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Using the Hierarchical Method to Identify the Critical Factors in the Success of E-learning in Algerian Universities Using the "DEMATEL" Method

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Abstract

This study focuses on how to identify, arrange and classify the critical factors in terms of cause and effect, using the DEMATEL method, which the university relies on to make e-learning successful and achieve the goal of university institutions. The study concluded that the factors vary in terms of their degree of importance and impact on the quality of e-learning, The most decisive factor that influences all other factors has been identified. The study also showed us that the greater the reliance on e-learning, the more this leads to improving the level of performance in Algerian Universities.

Keywords: e-learning, e-learning factors, DEMATEL hierarchical analysis.

I. General Introduction

Recent economic and social transformations have highlighted the pivotal role of information technology in improving teaching practices. These technologies present significant opportunities to enhance learning processes, but their success depends not only on technological tools but also on the pedagogical qualities of educators (Zina&Ahlem, 2021)[1].

In the era of information and communication technology (ICT), particularly with the advent of e-learning, human resources emerge as the decisive factor. It is the responsibility of individuals to master these advancements and channel them toward achieving educational objectives. However, relying solely on technology without addressing the development and preparation of human resources is impractical. Expecting all educators to possess identical pedagogical expertise to that of the most proficient professors can lead to more challenges than benefits (Guemide&Maouche, 2020)[2]

The initial adoption of these technologies has been marked by rapid implementation, technical complexity, and a lack of preparedness. Too often, their integration occurs without prior training or understanding of the necessary tools, protocols, and languages. Although only a few individuals may initially benefit from these advancements, their experiences pave the way for broader acceptance and refinement. Professors, akin to business leaders, must adapt to these changing circumstances by redefining their roles and equipping learners to navigate these technologies confidently and effectively (Benzida)[3]

[1]-Zina, A. &Ahlem, S. (2021). Perception of E-learning during the health crisis of COVID-19: case of algerian university teachers. Journal of Information Technology Management.ut.ac.ir

[2] - Guemide, B. &Maouche, S. (2020). Assessment of online learning in Algerian universities during COVID-19.Learning.iasj.net

[3]- Benzida, Y. (). Novice Teachers Attitudes towards TELUM E-Training in Higher Education. dspace.univ-ouargla.dz. univ-ouargla.dz

E-learning has become a vital tool in addressing various challenges within educational and academic settings, particularly in higher education. It offers solutions to issues such as the organization of academic work, yet it also presents its own set of disadvantages. Among these are the decline in the quality of education and an overemphasis on quantity rather than quality—problems that continue to challenge higher education institutions, especially in Algeria. By striking a balance between technological advancements and the enhancement of human and pedagogical resources, educational institutions can maximize the benefits of e-learning while addressing its limitations

In view of the above, the basic problem can be put forward:

What is the most contributing factor to the success of e-learning in Algerian universities?

The Main Premise

There is a difference in the degree of influence of the critical factors for e-learning from one institution to another.

Partial Hypotheses

- The determinants of e-learning are related to all factors combined with each other
- E-learning has become a necessity for university institutions
- There is a great interdependence between the factors of e-learning, and it cannot be said that there is one factor more decisive than another

Objectives of the Study

We aim through this study to identify the importance of e-learning and what are the requirements for its success to achieve comprehensive quality in the higher education sector

Study method

We used the descriptive method in the first part of the desktop survey for some references, as well as working papers presented in relevant conferences with our topic.As for the practical part of the course, the analytical method is used in the field study.

II. Definition and scope of e-learning

1- Definition of e-learning

E-learning is the use of web and other technology to transfer students from the environment in which they do their learning to one with different incentives for the necessary learning process. This definition could be given some precision in a variety of ways. First, temporary and partial transfers are the most common. Medical informatics, for example, is the use of technology to give medical students a brief familiarity with a large number of specific cases. This is used to supplement, not to replace the existing curriculum. E-learning can shorten one stage in a sequence of learning experiences. Students practice grammar under supervision in preparation for composition, or work on vocal production before tackling a song. An electronic aid to pronunciation can speed up the work of a native speaker who is helping a student to improve his accent.(Gupta & Gupta, 2020)[4]

E-learning and electronic materials can also stimulate education. Computers replaced snail mail as the cheapest, quickest and most reliable way of exchanging information about the speech defects of students with isolated problems.

[4] - Gupta, S. B. & Gupta, M. (2020). Technology and E-learning in higher education.Technology. academia.edu

Two-way radio links improved response time a little. But nerve-racking delay has been reduced by instructional television. Films played to one class at a time before everyone learned the protocol of interaction can now be captured and replayed, perhaps to speed up debate but also to concentrate discussion. Teachers in small rural schools working into collaboration with university courses using rich simulations provide yet another format in which lesser-qualified students could be taught by skilled professors.(Koripi, 2020)[5]

2- The Difference Between E-learning and Traditional Education

Traditional education involves the teacher presenting learning material directly to students in a classroom setting. The primary difference between e-learning and traditional classroom-based learning lies in the mode of delivery.(**Aslan, 2006**)[6]

In traditional education, the teacher has full control over the learning environment, allowing them to adapt and modify it as necessary. The teacher's abilities, personality, quality, and adaptability to the learning situation, along with the creation of course materials, significantly impact the learning and teaching performance.(**Georgiev, 2004**)[7]

3- Challenges and Opportunities of E-Learning in Algerian Universities

In the 21st century, the landscape of education has rapidly changed due to the rapid advancement in the field of information technology. This change has knocked on the door of the entire world, including Algeria, which is one of the countries that has been challenged by these significant changes. In this regard, e-learning has been introduced as an alternative approach to traditional education that would address some of the problems experienced in the traditional approach to learning, such as space constraints, access, and time considerations, to name just a few. Through the use of modern technology, students can attend classes using the internet. Several questions arise: is e-learning the new educational paradigm? Will the educational system be significantly changed by e-learning? What are the conditions that must be satisfied for the effectiveness of e-learning? What challenges and opportunities might result from the introduction of e-learning in the learning process? These are some questions that need to be answered.(Fettahine et al., 2022)[8]

Many higher education institutions in both developed and developing countries realize the importance of e-learning and are striving to tailor their current system to include e-learning as a supplementary approach to the traditional classroom-education concept. In some cases, universities have been equipped with an e-learning system that is sometimes explicitly tailored to the teaching practices adopted. Also, several lectures of different disciplines are offering their course materials online and some have conducted discussions through forums or chat rooms. However, the instructors were not selected based on their ability to teach in an electronic-only setting nor were they trained in the necessary instructional design and pedagogical technology. In addition, the pace of development of information and communication technologies (ICT) has created additional pressures on the educational system, which has been forced to adapt quickly to the new behaviors, expectations, and requirements of the students. Students have become very sensitive to the quality of the service, both in

[5] - Koripi, M. (2020). A review on architectures and needs in advanced wireless-communication technologies. A Journal Of Composition Theory. [HTML]

[6] - **Aslan O. New way of learning : E-learning. First University Journal of Social Science.2006, 16(2).**

[7] - **Georgiev TS, Georgieva E, Smrikarov A, M-learning-A new stage of e-learning. In : International Conference on Computer Systems and technologies.Rousse, Bulgaria, 17-18 June 2004.**

[8] - Fettahine, A., Anteur, A., &Lammamri, H. C. (2022). Examining the New Concept of E-learning and How it has Influenced Traditional Classroom in Algerian University. univ-km.dz

terms of content and form, that is offered to them and rapidly adopt radical changeswhich the new technologies have brought for their perception of time and space.(Guemide&Maouche, 2020)[9]

4- Advantages and Disadvantages of E-Learning

4-1Advantages of E-Learning

E-learning is a commitment, flexible, and not only an effective and efficient source of learning, but it is also related to various advantages and benefits. Some of the advantages that e-learning can offer are as follows:

First of all, it breaks time and geographical barriers and thus offers learners flexibility to choose the most suitable time frame and location for learning - work, home, or while traveling.

Another advantage of e-learning is that it offers only need-based learning, which means it requires learners to go through only the content matter that they have not yet mastered, offering them significant time and resource savings.

E-learning is available 24 hours a day and seven days a week, and its content can be easily updated as per need without spending additional money.

It supports learners with various sense channels of learning models, such as aural and visual learners, by offering a flexible multimedia platform such as documents, pictures, sound, voice, and video clips.

Unlike a traditional learning environment, e-learning models allow learners to learn at their own pace by offering them opportunities to change what they are learning and how fast or slow they would like to go over the subjects that are being learned.

The learning process and the learning performance are both tracked and recorded for later use, and detailed feedback can be offered to the learner about their progress, as well as coming feedback on the learning material, which helps to improve the quality of the learning process and its product. (Kokoç&Altun, 2021)[10]

4.1.1 Flexibility and Convenience

"The ability for students to have control over their time is the functionality that is being highly required nowadays, presented as an advantage, permeating all the other advantages. It is the one that makes e-learning the most used method. Students access Daily Courses despite any subject-interested aspect and not the course availability. Independently of considering the dialogue, for those who have little time available or for those that live far from the center of a city's day, the possibility to access the course material in the way and intensity that they decide over their personal agenda is a great

[9]- Guemide, B. &Maouche, S. (2020). Assessment of online learning in Algerian universities during COVID-19.Learning.iasj.net

[10] - Kokoç, M. &Altun, A. (2021). Effects of learner interaction with learning dashboards on academic performance in an e-learning environment.Behaviour& Information Technology.[HTML]:

advantage. This availability also creates opportunities for updating, exchange and efficient management of specialists' knowledge, with a constant actualization and improvement process. (Giatman et al., 2020)[11]

4.1.2 Cost-Effectiveness

Cost-effectiveness is the bottom line. 'E' preparedness means your business is economizing on costs such as travel, accommodations, and materials associated with off-site programs. It also means you're coming through with 'goods' where the cost of lost productivity on training days is expensive. Providing employees with online learning is affordable and cost-effective as it reduces the costs of training associated with time, resources, travel, accommodation, and study materials. The costs of sound research and professional development are greatly reduced. Costs are limited to course development, instructor/trainer support, training, and equipment.(Sisson & Kwon, 2021)[12]

4.1.3 Access to a Wide Range of Resources

The learning process involves more than just listening to the teacher and doing homework. A good teacher utilizes various educational resources to support students. eLearning offers a wide range of resources that can be tailored to individual needs. These multimodal resources make learning easier for students, including those with difficulties. Providing different resources and allowing teachers to customize the curriculum benefits students and reduces costs. eLearning is more flexible and cost-effective than traditional education.(Clark & Mayer, 2023).[13]

4.1.4 Self-Paced Learning

Self-paced learning allows learners to progress at their own pace, choosing content based on their interest and prior knowledge. It requires meeting learning objectives and active engagement. However, there are drawbacks, such as reduced quality of work and potential for falling behind without proper catch-up methods. Balancing learner involvement is crucial for optimizing the experience.(Yow2022).[14]

4.1.5 Global Reach

Learners are active in e-learning, combining social interaction with technology. Online tutors provide different strategies and solutions that learners enjoy. Collaborative online learning engages and immerses learners, allowing access to course material anytime. Immediate feedback and the comfort of home make online learning preferable for many students. Instructors support personalized learning and rationalize educational roles.(Al et al.2020)[15]

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[11] - Giatman, M., Siswati, S., &Basri, I. Y. (2020). Online learning quality control in the pandemic Covid-19 era in Indonesia.Journal of Nonformal Education. unnes.ac.id

[12] - Sisson, A. D. & Kwon, J. (2021). Effectiveness of E-learning as seen by meeting planners.Journal of Hospitality & Tourism Education.[HTML]

[13] - Clark, R. C. & Mayer, R. E. (2023). E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning. wordpress.com

[14] - Yow, H. Y. (2022). A case study of virtual anatomy museum: Facilitating student engagement and self-paced learning through an interactive platform. International Journal of Information and Education Technology, 12(12), 1345-1353. researchgate.net.

[15] - Al Abri, A., Jamoussi, Y., AlKhanjari, Z., & Kraiem, N. (2020). PerLCol: A framework for personalized e-learning with social collaboration support. International Journal of Computing and Digital Systems, 9(03). uob.edu.bh

4.1.6 Interactive and Engaging Content

Interactive e-learning allows for real-time addressing of questions and queries. It ensures clarity and understanding by working on unclear points. All learning styles are catered for, with connections made to real-world knowledge and context. Engaging media such as video, audio, and interactive graphics enhance learning. The combination of verbal and visual modes optimizes learning yield. Participants can share and discuss situations through voice-and-video conferencing for a more connected experience.(Liu [16]& Yu, 2023).

4-2 Disadvantages of e-learning

The disadvantages can be summarized as follows:

- The absence of traditional classroom structures, which can lead to confusion about course activities and deadlines.
- A sense of isolation from instructors and peers.
- Limited availability of instructors to provide assistance when needed by students.

5- Benefits of e-learning

E-learning at universities is primarily viewed as a tool to enhance the quality and efficiency of the educational process. Furthermore, understanding the functions and unique aspects of e-learning enables the identification of its positive economic impact on the university, the region, and employers. E-learning addresses issues such as the shortage of classrooms and student accommodation in hostels. It enhances the adaptability of educational content, as well as the forms and methods of interaction between lecturers and students. Additionally, it offers the potential to quickly align with the interests of prospective employers.(**Motlhabane jacobus,2018**)[17]

III. Steps of the "DEMATEL" method

1- Definition of the "DEMATEL" method:

It is a vocabulary of seven parts, where it represents (**DEcisionMAking Trial and Evaluation Laboratory**) ,This method aims to identify cause and effect within e-learning requirements, It is based on matrix calculations and graph theory.(**Gazg D,2021**)(**Kumar R,2021**)[{18,19}]

2- Determining the critical factors for the success of e-learning in Algerian universities

The Number	Code	Definition
1	F1	Adapting courses to suit e-learning
2	F2	Modifying traditional curricula and methods in line with e-learning

[16] - Liu, M. & Yu, D. (2023). Towards intelligent E-learning systems.Education and Information Technologies. springer.com

[17] - MotlhabanejacobusMaboe, and others the Experience of students with disabilities at an open distance e- learning institution ,ICEL 2018 13th International Conference on e-Learning, the cape peninsula university of technology cape town, south africa 5-6 july 2018 p 222.

[18] -Gazg D, Mustaqueem OA, Kumar R(2021) Sustainable circular manufacturing in the digital era:analysis of enablers, AdvInd Prod Eng, Lecture Notes in Mechanical Engineering

[19] - Kumar R, Harish K, Bhavish RH(2021) Intelligent technologies adopting and their affects on the performance of Indian manufacturing SMEs in modern era m: an IRP analysis, In 2021 2nd international conference on intelligent engineering and management (ICIEM),p461.

3	**F3**	Modernizing the technological means available to the teaching staff
4	**F4**	Training and qualifying teachers and students according to technological competence
5	**F5**	Intensify the university and institutional partnership in the field of information technology uses

Source: prepared by the researcher

Using the DEMATEL method, we will learn about the most important

factor among the above mentioned factors that explain e-learning.

3- Calculate the Average of the Matrix « Z »

Table No (01):Shows the opinion of the three experts on the factors of e-learning

Expert 01	**The factor**	**F1**	**F2**	**F3**	**F4**	**F5**
	F1	**0**	**1**	**2**	**1**	**2**
	F2	**2**	**0**	**1**	**1**	**1**
	F3	**1**	**2**	**0**	**1**	**1**
	F4	**3**	**1**	**1**	**0**	**3**
	F5	**1**	**1**	**2**	**1**	**0**
Expert 02	**The factor**	**F1**	**F2**	**F3**	**F4**	**F5**
	F1	**0**	**4**	**3**	**1**	**2**
	F2	**3**	**0**	**2**	**3**	**4**
	F3	**2**	**4**	**0**	**2**	**1**
	F4	**4**	**3**	**4**	**0**	**3**
	F5	**2**	**1**	**2**	**1**	**0**
Expert 03	**The factor**	**F1**	**F2**	**F3**	**F4**	**F5**
	F1	**0**	**4**	**3**	**1**	**4**
	F2	**4**	**0**	**3**	**3**	**4**
	F3	**3**	**4**	**0**	**2**	**2**
	F4	**4**	**3**	**4**	**0**	**4**
	F5	**3**	**2**	**2**	**3**	**0**

Source: prepared by the researcher

After collecting the opinions of experts on the evaluation of e-learning factors, It is necessary to find a common opinion of the three experts$\mathbf{x}\sum \mathbf{F}_1^{\mathbf{row}} = \frac{\mathbf{i_{F_{11}}+i_{F_{12}}+\cdots i_{F_{1n}}}}{\mathbf{N_{Fi}}} \sum \mathbf{F}_1^{\mathbf{col}} = \frac{\mathbf{j_{F_{11}}+j_{F_{12}}+\cdots j_{F_{1n}}}}{\mathbf{N_{Fj}}}$

Therefore, the following table shows the matrix "Ḿ" as follows :$\mathbf{X} = \begin{bmatrix} \mathbf{0} & \cdots & \mathbf{x_{n1}} \\ \vdots & \ddots & \vdots \\ \mathbf{x_{1n}} & \cdots & \mathbf{0} \end{bmatrix}$

Table No: (02) shows the "Mode" matrix

		F1	**F2**	**F3**	**F4**	**F5**
	F1	**0**	**4**	**3**	**1**	**2**
	F2	**3**	**0**	**2**	**3**	**4**

Ḿ	F3	2	4	0	2	1
	F4	4	3	4	0	3
	F5	2	1	2	1	0

Source: prepared by the researcher,Based on dematel method

4- Secondly Expert Evaluation

We calculate the sum of each row and the sum of each column

Table No. (03) shows the average matrix of e-learning factors

	F1	F2	F3	F4	F5	the total
F1	0	4	3	1	2	10
F2	3	0	2	3	4	12
F3	2	4	0	2	1	9
F4	4	3	4	0	3	14
F5	2	1	2	1	0	6
the total	11	12	11	7	10	51

Source: prepared by the researcher, Based on dematel method

Through the previous table, we can see that the largest value of the sum of the factor among the “Max row” factors is (14), and the largest value of the sum of the factor among the “Max col” factors is (12).

5- Calculation of the direct relationship matrix

5-1 Calculation of the normalized initial direct relationship matrix

$$\mathbf{m} = \mathbf{min}\left[\frac{\mathbf{1}}{\mathbf{max_j}\sum_{\mathbf{j=1}}^{\mathbf{n}}\mathbf{a_{ij}}}, \frac{\mathbf{1}}{\mathbf{max_i}\sum_{\mathbf{i=1}}^{\mathbf{n}}\mathbf{a_{ij}}}\right], \qquad \mathbf{i,j} = \{\mathbf{1,2,3,\dots.n}\}$$

We get the normal matrix"Normalized matrix "For the five factors of e-learning, the following table shows that:

Table No: (04) shows the natural matrix of e-learning factors

		F	F2	F3	F4	F5
m = $\frac{1}{14}$*Ḿ	F1	0	4/14	3/14	1/14	2/14
	F2	3/14	0	2/14	3/14	4/14
	F3	2/14	4/14	0	2/14	1/14
	F4	4/14	3/14	4/14	0	3/14
	F5	2/14	1/14	2/14	1/14	0

Source: prepared by the researcher, Based on dematel method

5-2 Diagonal matrix calculation

Table No : (05) shows the diagonal matrix

		F1	F2	F3	F4	F5
I	F1	1	0	0	0	0
	F2	0	1	0	0	0
	F3	0	0	1	0	0
	F4	0	0	0	1	0
	F5	0	0	0	0	1

Source: prepared by the researcher, Based on dematel method

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From it, the subtraction process takes place between the diagonal matrix, which is denoted by the symbol "I", and the matrix "m,"

Table No. (06) shows the subtraction between the two matrices I-m

		F1	F2	F3	F4	F5
I-m	F1	1	4/14-	3/14-	1/14-	2/14-
	F2	3/14-	1	2/14-	3/14-	4/14-
	F3	2/14-	4/14-	1	2/14-	1/14-
	F4	4/14-	3/14-	4/14-	1	3/1-
	F5	2/14-	1/14-	2/14-	1/14-	1

Source: prepared by the researcher, Based on dematel method

Next, we calculate the inverse of the matrix "Inverse of(I-m),which is indicated by the symbol : $(I-m)^{-1}$ Through the previous table, the matrix inverse condition is fulfilled, This means that the determinant of the matrix cannot be zero, To calculate the inverse of the matrix, we deal with the calculation of the determinant of this matrix through the following operation:

$$\mathbf{det(A)} = \sum_{\sigma \in S_n} \mathbf{sgn}\,(\sigma) \prod_{i=1}^{n} a_{\sigma(i)}$$

Then search for the algebraic complements of all its elements and then create a new matrix from it, thus moving this inverse of the matrix around the diagonal elements.

The following table shows;

Table 07 shows the inverse matrix)" I-m(Inverse of "

		F1	F2	F3	F4	F5
Inverse I-m	F1	0.515	0.366	0.577	0.682	0.407
	F2	0.675	0.504	0.595	0.512	0.649
	F3	0.453	0.411	0.39	0.667	0.524
	F4	0.686	0.383	0.771	0.786	0.772
	F5	0.236	0.246	0.379	0.357	0.377

Source: Prepared by the researcher based on the dematel method

5-3 Calculate the total relationship matrix (Ť)

$$\check{T} = \mathbf{D(I - D)^{-1}}$$

Table No. (08) shows the comprehensive relationship matrix" Total relation matrix"

		F1	F2	F3	F4	F5
Ť	F1	0	0	0.577	0.682	0
	F2	0.675	0	0.595	0	0.649
	F3	0	0	0	0.667	0.524
	F4	0.686	0	0.771	0.786	0.772
	F5	0	0	0	0	0

Source: Prepared by the researcher based on the dematel method

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It is clear from the results of the previous table that there bold values, These are the higher values of the values threshold values Which is symbolized by the symbol (ã)

$$\tilde{a} = \frac{\sum_{i=1}^{n} t_{ij} \sum_{j=1}^{n} t_{ij}}{N}$$

(N) is the total number of elements in the matrix, After substituting in the process, we obtain a value of ã equal to 0.517.

This value is the limit or threshold at which the interaction matrix of the e-learning operators can be found.

Table No. (09) shows the interaction matrix of e-learning factors according to the threshold value

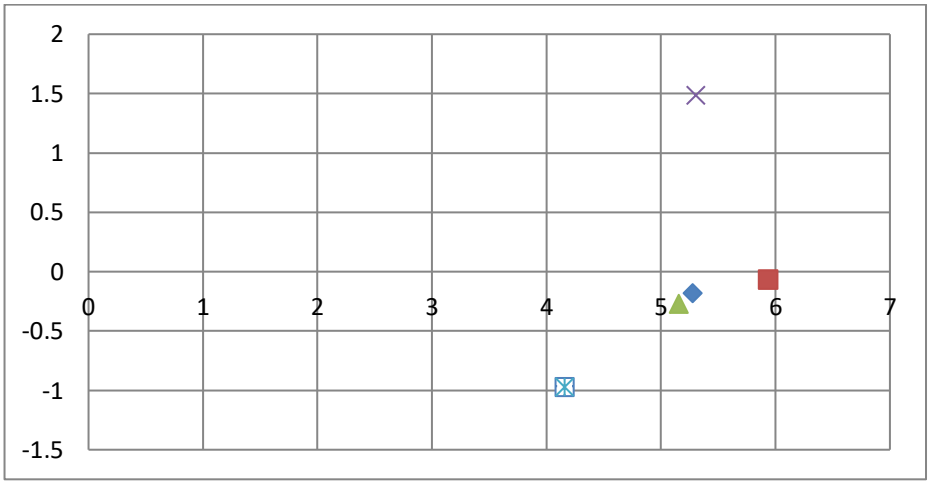
		F1	F2	F3	F4	F5
IM	F1			#	#	
	F2	#		#		#
	F3				#	#
	F4	#		#	#	#
	F5					

Source: Prepared by the researcher based on the dematel method

5-4 The relationship between cause and effect

First: Drawing the direct and indirect relationship (cause and effect) of e-learning factors,Based on the results of the table related to the total relationship matrix, The figure shows"Network relationship map" Which is symbolized by the symbol"NRM"

Figure 01 represents a cause and effect diagram for e-learning factors



Source: Prepared by the researcher based on the dematel method

From the previous figure, it is clear that the “DEMATEL” method is a comprehensive method for constructing and analyzing the relationship between cause and effect of complex factors.

Second: Determine the importance of e-learning factors using **(r + c)**

$$T = [t_{ij}]_{m*m} R = \left[\sum_{j=1}^{m} t_{ij}\right]_{m*1} = [t_i]_{m*1} C = \left[\sum_{i=1}^{m} t_{ij}\right]_{1*m} = [t_j]_{1*m}$$

Table No. (10) shows the importance of e-learning factors

	r_i	C_i	r + c	r – c	(r + c)Rank	*"Cause " "Effect"*
F1	**2.729**	**2.547**	**5.276**	**-0.181**	**3**	**"Effect"**
F2	**3.004**	**2.936**	**5.939**	**-0.068**	**1**	**"Effect"**
F3	**2.711**	**2.445**	**5.156**	**-0.267**	**4**	**"Effect"**
F4	***1.909***	***3.397***	***5.306***	***1.488***	***2***	***"Cause"***
F5	***2.565***	***1.594***	***4.159***	***-0.971***	***5***	***"Effect"***

Source: Prepared by the researcher based on the dematel method

From the previous table, it is clear that the symbol "ri"represents the sum of each rowfrom rows " Total relation matrix" ,

The symbol "Ci" represents the sum of each column of the total relationship matrix**.**

6- Results of the field study and testing of hypotheses

6-1 Presenting and analyzing the results of the study

Based on the cause and effect relationshipCritical factors ranked in order of priority:

- Consider adapting courses to suit e-learning....Most decisive with a value of (5.939).
- Modifying traditional curricula and methods in line with e-learning.....With a value of (5.306)
- Modernizing the technological means available to the teaching staff.....With a value of (5.276)
- Training and qualifying teachers and students according to technological competence..... With a value of (5.156)
- Intensify the university and institutional partnership in the field of information technology uses..... With a value of (4.159)

This analysis clarifies the officials and allows them to make the most appropriate decision regarding paying more attention to the factor that has a strong influence compared to other factors.

E-learning factors can be divided into two groups, the “Cause” group and the “Effect” group.

If the value of (r - c) is positive in this case, the factor is classified in the cause group and affects others directly, The greater the value, the greater the impact it has on others, Where the factor “F4” is classified in the reason group, which has a value of (1.488). If the value of (r - c) is negative in this case, these factors are classified as an influence or impact group. In our current study, “F1,” “F2,” “F5,” and “F3” are factors from the impact group.

The factor “F5” affects all other factors, and its value was (-0.971),Followed by an “F3” factor of (-0.267), Then the “F1” factor has a value of (-0.181), and the “F2” factor has a value of (-0.068), In this case, decision-makers at the Cherif University Center Bouchoucha-Baflou can focus on these factors if they want to achieve the best possible benefit from e-learning.

Based on the relationship between cause and effect

“Adapting courses to suit e-learning” is the most important with the greatest value (5.939), While “intensifying university partnerships" is the least important with an estimated value of (4.159)”

Regarding the order of priority of the critical factors, they are as follows:

- Adapting courses to suit e-learning with a value of **(5.939)**
- Modifying traditional curricula and methods in line with e-learning, with a value of **(5.306)**
- Modernizing the technological means available to the teaching staff, With a value of **(5.276)**
- Training and qualifying teachers and students according to technological competence, with a value of **(5.156)**
- Intensify the university and institutional partnership in the field of information technology uses,with a value of **(4.159)**

E-learning factors can be divided into two groups, the “cause” group and the “effect” group.

If the value of (r - c) is positive in this case, the factor is classified in the cause group, It affects others directly (direct effect), The largest value is the one that has the greatest impact on others, as the factor “F4” is classified in the cause group, which has a value of (1.488).

If the value of (r - c) is negative in this case, these factors are classified as the influence group, In our current study, “F1,” “F2,” “F5,” and “F3” are factors of the influence group.

The "F5" factor affects all other factors, which were its value (-0.971), followed by the “F3” factor with a value of (-0.267), then the “F1” factor with a value of (-0.181), and the “F2” factor with a value of (-0.068).

6-2 Testing Hypotheses

Through hierarchical analysis using the Dematil method, the main hypothesis was proven correct, which states the following" There is a difference in the degree of influence of the critical factors for e-learning from one institution to another"

- Through hierarchical analysis and using the DEMATEL method, The main hypothesis is correct.

Regarding the partial hypotheses, the first hypothesis is correct, which states that the determinants of e-learning are related to all factors combined with each other.

- As for the second hypothesis "E-learning has become a necessity for university institutions,« The theoretical aspect confirmed the validity of this hypothesis.
- The third hypothesis is also verified.

"There is a great interdependence between the factors of e-learning, and it cannot be said that there is one factor more decisive than another"

7- General conclusion

In the end, we can say that education is the only constant in a changing world, E-learning is no longer an option that a university institution may adopt or abandon, but rather it has become a necessary and permanent process for any educational institution.

The changes witnessed by the university environment have led to the necessity of moving towards modern curricula and practices that rely on digital planning and electronic thinking; E-learning management is capable of renewing the energies and capabilities of university institutions to ensure the competitive advantage that it establishes in their future development paths.

7-1The study recommandations

1-Involving employees, students and professors in the e-learning process

2-Building an organizational culture that supports e-learning at the university

3-Providing the administrative and educational staff with the knowledge and information necessary for the success of e-learning

4- Benefiting from technological progress in the e-learning process

5-The necessity of designing distinctive programs and ongoing courses for e-learning

6-Benefiting from the experiences of foreign universities regarding e-learning.

7-It is necessary to review the laws and regulations that hinder the introduction of advanced administrative models and methods used in e-learning.

8-The need to provide the financial and human capabilities necessary for e-learning

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