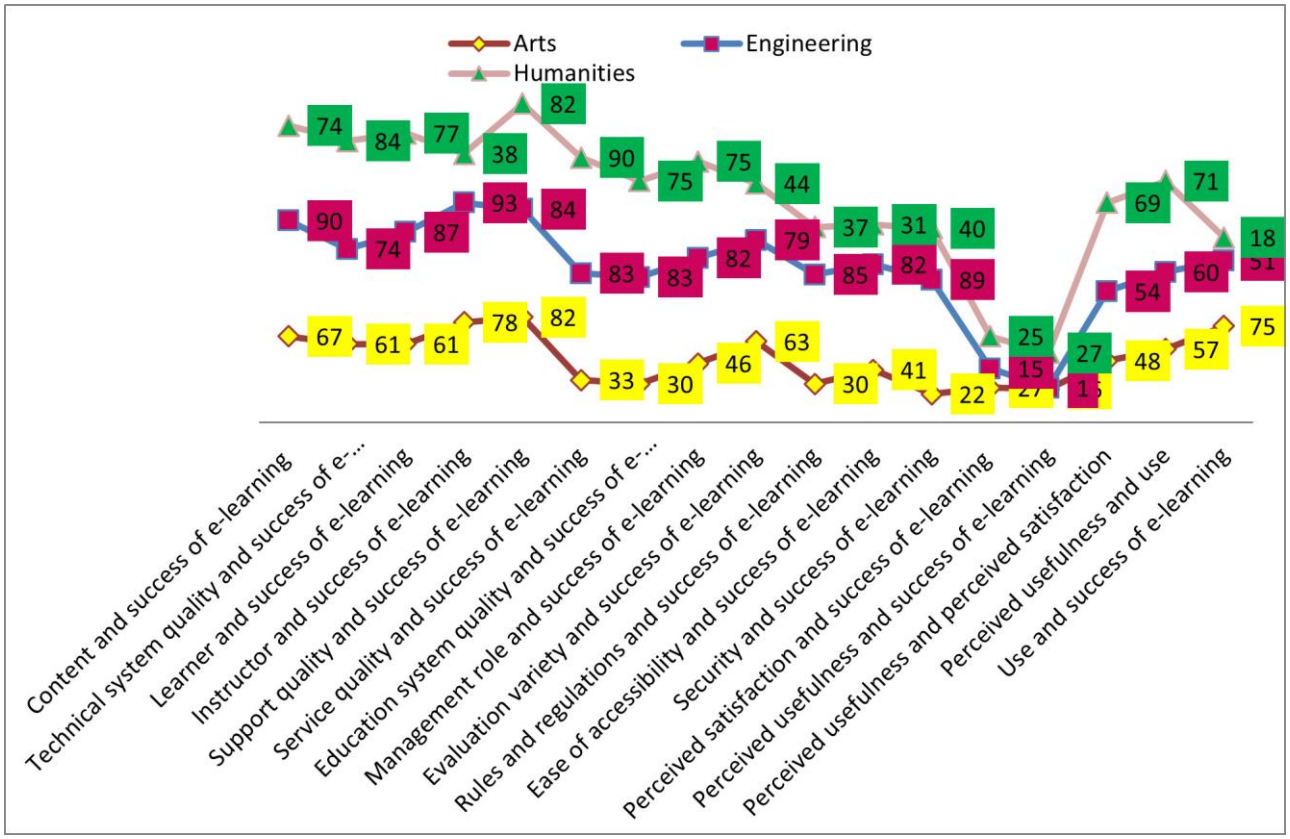

Figure. 3. Summary of hypothesis results based on path coefficients of all faculties

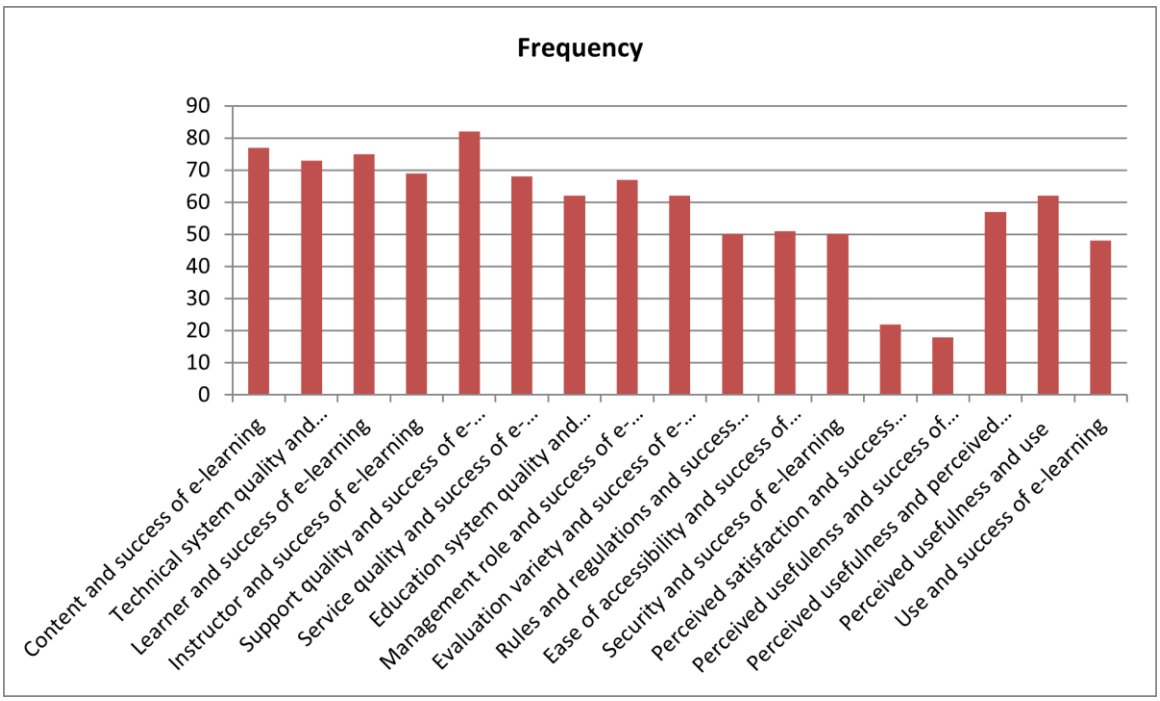

Figure. 4. Summary of hypothesis results based on averages of all faculties

Regardless of some variation in students' opinions about the success factors of e-learning, the results indicate that there were also meaningful commonalities. For example, with coefficients of 0.82, 0.84, and 0.82, support quality was viewed as the most importance factor in all the three faculties. This finding stresses the fact that irrespective of the quality of e-learning systems, their support aspects are of special importance to students. Moreover, the factor of instructor in the Faculty of Engineering and the Faculty of Arts was perceived as highly important. Also, obtained usefulness and

obtained satisfaction were rated the least important factors, receiving the lowest coefficients, which further proves the existence of noticeable commonalities among the three faculties.

Based on the summary of the results, displayed in Figure 4, it can be observed that support quality, content, learner, and technical system quality were regarded as the most important factors. These findings are in line with the results arrived at in the studies of [13], [14], [12]. In the study of [7], course quality, technology quality, and ease of application were introduced as the most effective factors in the success of e-learning. Wu [17] revealed that the affordances offered by technology had important impacts on the employment of e-learning. Al-Fraihat [18] analyzed and classified the following factors: Learner, instructor, technology, management, support quality, technical system quality, and key success factors of e-learning centers. Their study also proved that the quality of the e-learning system program, the quality of the course content, the e-learning system user-friendliness, and the instructor's information literacy were the most important factors for the success of e-learning. These findings resonate with those of [14]. However, these studies did not consider or mention the factors of security, rules and regulations, evaluation variety, ease of accessibility, and management. Noteworthy is the fact that the review of previous research in this domain revealed that such studies as [13], [14] , [12], [7], [18], [17], [15], [16], and [11] have not investigated the relationships between the key success factors in general and have considered only three factors as the most paramount success factors of e-learning, namely: quality of support, learner, and content.

6. Conclusion and suggestion

The general purpose of this research was to provide a model to evaluate the success of e-learning in different faculties of a university. For this purpose, using simple random sampling, the researchers included in the present study a group of 630 students from three faculties of a university and used a five-point Likert scale questionnaire to collect the necessary data. The measurement and statistical analysis were carried out considering and using construct validity, confirmatory factor analysis, and structural equation modeling. The results proved the optimal fit of the measurement model, the significance of the factor loadings for each variable, and the validity of the findings. Furthermore, Cronbach's alpha, computed to be 0.946 for the questionnaire, was used to measure and confirm the adequate reliability of the research instrument. With respect to the findings, structural equation modeling showed that the opinions of the students in the Faculties of Engineering, Humanities, and Arts about the success factors of e-learning were significantly different. The highest coefficient in the Faculty of Engineering was found to be instructor; in the Faculty of Humanities, it was service quality, and in the Faculty of Arts, support quality was identified as the most critical factor. Despite the differences of opinions among the students in the three faculties, significant commonalities were observed. More specifically, it was found that support quality, content, learner, and technical system quality, with their average coefficients exceeding 0.7, were the highest coefficients. The practical implications of the findings of this research study can be of interest to e-learning providers who wish to run successful courses online. In general, they are advised to pay close attention to support and service aspects in addition to the technical aspects of e-learning systems, as well as the central role of instructors. Finally, for the future work, research on role of different learning management system in this model is suggested.

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Authors' contributions

MJS: Supervision, design, interpretation of the results, drafting the manuscript, revision of the manuscript.
AA: Study design, acquisition of data, statistical analysis, drafting the manuscript; revision of the manuscript

Conflict of interest

The authors declare that they have no conflict of interests

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