Investigating the enablers of e-learning adoption from students' perspective: a trump for post-COVID 19 times Case study: High School of commerce, Algeria.

استقصاء العوامل الداعمة لتبني التعليم الإلكتروني من منظور الطلاب: ورقة رابحة لمرحلة ما بعد كوفيد19. دراسة حالة: المدرسة العليا للتجارة، الجزائر.

MAAMIR Safa[1*], AOUETT Sara[2], DERGHOUM Mahfoud[3]
[1]High School of commerce (Algeria), ✉ s_maamir@esc-alger.dz.
[2]High School of commerce (Algeria), ✉ s_aouetta@esc-alger.dz.
[3]High School of commerce (Algeria), ✉ m_derghoum@esc-alger.dz.

A B S T R A C T

The spread of COVID-19 across the globe has interrupted the educational process. Thus, E-learning is becoming more and more necessary and a requisite for schools, universities and educational institutions, which strive to maintain high quality learning and teaching. In order to implement a successful e-learning system, institutions should reveal the enablers and barriers for the e-learning adoption. In light of this requirement, the present study attempts to emphasize through PCA method, the crucial elements that constitute the determinants of e-learning success from the perspective of the students of High School of Commerce, Algeria.

Key words:E-learning, COVID-19, HSC, PCA.
JEL Classification: A20, O33, C42

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[*]Auteur correspondant :Maamir Safa, ✉ s_maamir@esc-alger.dz

الملخص

انتشار كوفيد 19 في جميع انحاء العالم عرقل سير العملية التعليمية . وبالتالي، أصبح التعلم الإلكتروني ضروريًا أكثر فأكثر وشرطًا للمدارس والجامعات والمؤسسات التعليمية، التي تسعى جاهدة للحفاظ على تعليم وتدريس ذو جودة عالية . من أجل تأسيس نظام ناجح للتعلم الإلكتروني، يجب على المؤسسات أن تكشف عن العوامل الداعمة والمعوقات التي تحول دون اعتماد التعلم الإلكتروني . في ضوء هذا الشرط المطلوب، تحاول الدراسة الحالية التأكيد من خلال طريقة PCA،على العناصر الحاسمة التي تشكل محددا ت نجاح التعلم الإلكتروني من منظور طلاب المدرسة العليا للتجارة، الجزائر.

الكلمات المفتاحية :التعليم الإلكتروني،كوفيد 19، م ج ت ،PCA.

تصنيفات JEL: A20،O33، C42.

1.   Introduction

Since World Health Organization declared COVID-19 as a global pandemic, the whole world has changed. In response to social distance rules, people's ultimate goal was to prevent the spread of coronavirus. Many countries have decided to close schools, colleges and universities. Thus, educational institutions began providingmost of their services online, which was unexpected shift in education for instructors and students(Alqahtani & Rajkhan, 2020).

Distance-education, e-education and online learning are used interchangeably to refer to e- learning , which is according to (Kessira & Kechad(2017)an innovation that provides great solutions and which is characterized by its fluidity and flexibility.Welsh, Wanberg, Brown, & Simmering(2003)defined e-learning as the adoption of information technology like internet to supply information. While accordingRadha, Mahalakshmi, Sathish Kumar, & Saravanakumar(2020)the e-learning is a process of knowledge or skills acquisition through study or experience. This innovative way of education has shown a rapid growth and which is proved to be the best learning style in all sectors, and particularly in

education, during the lockdown.The aim of this article is to disclose the crucial elements that constitute the determinants of e-learning success at high school of commerce,Algeria, from the students' perspective. So we will attempt through the present study to answer this question: **What are the crucial factors that we should focus on to enhance the e-learning quality at High school of commerce, Algeria?**

The remainder of this paper is organized as follows:In Section 2 we introduce brieflythe literature review of e-learning and the elements influencing its success .Section 3 then highlights the methodology and the study model. Section 4 and section5 discuss the study results .Finally;Section 6 concludes the paper and defines future research opportunities.

2. Literature Review

In this section, we give a brief synthesis of the important literature considering the e-learning and the factors influencing its success.

2.1. E-learning

E-learning is defined as the adoption of information technology like internet to supply information(Welsh, Wanberg, Brown, & Simmering, 2003).E-learning in higher education becomes inevitable(Ellis, Ginns, & Piggott, 2009), which is adopted to deliver courses in virtual platforms by using different digital tools for e-communication(Derouin, Fritzsche, & Eduardo , 2005). Researches in e-learning in higher education are increasing in number, they discuss the effect of e-learning on instructors, learners and universities(Sharpe & Benfield, 2005). Many studies have emphasized the factors influencing the adoption of e-learning , and they revealed a variety of barriers and enablers of the virtual learning including: institutional infrastructure, staff attitudes and skills and perceived student expectations(King & Boyatt, 2015).Technological readiness of students to adopt e-learning is also one of the crucial elements that may affect the

success of this new way of education (Al-Adwan & Smedley, 2012). A holistic model that includes the factors influencing the e-learning success was developed from the previous studies, which involves seven elements: information quality, service quality, instructor quality, learner quality, support system quality, educational system quality and technical system quality(Al-Fraihat, Joy, & Sinclair, 2020) . In the present study, we will test the influence of two variables of this model, which are **"educational system quality"** and **"instructor quality"** on the e-learning success at High school of commerce.

2.2. Variables and study model

In this section we introduce briefly the variables and the indicators of the study as follows:

2.2.1 Instructor quality

The variable of **"instructor quality"** includes five indicators, through which we measure the effectiveness of the instructors in the e-learning context. More details about each indicator are provided as follows:

a. Instructors' attitude

The instructors' impression about the e-learning has crucial impact on the e-learning success(Mahdizadeh, Biemans, & Mulder, 2008), andamongst the factors that influence the instructor' readiness for the e-learning is the lack of information and communication technology literacy to handle effectively the online teaching style(Cahillane, Smy , & MacLean, 2016).

b. Enthusiasm

The apathy and unwillingness of the instructor to use the e-learning may affect the satisfaction and the motivation of the learners for the e-learning adoption, hence the instructors' enthusiasm determines the success of the remote learning(Sun, Tsai, Finger, Chen, & Yeh, 2008).

c. Responsiveness

The learners' satisfaction of the e-learning usefulness is influenced by the instructors' responsiveness and effectiveness, in other words the timely feedback and the prompt reply to the students' questions by the instructors' may have a positive effect on the students' satisfaction(Thurmond, Wambach, Connors, & Frey, 2002)

d. Subjective norm

The adoption of intrinsic motivation depends on three elements: competence, autonomy and relatedness, which consists of linking the intrinsic motivation of an individual to the motivation of other persons. In the context of e-learning, relatedness means that learners' motivation to use the e-learning depends on the instructors' motivation.(Roca & Gagné, 2008). Hence, The willingness of the instructors to adopt the e-learning influences positively the students' acceptability to use the e-learning , which affect the e-learning success(Sørebø, Halvar, Gulli, & Kristiansen, 2009).

e. Communication

The crucial mission of instructors in e-learning is to ensure effective communication, through the adoption of appropriate communication style to connect between learners and between learners and instructors(Seok, 2008).

2.2.2 Educational system quality

The variable of **"educational system quality"** encompassesfour indicators by which we assess the quality of e-learning system. More details about each indicator are provided as follows:

a. Assessment materials

There is a positive relation between the learners' satisfaction of e-learning and information (content) qualitythat includes different assessment

materials to test the learners' understanding(Ozkan & Koseler, 2009). Verificational feedback is a crucial means that permits the evaluation of the course quality(Handley & Cox, 2007).Hence, institutions should provide assessment materials such as tests and quizzes to evaluate courses content quality to ensure e-learning success(Cidral, Di Felice, Aparicio, & Oliveira, 2018).

b. Diversity of learning styles

Enormous learning styles, are supported by various electronic learning materials in different formats, facilitate the communication between learners and between instructors and learners,including: virtual forum for discussion,which influence the perception of learners on e-learning usefulness(Selim, 2003).

c. Effective communication

Effective communication is an important means in e-learning (Betts, 2009) learners emphasize their satisfaction of the communication provided in e-learning with the other learners and instructors, which is crucial for the virtual program progress (Linardopoulos & Betts, 2011).

d. Interactivity & communication

Interactivity is a key element for e-learning success(Aldin & De Cesare, 2009)) information and communication technologies, and particularly the interactive videos, have a significant impact on the e-learning effectiveness(Zhang, Zhou, Briggs, & Nunamaker Jr, 2006).

e. Internet

One of the determinants of the e-learning success is the quality of internet, which is a requisite for schools, universities and all educational institutions, which adopt this new mode of education (Behaz & Djoudi, 2009)
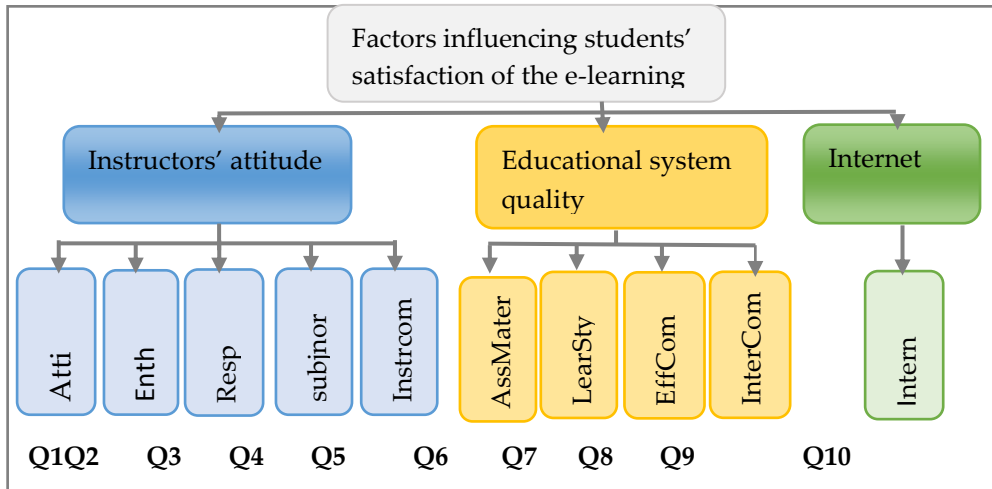
3. Methods

The aim of this study is to reveal the factors that we should focus on to enhance the e-learning system quality at high school of commerce , Algeria, from the students' perspective. Therefore, we conducted a questionnaire with students from high school of commerce, this choice is motivated by many reasons: the availability of the sample units and the adoption of e-learning system during the Covid-19 period at high school of commerce, which allowed us to apply our study. The assessment of students' satisfaction of the e-learning quality permitted the identification of the crucial determinants, which serve to improve the quality of the virtual learning system at this school. We applied the principal component analysis (PCA) which is the appropriate analysis for this kind of researches. Further details will be provided in the next subsections.

3.1. Study model

The present study is based on the model developed byAl-Fraihat, Joy, & Sinclair(2020)who have provided a complete model to evaluate the e-learning system. However,in this paper weshed the light on two variables of this model, which are "**the instructor quality**" and "**educational system quality**"because we attempt to evaluate the quality of the learning and teaching in the e-learning system with our respect to the technical features related to e-learning which will not be treated in the presentstudy. Besides the study of the influence of these two variables, we examine the effect of the internet on the students' satisfaction, which was revealed as a factor that influences the e-learning progress in the research of (Sun, Tsai, Finger, Chen, & Yeh(2008).

Figure 1 represents the study model that includes the variables, the dimensions and the indicators of the study as follows:

Figure 1: Study model

Source: adapted from (Al-Fraihat, Joy, & Sinclair, 2020; Sun, Tsai, Finger, Chen, & Yeh, 2008)

3.2. **PCA method**

Table 1 shows that the conditions of the principal component analysis PCA mentioned by Stafford & Bodson(2006) are met in the present study as follows:

Table 1 : PCA conditions

PCAconditions	The study characteristics	Observations
The number of variables (questions) should be sufficient (five or more variables)**(Stafford & Bodson, 2006, p. 60)**	The number of the variables is ten (see appendix 2).	✔
The form of answers of the questions (Items) should be the same **(Stafford & Bodson, 2006, p. 60)**	Likert scale questions with five points (1: strongly disagree, 2: disagree, 3: Neutral, 4: agree, 5: Strongly agree).	✔

The sample size should be superior or equal to the number of "variables × 10"**(Stafford & Bodson, 2006, p. 60)**	The sample consists of 134 students of high school of commerce.	✔

Source: Elaborated by the authors

4. Results

In the next section, we introduce the outputs of SPSS as follows:

4.1 Statistical test Table 2 shows that the PCA tests are validated in the present study as follows:

Table 2 : PCA tests

PCA tests	PCA tests in the study	Observations
The determinant of the correlation should be low (Stafford & Bodson, 2006, p. 82)	Table3 (see appendix 1) shows that the determinant is equal to (0,057) which means that there is no strong correlation between the variables.	✔
KMO and Bartlett's tests should be validated (Stafford & Bodson, 2006, p. 82)	Table 4 (see appendix 1) shows that the value of KMO is 0,842 which is acceptable because it is close to 1and the value of significance of the test is (0,000) which means that Bartlett's test is validated	✔

Source: Elaborated by the authors

4.2 Respondents profile

Table 5 shows the respondents profile which consists of 134 students from high school of commerce where 67, 2% of them are female and 32, 8% are male. Almost 20% of them are between 17 and 19 old while about 60% are between 20-22 old. Nearly 46% of the respondents are students in preparatory classes while 53% are students in Master degree. The most used e-learning platform by the students is Google meet.

Table 5: Respondents profile

| Items	Frequency	Percentage %
Gender	134	100
Female	90	67,2
Male	44	32,8
Age	134	100
17-19	28	20,9
20-22	81	60,4
23-25	24	17,9
26 or more	1	0,7
Academic grade		
1st year of preparatory	19	14,2
2nd year of preparatory	43	32,1
1st year of Master	31	23,1
2nd year of Master	28	20,9
3rd year of Master	13	9,7
E-learning platform		
Google Meet	9516	70,9
Zoom	211	11,9
Google meet & Zoom	1	15,7
Moodle		0,7
Other		0,7

Source: Elaborated by the authors

4.3 Descriptive analysis

Figure 2represents the descriptive statistics of the study. It shows that 82, 8 % of the respondents are unsatisfied of the internet quality (Intern) in Algeria, while only 2, 9 % are satisfied and the other respondents are neutral. 31, 7 % of the respondents are unsatisfied of the interactivity and communication (InterCom) in the e-learning platform while 42, 5% of them

are satisfied and 26, 1% of the rest of the respondents are neutral. 30, 9% of the respondents think that the communication (EffCom) on the e-learning platform is not effective while 38, 8% of the respondents think that the communication on the e-learning platform is effective and the rest of them are neutral. According to 10, 2% of the respondents ,the e-learning platform does not provide different learning materials (learsty) while 72, 4% of the respondents think that the platform offers various learning materials and the rest are neutral. According to 43, 2% of the respondents the e-learning platform provides different assessment materials (AssMater) while 34, 3 % of them think that the platform lacks of assessment materials and the rest of them are neutral. The findings show that 41% of the respondents are unsatisfied of the instructors' communication (InstrCom) while 36, 5% are satisfied with the instructors' communication and the rest are neutral. 47% of the respondents are not using the e-learning on the instructors' recommendations (SubjNorm) while 29, 1% are using the e-learning on the instructors' recommendations and the rest are neutral. 29, 8% of the respondents are unsatisfied with instructors' responsiveness (Resp) while 41, 1% are satisfied with the instructors' responsiveness and the rest of them are neutral. The findings show that 59% of the respondents think that the instructors are not enthusiastic (Enth) about the e-learning adoption while only 17,9 % of the respondents think that the instructors are enthusiastic about the e-learning adoption and the rest are neutral. According to 28, 3% of the respondents, the instructors do not master the ICT (Atti) while 37, 3% of them think that instructors master the ICT and the rest of the respondents are neutral.

Figure 2: Descriptive analysis
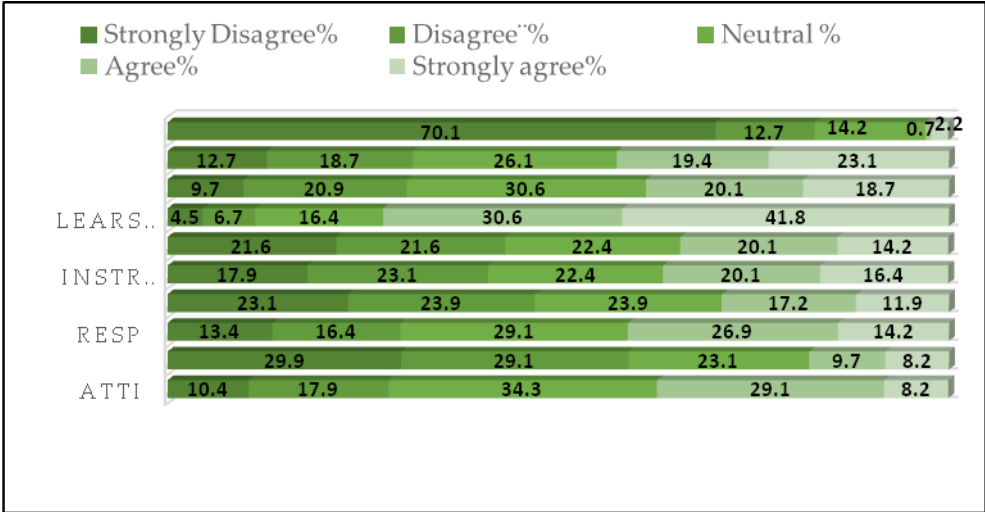
Source: Elaborated by the authors

Table 6 shows the final diagnose of the principal component analysis (PCA) of the students' satisfaction of the e-learning adoption at high school of commerce (HSC) as follows:

- Column 1 represents the components and the variables of the study; the component I **'Instructors' skills & internet'**encompasses the most important variables which constitute the factors that influence the students' satisfaction, which are classified according to their importance: Atti, InstrCom, Resp, Enth, SubjNorm, Intern. While component II **'Technical aspects of the e-learning'** includes the following variables : AssMater, LearSty, InterCom, EffCom.

- Column 2 shows that the coefficients of the components and the variablesare classified according to their importance to the students' satisfaction of the e-learning system.

- Column 3 represents the variance explained by the model; component I represents 39, 09 % of the variance; while component II represents only 12, 62% of the variance and the whole model explains 51, 71 % of the variance , which means that 48,44% still unexplained, in other words we should add other variables to explain the satisfaction of the students .

The analysis of the (PCA) reveals that the students' satisfaction depends on the following aspects: instructors' attitude, Enthusiasm, Responsiveness, Subjective Norm, and Internet. We notice also that component II is less important for the students' satisfaction of the e-learning. We conclude that the component II includes the crucial factors that influence the students' satisfaction but they do not determine their satisfaction.

Table 6: The main components analysis of the satisfaction of students bythe Varimax rotation method

Components and variables	Coefficients	Variance	%
		Real	Internal
Compenent I : instructors' skills & internet		39,09	75,59
Atti	0,751		
InstrCom	0,704		
Resp	0,666		
Enth	0,615		
SubjNorm	0,608		
Intern	0,562		
Compenet II:Technical aspects of the e-learning		12,62	24,4
AssMater	0,671		
LearSty	0,665		
InterCom	0,595		
EffCom	0,592		
Total		51,71	100

Source: Elaborated by the author using the outputs of SPSS

5. Discussion

The results of the PCA show that the instructors' skills are the most important factors that determine the students' satisfaction of the e-learning , hence the high school of commerce,Algeria, should focus on and invest efforts and time to improve the ICT competencies of the instructors . Since the ICT, skills are indispensable in e-learning for the staff members and teachers, these competencies should be included in the e-learning training programs for the staff members(Williams, 2003).The e-learning success depends on the communication skills of the instructor, because one of the problems of this mode of learning is that it causes the remoteness of the learner from the academia atmosphere. (Arkorful & Abaidoo, 2015).The findings of the study show that 41% of the students who participated in our study are not satisfied of the instructors' communication skills. Therefore, instructors should use communicational tools (e-mail and discussion forums…etc), oral and non-oral actions that decrease remoteness and distance between learners and instructors(Valacich & George, 2017).Instructors should provide timely and properly feedback. The descriptive statistics showed that 59% of the students think that the instructors are not enthusiastic about the e-learning adoption , so the instructors should also show more enthusiasm for the e-learning adoption , which will affect positively the willingness and motivate the students to adopt e-leaning(Sun, Tsai, Finger, Chen, & Yeh, 2008).47% of the participants in the survey are not using the e-learning on the instructors' recommendation, and since the students are influenced by the recommendation of the instructors to use the virtual learning (Roca & Gagné, 2008),instructors should motivate their students to adopt the e-learning in order to increase their acceptance to use this new method of education. Furthermore, the teachers should play the role of facilitator of communication between them and the students, and among students ,and

encourage students to participate in discussions to create interactive environment(Valacich & George, 2017).The information technology and particularly the quality of the internet is pivotal factor that influences and determines the e-learning success(Parsazadeh, Zainuddin, Ali, & Hematian , 2013)hence, it is vital to enhance the internet quality in the country to improve the e-learning usefulness.

6. Conclusion

The e-learning method of education has shown its effectiveness during the covid-19 which has been adopted by all the countries to replace the face-to-face education, therefore many decision makers have shown their enthusiasm to continue adopting the e-leaning besides the traditional learning even inPost-Covid-19 times . In light of this announcement, the present study attempts to highlight the critical factors that influence the effectiveness of the e-learning at high school of commerce, Algeria.

The principal component analysis has shown that instructors' Attitude towards the use of ICT , the instructors' enthusiasm for the e-learning adoption, Instructors' responsiveness to the students' inquiry , The subjective norm , the communication skills of the instructors and the internet quality are the crucial factors that we should focus on and improve in order to enhance the e-learning system quality at High school of commerce, Algeria .

This study was carried out at the High school of commerce, Algeria, in order to know more about the factors influencing e-learning success from the students' perspective. For the future studies, we suggest the application of this study to the other universities in Algeria and study the phenomenon from the perspective of all the stakeholders of higher education system to get a complete understanding of the elements that constitute the determinants of e-learning success in Algeria.

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8. Appendixes

8.1 Appendix 1 : SPSS outputs

Table 1:correlation matrix

		Atti	Enth	Resp	Subj Norm	Instr Com	Ass Mater	Lear Sty	EffC om	Inter Com	Inter n
Corrélation	Atti	1,000	,328	,324	,261	,381	-,123	,061	,217	,199	,260
	Enth	,328	1,000	,417	,514	,397	,194	,334	,455	,384	,342
	Resp	,324	,417	1,000	,422	,486	,061	,336	,507	,362	,274
	Subj Norm	,261	,514	,422	1,000	,489	,208	,327	,414	,326	,360
	InstrC om	,381	,397	,486	,489	1,000	,110	,208	,413	,405	,261
	AssM ater	-,123	,194	,061	,208	,110	1,000	,166	,183	,178	,093
	LearS ty	,061	,334	,336	,327	,208	,166	1,000	,451	,388	,123
	EffCo m	,217	,455	,507	,414	,413	,183	,451	1,000	,602	,362
	Inter Com	,199	,384	,362	,326	,405	,178	,388	,602	1,000	,133
	Intern	,260	,342	,274	,360	,261	,093	,123	,362	,133	1,000
Signification (unilatéral)	Atti		,000	,000	,001	,000	,078	,241	,006	,011	,001
	Enth	,000		,000	,000	,000	,012	,000	,000	,000	,000
	Resp	,000	,000		,000	,000	,242	,000	,000	,000	,001
	Subj Norm	,001	,000	,000		,000	,008	,000	,000	,000	,000

InstrCom	,000	,000	,000	,000		,103	,008	,000	,000	,001
AssMater	,078	,012	,242	,008	,103		,027	,017	,020	,142
LearSty	,241	,000	,000	,000	,008	,027		,000	,000	,078
EffCom	,006	,000	,000	,000	,000	,017	,000		,000	,000
InterCom	,011	,000	,000	,000	,000	,020	,000	,000		,062
Intern	,001	,000	,001	,000	,001	,142	078	,000	,062	

a.   Déterminant = ,057,

Table 3:KMO and Bartlett's test

Indice de Kaiser-Meyer-Olkin pour la mesure de la qualité d'échantillonnage.		,842
Test de sphéricité de Bartlett	Khi-deux approx.	370,102
	ddl	45
	Signification	,000

Table 7 : Communalities

	Initiales	Extraction
Atti	1,000	,642
Enth	1,000	,525
Resp	1,000	,524
SubjNorm	1,000	,515
InstrCom	1,000	,536
AssMater	1,000	,470
LearSty	1,000	,489
EffCom	1000	,636
InterCom	1000	,515
Intern	1000	,320

Figure 4 : Scree Plot
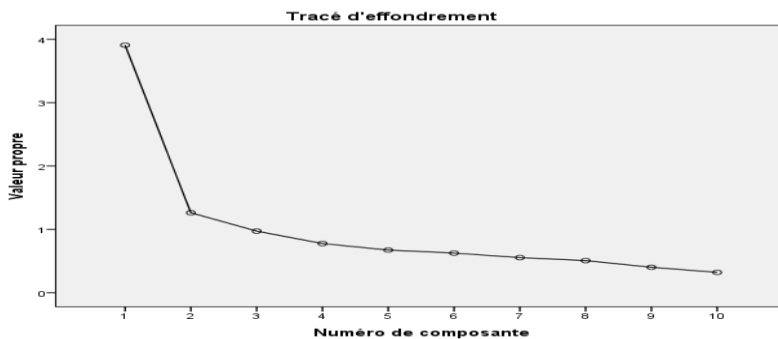
Table09 : Component transformation matrix

Composante	1	2
1	,828	,560
2	-,560	,828

Méthode d'extraction : Analyse en composantes principales.
Méthode de rotation : Varimax avec normalisation Kaiser.

Table 10 : Component Matrix [a]

	Composante	
	1	2
EffCom	,774	,191
Enth	,724	-,026
SubjNorm	,717	-,026
Resp	,710	-,139
InstrCom	,696	-,228
InterCom	,666	,268
LearSty	,550	,431
Intern	,503	-,258
Atti	,465	-,652
AssMater	,258	,635

Méthode d'extraction : Analyse en composantes principales.

a. 2 composantes extraites.

Méthode d'extraction : Analyse en composantes principales.

Méthode de rotation : Varimax avec normalisation Kaiser.

Table 11 : Patern Matrix

	Composante	
	1	2
Atti	,751	-,279
InstrCom	,704	,201
Resp	,666	,283
Enth	,615	,384
SubjNorm	,608	,381
Intern	,562	,068
AssMater	-,142	,671
LearSty	,214	,665
InterCom	,401	,595
EffCom	,534	,592

Figure 5 : Plot of components in space after rotation

8.2Appendix 2 : Questionnaire

	As a part of scientific study on the e-learning at High school of commerce-Algeria- we kindly ask you to fill in the following questionnaire. (answers are provieded in likert scale : 1:strongly disagree, 2:agree , 3: neutral, 4: Agree, 5:Strongly agree)	
Q1	Teachers master the e-learning system and ICT(computer literacy, internet …etc.)
Q2	Compared to face-to-face learning, teachers show enthusiasm about using e-learning system and ICT.
Q3	Teachers answer propyl and timely your questions on the e-learning platform.
Q4	My willingness to use the e-learning platform is motivated by teachers' recommendation
Q5	The teachers facilitate the communication with students and among students
Q6	E-learning system provides an appropriate self-assessment materials (quizzes , qcm and tests) to test your lecture understanding
Q7	There are different learning styles (Pdf files, videos, webinars, visio call …etc.) on the e-learning platform
Q8	The effective communication on e-learning helped us to understand better the lectures
Q9	E-learning platform provides tools (chat,visual discussion …etc.) For communication and interactivity (discussion between students and between students and teachers)
Q10	I feel satisfied with the internet speed