The Factor Analysis in determining the most important Factors influencing Basra University students' reluctance to Electronic -learning

For the academic year 2019-2020

[a] *Wafaa Abdulsamad Ashour*

[a] *Department of statistic, College of Administration and Economics, University of Basra , Iraq,*
 Email*: wwwaaafffaaa88@gmail.com*

A R T I C L E   I N F O

A B S T R A C T

This study aimed to use the factor analysis, which is a scientific method for analyzing multivariate data and reducing it to a smaller number of factors.. The researcher depend on data obtained through a questionnaire whose paragraphs were inspired by a student's opinions of the College of Administration and Economics / University of Basra for the academic year 2019 -2020, with whom they were contacted electronically to find out the reasons for students' reluctance to electronic education and accept it as an alternative to classical education in light of the pandemic conditions of Corona. The researcher relied on the questionnaire of (22) questions as variables for the study. Results were obtained using the statistical program spss v. 19 The study concluded that the variables were reduced to (8) basic factors, which explained a variation of (72,221%) of the total variance.

And the most important factors are that e-learning leads to introvertedness and that it is an innovation that must end and the interruption of the Internet and the electrical current and the lack of knowledge in the use of electronic platforms and the lack of students' possession of smart phone devices and their own computers that make the process of e-learning difficult .and tiring

MSC : 30C45 , 30C50

Introduction

The e-learning phenomenon is considered one of the most important phenomena imposed by the Corona pandemic conditions in the world and forced not only Iraq but the world as a whole

Corresponding author *: Wafaa Abdulsamad Ashour*

Email address: *wwwaaafffaaa88@gmail.com*

Communicated by : Alaa Hussein Hamadi

to apply e-learning as an alternative to classical education, which was prevalent before the pandemic.

E-learning is defined as any teaching the learner learns through electronic technological media such as online learning, computer-based learning, digital learning, satellite learning, and digital technologies in line with the teaching principles appropriate for a flexible open learning environment.

E-learning aims to create an interactive learning environment through electronic technologies. Giving teachers the technical skills and giving learners the skills needed to use communication technology and support the process of interaction between learners and teachers through exchanging educational experiences and creating educational networks to organize the work of educational institutions and preparing a generation of graduates who are able to deal with Technology and age skills.

E-learning tools (e-mail, online conversation boards, source and reference databases including search engines and video conferencing using the computer). [10]

The First Topic: The Scientific Method

1- The study problem

The Corona crisis has cast a shadow over the education sector and prompted schools and universities to close its doors to reduce the chances of its spread. This prompted educational institutions to switch to e-learning as an alternative to traditional education. The use of the Internet in the educational process has increased in light of the Corona pandemic

Noticeable and use of video chat applications such as

 zoom, Google class, meeting,…

The operations of downloading these programs amounted to (62) million times during the period (14-21) March 2020. Despite this, most students suffer greatly in the use of these educational platforms, including the weakness of the Internet in Iraq, power outages, and the majority of students not having computers and smart phones . Many families do not have the ability to provide e-learning supplies without the government providing educational grants to help.[10]

2- The aim of the study

This study aimed to use the multivariate statistical method (factor analysis) to demonstrate the most important causes and factors that lead students to stumble in pursuing e-learning as an alternative to classical learning and try to develop solutions and treatments that specialists can benefit from in dealing with this phenomenon.

3- The importance of the study

The importance of this study stems from knowing the most important reasons that led most students to refrain from e-learning, and the lack of desire to follow this method as an alternative to classical education that compels the student to join the ideas and electronic educational

curricula. From the beginning of his entry into the worlds of education and knowledge, this may create psychological, economic and educational crises Not calculated by the student due to the difference in the nature of families, acceptance of the idea, and the provision of modern teaching methods.

4-Study limits

Spatial limits: University of Basra / College of Administration and Economics.

Human Frontiers: Students of the College of Administration and Economics.

Time limits: academic year 2019-2020 in the shadow of the Corona pandemic.

5- Previous studies

1) Kazim study (2013) This study aimed to determine the most important factors affecting improving the quality of health services using the global analysis of the components method, and a reduction of factors was reached to two factors out of (19) variables. [6]

2) The study of Ali and Muhammad (2019) aimed to use the global analysis to determine the most important factors that lead to an increase in car accidents, and the study came out to reduce the number of basic components of the 8 components that led to an increase in car accidents [2].

3) Raheem Study (2017) The aim of this study is to use the global analysis to determine the most important factors affecting the migration of Iraqi youth. The study concluded that the factors affecting migration are reduced to 5 basic components. [4]

4) Saad's study, "The Factor Analysis of the Reasons for Academic Failure for Dammam University Students," Graduate Studies Journal, Al-Neelain University, Volume 5, No. 15, 2016. The research found that there are 4 factors behind the academic failure. [5]

5) Deldom Study (2015) This study used the global analysis to show the most important diseases that cause child mortality in Sudan. The study concluded with a statement (11) of the main factors out of 25 variables. [8]

The Second Topic: The Theoretical Side

1- Factorial analysis :   is a statistical method used in studying phenomena with the aim of returning them to the factors affecting them, that is, it is a method that aims to explain correlation coefficients that have a statistical significance between the various variables.

2- The type of factor analysis

A- Exploratory Factor Analysis This type is used when the relationships between the variables and the underlying factors are unknown, that is, it aims to discover the factors to which the variables are classified.

B - Empirical factor analysis This type is used for testing hypotheses regarding the presence or absence of a relationship between variables and underlying factors, as it is used in assessing the

ability of factors to express the actual data set and comparison between several models of factors in this field.

3- Methods of factor analysis

A- The basic components method: It is one of the most accurate and used methods because of the accuracy of its results compared to the rest of the methods, and its advantages are that it leads to delicate saturations, and the correlation matrix is reduced to the lowest number of unrelated orthogonal factors. It aims to define the components (factors) that explain the largest possible percentage From the variance to the original variables.

B- The Qatari method: It is considered one of the easy and direct methods of global analysis, and it is used when we have a few number of factors and lead to extracting the largest possible number of factors. This method requires a prior knowledge of the commonness of the variables. This name is given because it is based on the use of diagonal values in the correlation matrix.

C - the central method: this method only extracts a limited amount of correlative variation, and the values of commonness in the correlation matrix are determined according to inaccurate estimates, as it uses the maximum correlation between the variables in the matrix and this procedure leads to a demotion of the matrix. [1]

4- The correlation matrix:

The main idea of the global analysis is to summarize a large number of variables into a few factors. The factor is a linear structure of the variables, the relationship between the variable and the factor can be expressed in the form:

$$F_1 = a_{11}X_1 + a_{12}X_2 + ... + a_{1n}X_n$$
$$F_2 = a_{21}X_1 + a_{22}X_2 + ... + a_{2n}X_n \qquad (1)$$
$$\vdots$$
$$F_m = a_{m1}X_1 + a_{m2}X_2 + ... + a_{mn}X_n$$

a_{ij} coefficient, X_j variables, j = 1,2,…, n, i = 1,2,…, m

$$X = \begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_n \end{bmatrix} \quad , \quad F = \begin{bmatrix} F_1 \\ F_2 \\ \vdots \\ F_m \end{bmatrix} \quad , \quad A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{bmatrix} \quad \cdots(2)$$

The coefficients in the previous equations can be extracted from the correlation matrix, since the elements of the correlation matrix are the values of the correlation coefficients between the variables.

The importance of the basic component is estimated to be the amount of variation it explains relative to the total variance, meaning that the importance of the basic component is $\dfrac{\lambda_i}{\sum \lambda_i}$ [2]

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1k} \\ r_{21} & r_{22} & \cdots & r_{2k} \\ \vdots & \vdots & \cdots & \vdots \\ r_{k1} & r_{k2} & \cdots & r_{kk} \end{bmatrix} = \begin{bmatrix} 1 & r_{12} & \cdots & r_{1p} \\ r_{21} & r_{22} & \cdots & r_{2p} \\ \vdots & \vdots & \cdots & \vdots \\ r_{p1} & r_{p2} & \cdots & r_{pp} \end{bmatrix} \quad \cdots (3)$$

The characteristic equation for matrix R is $\left| R - \lambda^* I \right| = 0$

For each distinct root it corresponds to it $\left(R - \lambda^* I \right) = 0$ and that all the Eigen roots of matrix R are positive and their sum equals the sum of the radical elements of matrix R.

5- Communalities:

It is the sum of squares of factors' Loading and is part of the total variance that is known as

$$h_j^2 = \sum_{p=1}^{m} a_{jp}^2 \quad , \quad j = 1,2,...,p \quad , \quad p = 1,2,...,m \cdots (4)$$

a_{jp}^2 The weight of the factor p represents the variable j, which is the coefficient of the matrix of factors. Although $0 \le h_j^2 \le 1$ it is part of the total variance. [7]

6- Factors (component coefficients)

variables derived from a set of variables were directly measured. That is, it stems from within a set of relationships between variables and helps to understand the nature of the relationships between the original variables. [1]

The coefficient of the first variable is the quotient of dividing the coefficient of the first variable by the contrast of the first component

$$F_1 = a_{11} X_1 + a_{12} X_2 + ... + a_{1n} X_n$$

$$c_{11} = \frac{a_{11}}{V(F_1)}$$

And so in relation to the coefficient of other variables.

7- Rotating the factors:

When using the factor analysis of the correlation matrix, it is reached to extract specific factors and these factors are orthogonal axes that represent the saturation of variables and their coordinates, but it does not always guarantee us to obtain factors that can be easily explained through their correlations with the variables, because determining the factors on This basis is done in a random manner, so adjusting these axes must be made by rotating the factors. [5]

The Third Topic: The practical side

Data collection

The data for this study was obtained by means of a questionnaire prepared by the researcher, whose paragraphs were inspired by the opinions of students who were communicated with them electronically to find out the obstacles of electronic education that students witnessed reluctance on the reasons for placing paragraphs for the questionnaire form. The Likert pentagon scale was used (Strongly Agree and Agree, Neutral, Disagree, Strongly Disagree) with weights (1,2,3,4,5), respectively. Questionnaire questionnaire questions were approved as variables in the global analysis.

The research sample reached (128) male and female students who were included in the research, distributed in the following table:

.

Table No. (1)

Shows the distribution of the sample by department and gender

female	male	department
43	40	Statistic
24	21	Management Information Systems

Table No. (1) shows the distribution of sample according to the department and gender (45) male and female students from the Department of Management Information Systems and (83) male and female students from the Statistics Department.

Table No. (2)

Distribution of sample according to department and stage of study

Fourth stage	Third stage	Second stage	First stage	Department
24	14	22	23	Statistic
		15	30	Management Information Systems

Table No. (2) shows the distribution of the sample members according to the department, the study stage. It is noted that the Department of Management Information Systems has two stages because it is a new department.

The Results of Factor Analysis

Table No.(3)
KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.704
Bartlett's Test of Sphericity	Approx. Chi-Square	1088.109
	Df	231
	Sig.	.000

The table (3)shows the Kaiser Mir Olkin measure (KMO), which measures the efficiency of the sample and Bartlett test for sample data. The KMO measure reached (0.704) which is greater than (0.5), which indicates an increase in the reliability of the factors that we obtain from the factor analysis, And the level of significance of the relationship between the variables (0.000) is less than (0.05), meaning that the relationship between them is statistically significant.

Table No(4)

	Initial	Extractio n
q1	1.000	.749
q2	1.000	.776
q3	1.000	.781
q4	1.000	.825
q5	1.000	.770
q6	1.000	.718
q7	1.000	.672
q8	1.000	.741
q9	1.000	.705
q10	1.000	.733
q11	1.000	.517
q12	1.000	.719
q13	1.000	.817
q14	1.000	.837
q15	1.000	.611
q16	1.000	.639
q17	1.000	.731
q18	1.000	.709
q19	1.000	.675
q20	1.000	.702
q21	1.000	.832
q22	1.000	.630

Table No. (4) shows the preliminary and extracted values for the prevalence, and that the common factors explain a high percentage of the variance of the study variables except the

variable (11) where the ratio of the explained variance with the common factors is less than 60%.

Table No (5)
Total Variance Explained

Component	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	5.330	24.229	24.229	5.330	24.229	24.229	3.334	15.156	15.156
2	2.247	10.211	34.440	2.247	10.211	34.440	3.121	14.186	29.341
3	1.974	8.974	43.414	1.974	8.974	43.414	1.740	7.908	37.249
4	1.577	7.166	50.581	1.577	7.166	50.581	1.686	7.662	44.912
5	1.390	6.317	56.898	1.390	6.317	56.898	1.604	7.292	52.203
6	1.170	5.319	62.217	1.170	5.319	62.217	1.582	7.193	59.396
7	1.160	5.273	67.490	1.160	5.273	67.490	1.524	6.927	66.323
8	1.041	4.731	72.221	1.041	4.731	72.221	1.298	5.898	72.221
9	.846	3.846	76.067						
10	.749	3.404	79.472						
11	.639	2.904	82.376						
12	.598	2.720	85.096						
13	.575	2.614	87.710						
14	.464	2.108	89.817						
15	.404	1.835	91.652						
16	.397	1.804	93.457						
17	.322	1.465	94.921						
18	.289	1.315	96.237						
19	.280	1.274	97.511						
20	.229	1.041	98.552						
21	.205	.933	99.485						
22	.113	.515	100.000						

Table No. (5) above shows the underlying roots (variations of components or factors), as it is noted that there are eight factors (basic components) that affect the success or failure of the e-learning process and that represent the factors whose value exceeds the correct one. These factors explain the percentage (72.221%) From the total variance of the variables and these eight factors, each of them explained, respectively, 4.731, 5.273, 5.319, 6.317, 7.166, 8.974, 10.211, 24.229.

Table No (6)

	Component							
	1	2	3	4	5	6	7	8
q1	-.125					.753	.389	
q2	-.168	-.247	.808					.123
q3			.842			.127	.198	
q4			.265	.175		.838	-.135	
q5			.173	.811	-.137	.187	-.152	
q6		.177	-.155	.751	.130		.238	-.128
q7				.534		.194	.518	.236
q8		-.108	.132				.836	
q9		-.201	.194	.160	.639		.375	-.223
q10					.846			
q11		.456	-.210		.437	-.133	-.183	.128
q12	.122	.797				-.230		
q13	.156	.869					-.108	
q14	.229	.843	-.221	.114				
q15	.337	.598		-.228	-.230			-.167
q16	.603	.374			-.344			
q17	.783	.196				-.239		
q18	.755	.280	-.176		.164			
q19	.781	.112					-.144	.135
q20	.734		-.192			.101	-.151	.300
q21	.175							.876
q22	.571			.124	-.100	-.242		.458

Table No. (6) represents the matrix of factors after rotation, which includes eight factors, where it is noticed that the strongest variables are related to the eight factors with the amount of loading between them is shown in Table No. (7) below.

Table No.(7)

التشبع	المتغير	العامل
0.783	17	1
0.843	14	2
0.842	3	3
0.811	5	4
0.846	10	5
0.838	4	6
0.836	8	7
0.876	21	8

Table N0.(8)

% of variance	variables	component
15.156	$X_{16}, X_{17}, X_{18}, X_{19}, X_{20}, X_{22}$	1
14.186	$X_{11}, X_{12}, X_{13}, X_{14}, X_{15}, X_1, X_4$	2
7.908	X_6, X_7	3
7.662	X_9, X_{18}	4
7.292	X_2, X_3, X_{10}	5
7.193	X_2, X_5	6
6.927	X_8	7
5.8981	X_{21}	8

Table No. (8) shows the eight basic factors, the variables, and the percentage of variation explained for each factor. It is noted that the first factor has great importance in influencing the study problem and in determining the variables affecting the progress of the e-learning process in light of the Corona pandemic, where it explains (15.156%) of the variance. The second factor follows in terms of importance and influence on the problem of the study, where it explains (14.186%) of the total variance. The third factor comes in terms of importance and influence in the third rank.

Conclusions : The most important conclusions reached:

1- The factor analysis resulted in the extraction of (8) basic factors that explain the percentage (72.221%).

2- The most important factor is the majority of students agree that electronic education leads to introverted and that it is heresy that must end , the internet disconnection   and electric current , Lack of knowledge in using electronic platforms, The students' lack of smart phone devices and their own computers makes the process of electronic learning difficult and tiring.

٣- The second component in terms of importance and impact included electronic learning makes the student more free to express themselves and provides information exchange with students as it takes time and effort and the lack of an infrastructure for learning and the difficulty of electronic platforms and electronic learning does not take into account individual differences.

4 - The absence of a specific schedule for students in offering electronic lectures has the least variation.

Recommendations

The study recommended a number of recommendations for the success of the e-learning process:

1- Conducting statistical studies to distinguish the most important factors that lead to the success of e-learning under the current circumstances.

2- Using multivariate statistical methods that address the causes and obstacles of e-learning.

3- Providing the infrastructure for the success of the e-learning process.

4- Motivating the educational cadres for students to continue in education and encouraging them to pursue electronic lessons.

<u>References</u>

[1] Ahmad Abu Fayed, "Factor Analysis: Its Concept, Objectives, Conditions, Types, and Steps," Al-Azhar University - Gaza, 2016.

[2] Israa Moayad Ali and Zainab Abdullah Muhammad, "A statistical study on the most important factors that lead to an increase in car accidents in the governorate of Erbil, using factor analysis and cluster analysis." Kaafari Zanko Bao Zansah, Moravia Tiba Kan, Volume 23 ', Issue 2, 2019.

[3] Al-Bukhari, Salem, "The Use of Multivariate Factor Analysis in Analysis of Marketing Questionnaires", Al-Hajj Al-Khadr University, Batna, Algeria, 2009.

[4]Rahim, Saif Hussam, "Using Factorial Analysis to Determine the Most Important Factors Affecting Iraqi Youth Migration: A Statistical Study of the Status of Iraqi Youth Migration in Al-Qadisiyah Governorate" Al-Qadisiyah Journal of Computer Science and Mathematics, Volume 9, Issue 1, 2017.

[5]Saad, Ali Osman Syed, "The Factor Analysis of the Reasons for Academic Failure for Dammam University Students," Journal of Graduate Studies, Al-Neelain University, Volume 5, No. 15, 2016.

[6] Kazem Abdel Abbas Hassan, "The Role of Factor Analysis in Determining the Most Important Factors Affecting the Quality of Health Services for Patients in the Euphrates Central Teaching Hospital as a Model", Al-Qadisiya Journal of Administrative and Economic Sciences, Volume (16), No. (4), 2014.

[7] Muhammad, Muhammad Abdel-Hussein, "The use of factor analysis from higher grades to determine the most important factors affecting the social upbringing of children under the age of six" Al-Qadisiyah Journal of Administrative and Economic Sciences, Volume 13, Issue 14, 2011.

[8] Youssef Madbou Jacques Deldom, "Applying the Method of Factor Analysis to Determine the Most Important Diseases Causing Child Mortality," Al-Jazeera University, College of Economics and Rural Development, Master Thesis, 2015.

[9]Tacq,J ."Multivariate Analysis Techniques in Social Science Research from Problem to Analysis .Rotterdam Institute voor Sociologisch en Bestuurskunding Onderzoek , Rotterdam.(1997).

[10] www.edutrapedia.com   (20-5-2020)

Questionnaire Form

Dear Students, This form has been prepared for the purpose of knowing students 'position on e-learning imposed by the current circumstances

.So the answer will be to check the choice for each paragraph, which corresponds to your opinion on the paragraph

College/   Department /   Stage

Major / A) Scientific   (B) Human

Sex /   a) Male   (b) Female

Marital Status / a) Married   (b) Single   (c) Other

Age/

Study / a) Morning   (b) Evening

	questions	Strongly Agree	Agree	neutral	disagree	Strongly Disagree
1	E-learning makes me more free to express myself					
2	What is presented in electronic lectures is useful and understandable					
3	I can re-study the lectures and refer to them electronically					
4	Provides information exchange between students					
5	It provides the student with discussion with his classmates in reviewing the lectures					
6	The faculty member is interested in answering student inquiries					
7	I found encouragement to ask questions and develop my ideas through discussions					
8	Easy to browse electronic lectures and access information					
9	E-learning helped me improve my research skills online					
10	I am generally satisfied with the quality of our online lectures					
11	E-learning takes time and effort					
12	No e-learning infrastructures					
13	Reduces student and teacher communication and interaction					
14	Difficulty using e-learning platforms					
15	E-learning does not take into account individual differences between students					
16	E-learning does not take into account individual differences between students					
17	E-learning is a Hersey that must be finished					
18	Network and power outages make electronic learning difficult and tiring					
19	Lack of knowledge in using educational platforms					
20	Most students do not have their own phones or computers					
21	The absence of a specific schedule for students to offer electronic lectures					
22	I do not support the use of e-learning					