THE EFFECTIVENESS OF THE E-LEARNING APPLICATIONS: ASSESSMENT OF THE SERVICE QUALITY USING BINOMINAL LOGISTIC REGRESSION

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Highlights

- *Our research objectives include the quality of e-Learning establishment of our institution*
- *We used statistic methods to examine the quality evaluation of the e-Learning usage*
- *It is more effective and better to operate the e-Learning system under organized circumstances*

Abstract

The success and the efficiency of e-Learning should be measured by a reliable method in order to use it effectively. Although, there are several studies about the success of e-Learning systems, only a few of them deal with the measurement of this success within the institutions.

We made a questionnaire to evaluate the e-Learning application. The aim was to develop such questionnaire which is suitable to evaluate e-Learning quality. The basis of the e-Learning quality questions was a multi-dimensional model for assessing e-learning systems success (ELSS).

The aim of the questionnaire were to compare the opinions of the students and the teachers and also to evaluate the Faculty of Economics and Business (FEB) of the University of Debrecen and the Corvinus University of Budapest (CUB) regarding the application of e-Learning. The role of the questionnaire for quality development is to give guidance for the FEB in implementing and using e-Learning. E-Learning in the CUB is applied under certain organized institutional circumstances. The e-Learning application of CUB works with an organization defined extended several faculties of the University, which can be a good example for FEB.

We have used factor analysis and binominal logistic regression. We have examined whether the background variables manipulating the variables are possible to be developed on the basis of the answers. We used factor analysis to demonstrate this since it contracts the coherent factors into one common factor.

Finally we used logistic regression to determine the importance of a given factor for the users of both faculties.

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Introduction

The number of educational institutions, companies and other users who applying e-Learning systems has grown significantly in the last decade, therefore they have become as important means and resources as other information systems of the institutions (Szilágyi, 2012). However, there are several conditions and components to use these systems in the educational institutions successfully. Important issues for example what kind of system is chosen, how it is implemented and introduced. The availability of the system and services are also important for the users (teachers, students) (Lengyel et al, 2016).

Probably the most significant question is how teachers and students can profit from the system. What is the advantage of using it? How does it help the process of teaching and learning to become more effective and transparent? Does it support the management of institutional education? If it does so, what extent? Naturally, the organizational and economical aspects of the usage of e-Learning systems are also important. The application of the e-Learning systems is gradually becoming more essential for those institutions, organizations and companies have distance learning and also useful for the improvement of human resources.

The Learning Management System (LMS) is often used with a virtual learning environment (VLE) interchangeably. A VLE refers to an operating system and specialized learning management software that allows students and the instructor to plan, organize, monitor, coordinate, and control the learning activities to facilitate the learning process and to optimize the desired learning outcomes.

The DeLone and McLean (D&M) model is one of the widely recognized information system (IS) success models based on a systematic review of 180 studies with over 100 measures. The DM model theorized that system quality and information quality singularly and jointly affect both use and user satisfaction, which in turn, are direct antecedents of system effectiveness (DeLone and McLean, 1992). To extend the DM model into the e-learning area, a number of studies empirically tested the D&M model of information systems success model in a university e-learning context using structural equation modeling. Eom and others (Eom et al, 2012) presented empirical test of the D&M model of IS success in a university e-learning context, which is strictly involuntary use. Their study reached several useful conclusions. Perceived system quality and perceived information quality are very strong (high path coefficient) predictor of user satisfaction. Perceived user satisfaction is a very strong predictor of individual impact. Perceived system quality is an insignificant predictor of system use or relatively weak predictor of system use. The direct influence of system use on user satisfaction is weak even though it is statistically significant. In order for e-learning students to be successful, they must be provided with e-learning system that provides information they need and user-friendly.

Although system quality has not directly contributed to predict individual impact, its impact is indirect. System quality and information quality have positive effects on user satisfaction. Information quality has also positive effects on system use, which in turn positively contributes to user satisfaction. Therefore, all the antecedent variables are positively affecting e-learning outcomes either indirectly or directly. System quality and information quality are necessary conditions for e-learning success and students' satisfaction with LMS, but not sufficient conditions (Eom, 2015).

Our research objectives include the quality of e-Learning establishment and the support of our institution. Accordingly, tasks were set for the examination of e-Learning opportunities for quality improvement in education, improvements in this regard, proposals and recommendations for application development. The course structure recommended for the application of e-Learning for institutional quality improvement together with other functions reachable as a module of the system, can ensure an integrated and comprehensive e-Learning quality service. The strategy and implementation of quality improvement is only possible by providing qualified human resources. The basic objective of the introduced LMS (Learning Management System) is to improve the quality of education, which is one way where the students and instructors receive ongoing feedback about their experiences with the system (Wang, Wang and Shee, 2007). Corresponding objective is to compile a questionnaire, which was a result of useful information about the students and teachers e-Learning system and application views (Lengyel and Herdon, 2012).

The aim of the questionnaires were to compare the opinions of the students and the teachers and also to evaluate the Faculty of Economics and Business (FEB) of the University of Debrecen and the Corvinus University of Budapest (CUB) regarding the e-Learning applications. The role of the questionnaire for quality development is to give guidance for the FEB in the application of e-Learning. E-Learning in the CUB is applied under certain organized institutional circumstances. The e-Learning application of CUB works with an organization defined extended several faculties of the University, which can be a good example for our faculty.

The following hypotheses was defined: The quality development of e-Learning should be ensured under organized circumstances.

Matherials and methods

Questionnaire survey

There is an on-line way of response, which is a quantitative online CAWI (Computer Assisted Web Interviews) survey over the Internet. Usually rapid market surveys are made by this method. Our questionnaire was accessible through Limesurvey system (Figure 1), which is a free and open source on-line survey application written in PHP based on a MySQL database. As a web server-based software it enables users using a web interface to develop and publish on-line surveys, collect responses, create statistics, and export the resulting data to other applications (Bocarnea, Reynolds and Baker, 2012).

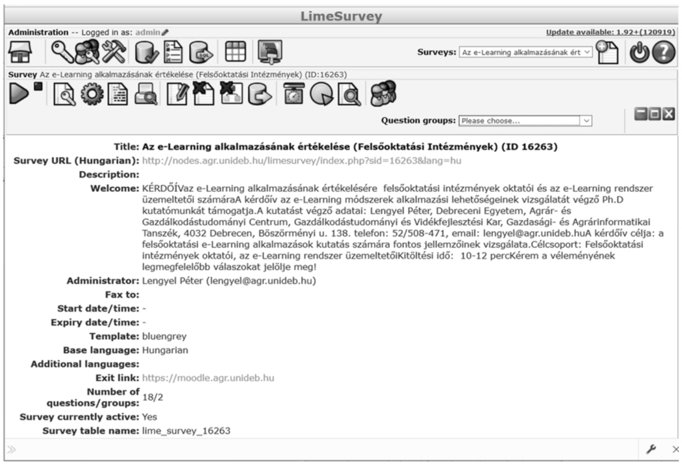

Figure 1: Administration interface of Limesurvey system (source: http://nodes.agr.unideb.hu/limesurvey/index.php?sid=16263&lang=hu, 2016)

The research survey designed from the predetermined group of users to get answers to important research questions. The SPSS (Statistical Package for the Social Sciences) program was used to evaluate the questionnaires. The questionnaire responses from LimeSurvey were exported to the files that we imported into SPSS.

The applied statistical methods

A statistically significant t-test result is one in which a difference between two groups is unlikely to have occurred because the sample happened to be atypical. Statistical significance is determined by the size of the difference between the group averages, the sample size, and the standard deviations of the groups. For practical purposes statistical significance suggests that the two larger populations from which we sample are "actually" different.

We used factor analysis and binominal logistic regression too. We examined whether the background variables manipulating the variables are possible to be developed on the basis of the answers. We used factor analysis to demonstrate this since it contracts the coherent factors into one common factor. Factor analysis is used to compress data and explore data structure (Szakály et al, 2014, Balogh et al, 2015). This method contracts the basic variables into so called factor variables which cannot be directly observed. In most cases, factor analysis is used foremost in order to filter out multicollinearity (Field, 2009).

Logistic regression quantifies the probability of occurrence of the category of a doubtful, category like dependent variable under the condition of the known outcomes of other explanatory variables. Logistic regression is a non-linear classification method that does not suppose the continuity of explanatory variables neither the normality of multivariables. The decision-maker can construct a decision-making rule relying on the hypothetical probability value in order to classify the given observation unit into a predetermined result like category (Gal et al, 2013). If the number of the dependent variables' outcome is two, then the method is called a binomial logistic regression.

The applied model

The success and the efficiency of e-Learning should be measured by a reliable method in order to use it effectively. Although, there are several studies about the success of e-Learning systems, only a few of them is about the measurement of this success within the institutions (Karima and Mostafa, 2016, Li, Fu and Duan, 2013, Silambannan and Srinath, 2013). It is a study by Wang, Wang and Shee (2007), in which they measured the success of the e-Learning systems with e-Learning System Success (ELSS) model based on DeLone and McLean (2003) Information System Success Model.

Results

The aim was to develop such questionnaires which are suitable both for the evaluation of the e-Learning's quality. The basis of the e-Learning's quality questions was the ELSS model. The questions of the students and the lecturers were the same.
The groups of questions were the following:

- System quality (1-7)
- Information quality (8-12)
- Service quality (13-17)
- Benefits of the e-Learning system (18-24)
- Conclusions (25-27)

The questionnaire involving 27 questions is shown in the Appendix. There were 273 students and 50 lecturers from the CUB and 288 students and 46 teachers from the UD FEB who properly filled out the questionnaires. We examined the answers about the e-Learning quality in this research on the basis of two criterion (student-teacher, CUB - FEB). The basis of the answers' comparability was that both institutions applied the Moodle frame system. We tried to find out what extent they exploit the facilities of the system.
The 27 questions could be answered in a scale of 10. Figure 2 represents a diagram that indicates the means of the answers of the two institutions' students and teachers.

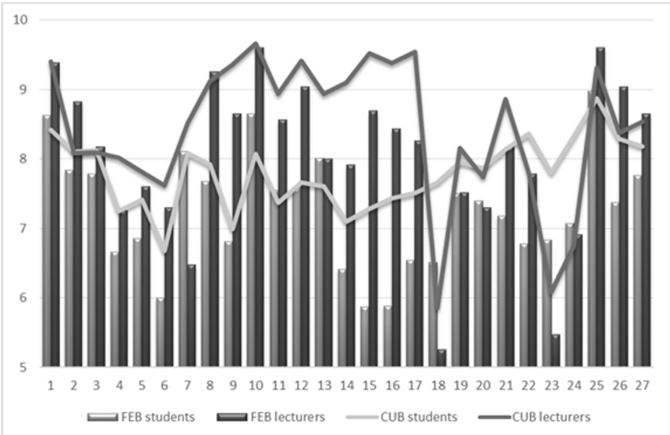

Figure 2: Comparison of the students and teachers responses at FEB and CUB (source: own calculation)

We can see on Figure 2 that generally, according to the e-Learning users of the CUB, the quality of the e-Learning application is better. The answers are demonstrating significant differences based on the results of t-tests, therefore we find significant differences in the answers.
The significant differences in the lecturers' answers is illustrated by Table 1 and Table 2 naming the difference indicator issues. All results were higher at Benchmark excepting for the question 2 and 26. Before t-test we calculated descriptive statistics with SPSS (Appendix 2). Within the results for t-test for Equality of Means, the results were displayed into Equal Variances assumed (E.v.a.) and not assumed (E.v. not a.).

question		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tai-led)	Mean Diffe-rence	Std. Error Difference
2.	E.v.a.	2.704	0.103	3.341	94	0.001	0.7461	0.2233
	E.v. not a.			3.380	90.657	0.001	0.7461	0.2207
7.	E.v.a.	21.558	0.000	-5.024	94	0.000	-2.0417	0.4064
	E.v. not a.			-4.895	64.022	0.000	-2.0417	0.4171
9.	E.v.a.	34.140	0.000	-2.215	94	0.029	-0.7078	0.3195
	E.v. not a.			-2.141	53.624	0.037	-0.7078	0.3306
13.	E.v.a.	10.075	0.002	-2.625	94	0.010	-0.9400	0.3581
	E.v. not a.			-2.539	54.687	0.014	-0.9400	0.3702
14.	E.v.a.	8.619	0.004	-4.479	94	0.000	-1.1870	0.2650
	E.v. not a.			-4.342	57.460	0.000	-1.1870	0.2733
15.	E.v.a.	47.302	0.000	-3.510	94	0.001	-0.8243	0.2349
	E.v. not a.			-3.413	61.405	0.001	-0.8243	0.2415
16.	E.v.a.	18.063	0.000	-4.011	94	0.000	-0.9452	0.2357
	E.v. not a.			-3.908	64.075	0.000	-0.9452	0.2419
17.	E.v.a.	56.573	0.000	-3.957	94	0.000	-1.2791	0.3232
	E.v. not a.			-3.817	51.447	0.000	-1.2791	0.3351
26.	E.v.a.	2.879	0.093	2.927	94	0.004	0.6635	0.2267
	E.v. not a.			2.974	86.273	0.004	0.6635	0.2231

Table 1: Significant differences in teachers' answers (source: own calculation)

Regarding the result it can be said that the e-Learning application of the CUB is more successful than the FEB according to the students' and the lecturers' evaluation. It is also obvious that the quality of the system's operation of the CUB is higher than the FEB. This result supports our hypothesis according to which the FEB can evolve in the quality of e-Learning application by ensuring the institutional frames for the system.
After that we examined whether background variables influencing the variables are possible to be formed. We analyzed the whole database used factor analysis to demonstrate this contracts the coherent factors into one common factor. We examined the variables on the basis of the Kaiser-Meyer-Olkin (KMO) criteria to determine whether they are suitable for factor analysis (Várallyai, Botos and Péntek, 2015). The value of the KMO is 0.886 (Table 3), which means that the variables are suitable for factor analysis.
The table also indicates the null hypothesis of the Bartlett test, which means that there is no correlation between the basic variables because the level of significance (Sig.) is smaller than 0.05. Consequently the basic condition of the factor analysis, according to which the variables must correlate is fulfilled (Sajtos and Mitev, 2007).

question		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
3.	E.v.a.	45.561	0.000	-2.873	559	0.004	-0.3402	0.1184
	E.v. not a.			-2.849	496.230	0.005	-0.3402	0.1194
4.	E.v.a.	6.349	0.012	-4.544	559	0.000	-0.5861	0.1290
	E.v. not a.			-4.530	544.646	0.000	-0.5861	0.1294
5.	E.v.a.	3.602	0.058	-3.351	559	0.001	-0.5634	0.1681
	E.v. not a.			-3.357	558.955	0.001	-0.5634	0.1678
6.	E.v.a.	16.211	0.000	-3.773	559	0.000	-0.6813	0.1806
	E.v. not a.			-3.785	556.557	0.000	-0.6813	0.1800
10.	E.v.a.	74.275	0.000	5.026	556	0.000	0.5785	0.1151
	E.v. not a.			4.938	408.564	0.000	0.5785	0.1171
13.	E.v.a.	7.834	0.005	2.735	556	0.006	0.3993	0.1460
	E.v. not a.			2.721	528.765	0.007	0.3993	0.1468
14.	E.v.a.	27.860	0.000	-3.443	556	0.001	-0.6833	0.1985
	E.v. not a.			-3.468	541.585	0.001	-0.6833	0.1970
15.	E.v.a.	6.775	0.009	-7.322	556	0.000	-1.4139	0.1931
	E.v. not a.			-7.378	540.316	0.000	-1.4139	0.1916
16.	E.v.a.	0.412	0.521	-8.667	556	0.000	-1.5479	0.1786
	E.v. not a.			-8.686	555.987	0.000	-1.5479	0.1782
17.	E.v.a.	0.729	0.394	-5.305	556	0.000	-0.9694	0.1827
	E.v. not a.			-5.318	555.973	0.000	-0.9694	0.1823
18.	E.v.a.	36.219	0.000	-6.286	559	0.000	-1.1489	0.1828
	E.v. not a.			-6.330	535.017	0.000	-1.1489	0.1815
19.	E.v.a.	31.714	0.000	-2.462	559	0.014	-0.4456	0.1810
	E.v. not a.			-2.474	548.737	0.014	-0.4456	0.1801
20.	E.v.a.	1.128	0.289	-2.631	559	0.009	-0.4723	0.1795
	E.v. not a.			-2.633	558.579	0.009	-0.4723	0.1794
21.	E.v.a.	22.547	0.000	-5.664	559	0.000	-0.9658	0.1705
	E.v. not a.			-5.714	519.901	0.000	-0.9658	0.1690
22.	E.v.a.	56.671	0.000	-7.659	559	0.000	-1.5814	0.2065
	E.v. not a.			-7.747	489.119	0.000	-1.5814	0.2041
23.	E.v.a.	25.634	0.000	-5.080	559	0.000	-0.9689	0.1907
	E.v. not a.			-5.114	538.851	0.000	-0.9689	0.1895
24.	E.v.a.	12.750	0.000	-7.956	559	0.000	-1.2458	0.1566
	E.v. not a.			-8.006	541.488	0.000	-1.2458	0.1556
25.	E.v.a.	6.600	0.010	-6.810	559	0.000	-0.9107	0.1337
	E.v. not a.			-6.801	553.257	0.000	-0.9107	0.1339
27.	E.v.a.	59.530	0.000	-3.166	559	0.002	-0.4160	0.1314
	E.v. not a.			-3.139	491.741	0.002	-0.4160	0.1325

Table 2: Significant differences in students' answers (source: own calculation)

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.886
Bartlett's Test of Sphericity	Approx. Chi-Square	17 114.773
	df	351
	Sig.	0.000

Table 3: The results of KMO and Bartlett test (source: own calculation)

We used two methods to determine the number of the factors. One of them is the percentage of variance, which determines the number of the factors on the basis of the cumulated percentage of the variance, which means that it is necessary to establish such number of the factors which makes it possible to reach a cumulated minimal level of variance. The Table 4 indicates the variance explained by the factors.

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	11.526	42.690	42.690	11.192	41.452	41.452	6.140	22.740	22.740
2	3.621	13.410	56.100	3.317	12.285	53.737	5.893	21.825	44.565
3	1.944	7.201	63.301	1.566	5.800	59.538	3.105	11.501	56.066
4	1.500	5.554	68.855	1.264	4.681	64.219	2.201	8.153	64.219
5	1.090	4.037	72.892						
6	0.953	3.530	76.423						

Table 4: Choice factors in the method variance (source: own calculation)

The fourth row of the 'Cumulative %' shows the cumulated variance of the four factors (64.219%) which were developed by the Kaiser-criteria. It is above the necessary 60%.

The 5-factor solution would have been reasonable regarding the methods but relying on the fulfilled factor analysis there would only be one variable in the factor 5. Therefore, we used a 4-factor solution which means that we replaced 27 variables. It explains with 100% with 4 factors which explains in 64.22%. After this, we rotated the factors during their selection to filter the correlated factors without relation and also in order to get a more simple and understandable solution. We used the Varimax rotational method during which the orthogonal rotation results in correlating factors.

Finally, we reached a 4-factor solution as a result of the analysis, where the KMO = 0.886 and the explained variance is 64.22%. The names of the factors are the following:

- FACTOR1: Quality of the service
- FACTOR2: Efficiency of the system
- FACTOR3: Quality of the online material
- FACTOR4: Usability of the system

We used logistic regression for the results of the factor analysis. Our aim was to determine the importance of a given factor for the users of the CUB and the FEB. The dependent variable is the factor CUB and the independent variable is the factor of FEB.

Table 5 and 6 represent the first phase of the analysis. Table 4 shows the constant Wald-statistic in the pre-analysis phase, which is the square of the beta (B) and the standard error. It demonstrated that there is not a significance.

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.043	.078	.300	1	.584	.958

Table 5: Parameter estimation based on the Wald-statistic (source: own calculation)

Table 5 represents the individual effect of the independent variables yet not used in the analysis, according to which FACTOR1. FACTOR2 and FACTOR3 are also significant on their own, while the forth variable is not. The second part of the analysis demonstrates the final result. We used the „Enter" method, which means that we used the four independent variables in the analysis at same time.

			Score	df	Sig.
Step 0	Variables	FACTOR1	49.687	1	.000
		FACTOR2	20.899	1	.000
		FACTOR3	22.418	1	.000
		FACTOR4	.401	1	.526
	Overall Statistics		97.189	4	.000

Table 6. Significance of individual effects of variables (source: own calculation)

Table 7 also applies the Wald-statistic. If the given variable is significant, then it supports the model. It is obvious that FACTOR1. FACTOR2 and FACTOR3 contributes to the model, while FACTOR4 does not. The Exp(B) indicates how each variables correct the estimation.

		B	S.E.	Wald	df	Sig.	Exp(B)	95.0% C.I.for EXP(B)	
								Lower	Upper
Step 1(a)	FACTOR1	.759	.105	52.118	1	.000	2.135	1.738	2.624
	FACTOR2	.521	.102	26.021	1	.000	1.683	1.378	2.056
	FACTOR3	-.596	.104	32.805	1	.000	.551	.449	.676
	FACTOR4	-.115	.087	1.748	1	.186	.891	.751	1.057
	Constant	-.108	.087	1.549	1	.213	.898		

Table 7: Wald-statistic (source: own calculation)

Regarding this, FACTOR1 corrects the estimation the most (Exp(B)=2.135) with 113.5%, while FACTOR2 corrects it with 68.3%. FACTOR3 worsens the estimation with 44.9%, which means that according to the CUB users the first factor is twice, while the second factor is 1.683 times more important than according to the FEB.

Discussion

In our study we used the ELSS model (Wang, Wang and Shee, 2007) based on IS success model developed by DeLone and McLean (2003). We used it at both institutions. Our results of the questionnaire evaluation are the same as the main line of article by Halonen et al (2009).

System quality has a significant influence on use and user satisfaction (DeLone and McLean, 2003). In our research the system was Moodle platform and when evaluating 'System Quality' we considered Moodle's functionality and the technical support that was connected with its use.

Respondents perceived that the e-learning system operated almost without reproaches and we interpret that it describes the stability and good availability of the system.

Information quality has a significant impact on use and user satisfaction (DeLone and McLean, 2003). Information is an important factor in the e-learning system. The respondents were mainly satisfied with the organized information. The replies did not indicate if the organization of information helped the students perceive the structure of the degree.

Replies concerning 'Information Quality' highlighted three issues on 'Service Quality'. The students perceived that the plans of study blocks helped them understand the purpose of their studies. Another important information concerned students' experiment on receiving essential and needed information for their degree from the e-learning system. The third significant success factor was the instructions on giving evidence of expertise (Halonen et al, 2009).

Service quality builds on all support that is offered to its users (DeLone and McLean, 2003). In our study we measured 'Service Quality' by evaluating interaction between the students and teachers. The students replied that they were mostly satisfied with interaction. The students had received support and guidance and their questions were answered. These results tell us that the respondents were satisfied with given guidance.

Service quality is extremely important because due to bad service customers may be lost (DeLone and McLean, 2003). From the e-learning approach we could interpret that weak interaction in the e-learning system could lead to reluctance to study. Our measures showed that 'service quality' was good.

Benefits in e-learning are positive consequences and in our research they were positive consequences for studies and evidences of experience. The most important output was that the students perceived to benefit from the e-learning system when they accomplished their degrees (Halonen et al, 2009). Benefits indicated that the e-learning system supports students when they accomplish their degrees.

Conclusion

We used statistic methods to examine the quality evaluation of the e-Learning usage among the students and the lecturers of the FEB and the CUB. We found significant differences between the CUB's and the FEB's application as well as between the students' and the lecturers' evaluation by performing a t-test. We determined relying on the result, that it is more effective and better to operate the e-Learning system under organized circumstances. This confirmed our hypothesis. We have created 4 factors from the 27 variables by factor analysis and we performed logistic regression on them. Our result shows according to the CUB users the quality of the service is more than twice as good according to the FEB users. While the efficiency of the system is 1.683 times more important. This method can be used to evaluate (compare) the quality of e-Learning services among educational institutes.

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Appendix 1.

Questionnaire

System Quality (questions 1-7)

1. The LMS provides high availability.
2. The LMS is easy to use.
3. The LMS is user friendly.
4. The LMS provides interactive features between users and system.
5. The LMS provides personalized information presentation.
6. The LMS provides charming feature to attract users.
7. The LMS provides high speed of accessing information.

Information Quality (questions 8-13)

8. The LMS provides information that is exactly what you need.
9. The LMS provides information you need in time.
10. The LMS provides information that is relevant to your job.
11. The LMS provides sufficient information.
1. The LMS provides up-to-date information.

Service Quality (questions 14-18)

13. The LMS provides proper level of on-line assistance and explanation.
14. The LMS developers interact with users extensively during the development of e-learning system.
15. The IS department staff provide high availability for consultation.
16. The IS department responds to your suggestion for future enhancements of e-learning system cooperatively.
17. The IS department provides satisfactory support to users using e-learning system.

Benefits (questions 18-24)

18. The LMS helps you improve your job performance.
19. The LMS helps the organization enhance competitiveness or create strategic advantage.
20. The LMS enables the organization to respond more quickly to change.
21. The LMS helps the organization provide better products or services to customers.
22. The LMS helps the organization save cost.
23. The LMS helps the organization to speed up transactions or shorten product cycles.
24. The LMS helps the organization increase return on financial assets.

Conclusion (questions 25-27)

25. As a whole, the performance of the e-learning system is good.
26. As a whole, the e-learning system is successful.
27. You are satisfied with the e-learning system.

Appendix 2.

Descriptive statistics on teachers' answers

question number	Institution	N	Mean	Std. Deviation	Std. Error Mean
1.	FEB	46	9.391	0.8814	0.1300
	CUB	50	9.400	0.6999	0.0990
2.	FEB	46	8.826	0.9263	0.1366
	CUB	50	8.080	1.2262	0.1734
3.	FEB	46	8.174	1.1016	0.1624
	CUB	50	8.100	1.3740	0.1943
4.	FEB	46	7.261	2.3705	0.3495
	CUB	50	8.020	1.7437	0.2466
5.	FEB	46	7.609	3.1516	0.4647
	CUB	50	7.820	1.6123	0.2280
6.	FEB	46	7.304	3.4825	0.5135
	CUB	50	7.620	1.7010	0.2406
7.	FEB	46	6.478	2.5625	0.3778
	CUB	50	8.520	1.2493	0.1767
8.	FEB	46	9.261	0.9985	0.1472
	CUB	50	9.120	1.2720	0.1799
9.	FEB	46	8.652	2.1418	0.3158
	CUB	50	9.360	0.6928	0.0980
10.	FEB	46	9.609	0.7142	0.1053
	CUB	50	9.660	0.4785	0.0677
11.	FEB	46	8.565	1.6553	0.2441
	CUB	50	8.940	1.1141	0.1576
12.	FEB	46	9.043	1.4446	0.2130
	CUB	50	9.420	0.5746	0.0813
13.	FEB	46	8.000	2.3851	0.3517
	CUB	50	8.940	0.8184	0.1157
14.	FEB	46	7.913	1.7362	0.2560
	CUB	50	9.100	0.6776	0.0958
15.	FEB	46	8.696	1.5036	0.2217
	CUB	50	9.520	0.6773	0.0958
16.	FEB	46	8.435	1.4855	0.2190
	CUB	50	9.380	0.7253	0.1026
17.	FEB	46	8.261	2.1953	0.3237
	CUB	50	9.540	0.6131	0.0867
18.	FEB	46	5.261	3.4797	0.5131
	CUB	50	5.860	2.1666	0.3064
19.	FEB	46	7.522	3.4237	0.5048
	CUB	50	8.160	1.5167	0.2145
20.	FEB	46	7.304	3.2446	0.4784
	CUB	50	7.740	1.9878	0.2811
21.	FEB	46	8.174	2.8387	0.4185
	CUB	50	8.860	1.4429	0.2041
22.	FEB	46	7.783	2.8590	0.4215
	CUB	50	7.800	2.1381	0.3024
23.	FEB	46	5.478	2.9645	0.4371
	CUB	50	6.080	3.0226	0.4275
24.	FEB	46	6.913	3.5890	0.5292
	CUB	50	6.740	2.4974	0.3532
25.	FEB	46	9.609	0.7142	0.1053
	CUB	50	9.320	1.3915	0.1968
26.	FEB	46	9.043	0.8681	0.1280
	CUB	50	8.380	1.2919	0.1827
27.	FEB	46	8.652	0.7664	0.1130
	CUB	50	8.540	1.0539	0.1490

Descriptive statistics on students' answers

question number	Institution	N	Mean	Std. Deviation	Std. Error Mean
1.	FEB	288	8.635	1.0030	0.0591
	CUB	273	8.418	1.6938	0.1025
2.	FEB	288	7.844	1.8020	0.1062
	CUB	273	8.110	1.6701	0.1011
3.	FEB	288	7.792	1.1739	0.0692
	CUB	273	8.132	1.6079	0.0973
4.	FEB	288	6.667	1.4435	0.0851
	CUB	273	7.253	1.6106	0.0975
5.	FEB	288	6.854	2.0498	0.1208
	CUB	273	7.418	1.9254	0.1165
6.	FEB	288	6.000	2.2585	0.1331
	CUB	273	6.681	2.0030	0.1212
7.	FEB	288	8.115	1.2258	0.0722
	CUB	273	8.088	1.7677	0.1070
8.	FEB	288	7.677	1.3447	0.0792
	CUB	273	7.923	1.7525	0.1061
9.	FEB	288	6.813	1.8364	0.1082
	CUB	273	6.989	2.1343	0.1292
10.	FEB	288	8.656	0.9239	0.0544
	CUB	270	8.078	1.7043	0.1037
11.	FEB	288	7.552	1.4009	0.0825
	CUB	273	7.374	1.6448	0.0995
12.	FEB	288	7.583	1.5483	0.0912
	CUB	273	7.659	1.7334	0.1049
13.	FEB	288	8.010	1.5806	0.0931
	CUB	270	7.611	1.8635	0.1134
14.	FEB	288	6.417	2.5851	0.1523
	CUB	270	7.100	2.0535	0.1250
15.	FEB	288	5.875	2.5220	0.1486
	CUB	270	7.289	1.9883	0.1210
16.	FEB	288	5.885	2.1778	0.1283
	CUB	270	7.433	2.0316	0.1236
17.	FEB	288	6.542	2.2302	0.1314
	CUB	270	7.511	2.0761	0.1263
18.	FEB	288	6.510	2.4237	0.1428
	CUB	273	7.659	1.8504	0.1120
19.	FEB	288	7.510	2.3314	0.1374
	CUB	273	7.956	1.9246	0.1165
20.	FEB	288	7.396	2.1518	0.1268
	CUB	273	7.868	2.0963	0.1269
21.	FEB	288	7.177	2.3134	0.1363
	CUB	273	8.143	1.6510	0.0999
22.	FEB	288	6.781	2.9033	0.1711
	CUB	273	8.363	1.8402	0.1114
23.	FEB	288	6.833	2.5113	0.1480
	CUB	273	7.802	1.9547	0.1183
24.	FEB	288	7.073	2.0511	0.1209
	CUB	273	8.319	1.6194	0.0980
25.	FEB	288	8.979	1.0119	0.0596
	CUB	273	8.879	1.5134	0.0916
26.	FEB	288	7.375	1.5455	0.0911
	CUB	273	8.286	1.6221	0.0982
27.	FEB	288	7.771	1.2890	0.0760
	CUB	273	8.187	1.7941	0.1086