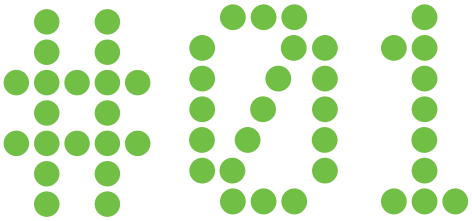

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E-LEARNING, E-SKILLS AND EMPLOYABILITY: FIRST EVIDENCE IN EUROPEAN COUNTRIES

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E-learning, e-skills and employability: first evidence in European countries

ABSTRACT

The main objective of this article is to make clear that there is a set of e-skills developed through e-learning that is broadly applicable to the employability of European workers. More specifically, it appears that the great development of certain e-skills – handling online content, flexibility, organization, etc. – thanks to online learning is one of the most useful factors in the professional development of students through the transition to a new job with the same or greater security than the job they held the previous year. To carry out the study, different official European statistics databases related to employment, e-skills and the usage of e-learning systems have been analysed, finding relationships that establish links between e-learning and the professional improvement of employees.

KEYWORDS

e-learning, e-skills, employability, workers, Europe.

INTRODUCTION

In Europe, lifelong learning is one of the most important activities in all States, as the importance and need for the employability of citizens is widely recognised (Badescu & Loi, 2010), even more so in an economic and social context which, in recent years, has been more than uncertain. European countries therefore face different challenges in relation to having to improve the training and qualifications of their citizens.

In this sense, for example, different situations in terms of levels of completion of compulsory secondary education can be observed in European countries. also In addition, it is detected that adult participation in actions relating to lifelong learning is very variable (Boateng, 2009) and clearly unsatisfactory in most European countries. While in 2004, 9.1% of people aged between 25 and 64 were involved in lifelong learning, it is notable that this figure has risen only minimally a decade later, as in 2013 this was true for only 10.5% of this population.

In this respect, certain countries in South-East Europe present barriers to the participation of adults in lifelong learning due to cultural, structural and socio-economic characteristics (Zarifis, 2012) and great differences between the few socio-demographic barriers for lifelong learning in the countries of Northern Europe and major barriers in Southern and Eastern Europe can clearly be seen (Róbert, Sagi & Balogh, 2011).

In this context, some countries offer education based on open and distance learning (Kocanova, Paolini & Borodankova, 2011) that is clearly related to e-learning methodologies, allowing the development of e-skills aligned with the e-Skills for the 21st Century Initiative provided in 2007 by the European Commission, the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions (European Commission, 2007).

These e-skills existing in people, which were assessed as insufficient in 2010 (Husing & Korte, 2010) and are acquired by students in e-learning systems, must match those demanded by the labour market of the 21st century (Levy, 2010) in order to set as factors that cause the desire to acquire these skills by workers (Desjardins & Rubenson, 2011) and thanks to lifelong learning systems.

Given this situation, it is necessary to study whether there is any relationship between the development of these e-skills, so necessary for the development of employment (Pouliakas, 2013), through e-learning systems.

HYPOTHESIS AND METHODOLOGY

Currently, and according to data published by Eurostat, the European population has a high level of e-skills in the use of Internet. For example, using data from 2013, 67% of the total European population had sent or received emails, 59% had sought information on goods and services by Internet, 42% had used e-banking and 38% had purchased online in the 3 months prior to the period of conducting the survey.

In this respect, it is notable that the development of e-skills can help people prepare better for involvement in lifelong learning (Loureiro, Messias & Barbas, 2012). At the same time, it is understood that the application of methodologies based on e-learning helps with the development information skills that are valid in the information society Europe is immersed in (Van de Vord, 2010; Jun & Pow, 2011).

Given all the above, two research questions can be defined, with their corresponding working hypothesis, to be checked later with the corresponding data analysis on different indicators obtained from Eurostat for 28 European countries:

- **Q1:** Is the variable e-learning important for providing a simplified representation of different variables related to employment, educational level and e-skills for 2007 and 2013?
- **H1:** E-learning is just as important for international comparisons as other indicators related to employment, education and e-skills.

- **Q2:** Compared with other variables related to education and e-skills, does e-learning help to obtain a better approximation of

Table 1. Indicators of Eurostat related to employment, education and e-skills selected and used

FIELD	FACTOR	INDICATOR
Employment	Employment	Employment
	Working	Transition from unemployed person to employed person
	Security	Transition to the same or higher employment security as previous year
	E-search	Internet use: job search or sending an application
Education	Tertiary	Tertiary educational attainment
	Lifelong Learning	Participation rate in education and training (last 4 weeks)
	E-learning	Individuals who have used the Internet for e-learning: ▪ Individuals who have used the Internet in the last 3 months for doing an online course (of any subject) ▪ Individuals who have used the Internet in the last 3 months for looking for information about education, training or course offers
E-skills	E-skills	E-skills: ▪ Internet use: sending/receiving e-mails ▪ Internet use: finding information about goods and services ▪ Internet use: seeking health information ▪ Internet use: travel and accommodation services ▪ Internet use: Internet banking ▪ Last online purchase: in the last 3 months ▪ Internet use: selling goods or services ▪ Internet use: telephoning or video calls ▪ Internet use: playing/downloading games, images, films or music ▪ Internet use: downloading software ▪ Internet use: reading/downloading online newspapers/news ▪ Internet use: listening to web radio and/or watching web TV ▪ Internet use: obtaining information from public authorities web sites (last 12 months) ▪ Internet use: downloading official forms (last 12 months) ▪ Internet use: sending filled-in forms (last 12 months) ▪ Internet use: interaction with public authorities (last 12 months) ▪ Internet use: uploading self-created content to any website to be shared
	Media Literacy	General Media Literacy Assessment

the function of the employment security in Germany, a country with a good performance during the economic crisis suffered at European level over the period 2007-2013?

- **H2.** There is a positive linear relationship between employment, education, e-learning and e-skills in European countries.

To carry out the analysis of the relationships between employment, education and e-skills factors, two statistical techniques are used. Firstly, a principal component analysis (PCA), for finding relationships between employment, education and e-skills, and, secondly, a linear regression analysis between employment security and tertiary educational level, on one hand, and e-learning, e-skills and media literacy levels, on the other.

Along these lines, the following indicators are used for analysing the period 2007-2013 (table 1):

The set of 28 European countries taken into account is as follows: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom.

RESULTS

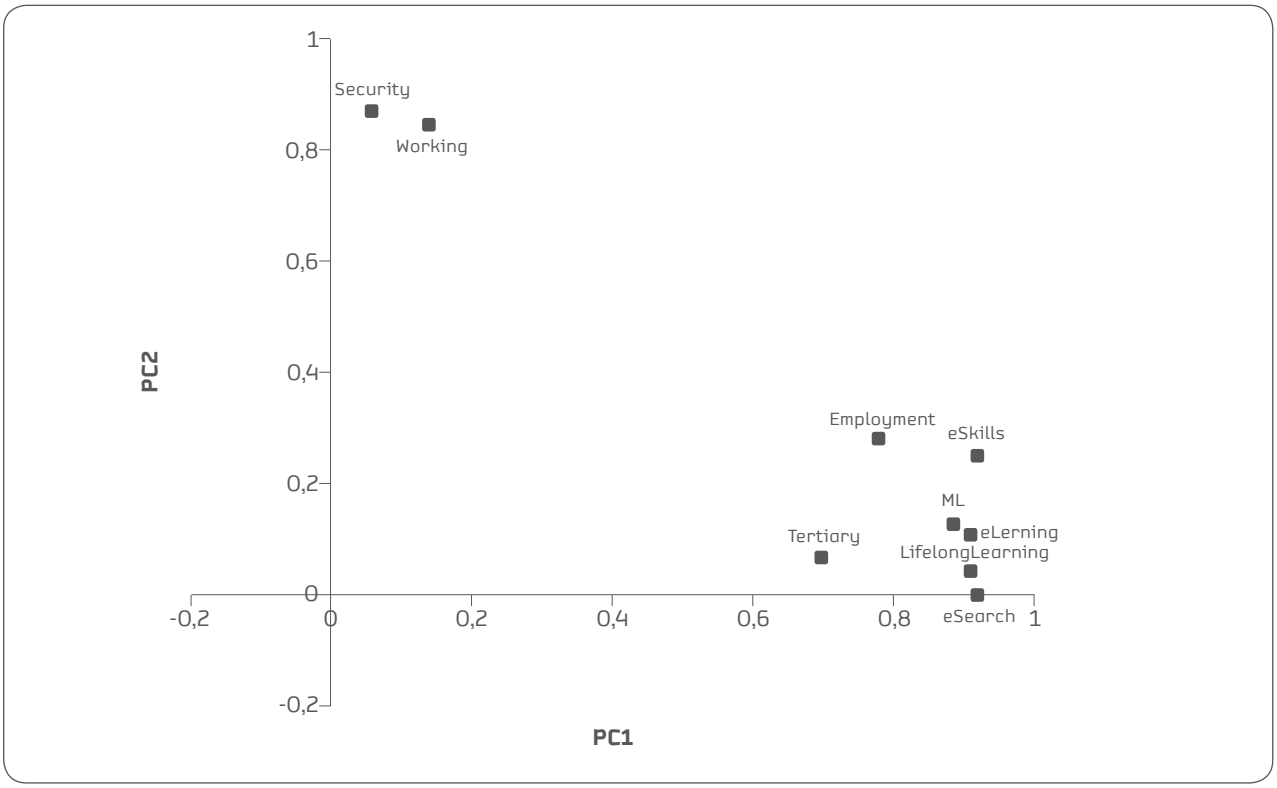
To answer Q1, statistical data from Eurostat is analysed using a principal component analysis (PCA) performed on all variables in Table 1 for the 28 countries considered and taken into account both year 2007 and 2013. Thus, an x-y plane is obtained with the following weights for the two principal components found (table 2):

As can be seen in the charts below, two sets of variables are clearly distinguishable in 2007: firstly, and associated with the horizontal axis, the set of variables related to education and e-skills; and secondly, and on the vertical axis, two variables in the employment, security and working fields. Thus, it is detected that e-learning behaves similarly to the e-skills factor (figure 1).

Table 2. Weight of factors after principal component analysis (PCA)

FACTOR	2007		2013	
	PC1	PC2	PC1	PC2
Employment	0.78	0.28	0.64	0.61
Tertiary	0.70	0.07	0.67	0.11
Working	0.14	0.85	0.36	0.68
Security	0.06	0.87	-0.09	0.87
E-search	0.92	0.00	0.91	0.11
Lifelong Learning	0.91	0.04	0.85	0.34
E-learning	0.91	0.11	0.85	-0.10
E-skills	0.92	0.25	0.90	0.36
Media literacy	0.89	0.13	0.79	0.34

Figure 1. Principal Component Analysis (PCA) axes. 2007



Regarding the situation for 2013, more variation is observed in the weight of the factors obtained by Principal Component Analysis (PCA). On one hand, the employment and working factors move away from their positions in 2007, approaching one other. A similar situation exists for the e-learning factor. On the other hand, other variables undergo few changes and their weight values remain nearer to those mentioned above (figure 2).

If an analysis is carried out by countries, according to the two PCA axes obtained for 2007, wide variation is observed, although the situation in the countries of Northern Europe, which always have values on the horizontal axis, is clear. It is very interesting to see that Germany and the UK are close together (figure 3).

Regarding the coordinates of the countries on the PCA axes for 2013, it is found that the countries of Northern Europe maintain their positive values for the PCA horizontal axis, and that Germany and the UK have very different values to those previously analysed, as do Greece, Latvia and Spain (figure 4).

With all this, and taking into account the coordinates of the e-learning factor on the PCA axes, it can be stated that the e-learning factor is very useful to reduce the size of the dimensions needed to study countries. Specifically, thanks to the e-learning and security factors, the position of a country can be represented in a simplified way, reducing the original number of nine variables related to employment, education and e-skills.Regarding Q2, this can be analysed taking into account the following data analysis performed with linear regression in Germany, and for the period 2007-2013 (table 3).

As can be detected, the best approach is Model V (R^2 is the greatest, and its p-value is also

Figure 2. Principal Component Analysis (PCA) axes. 2013

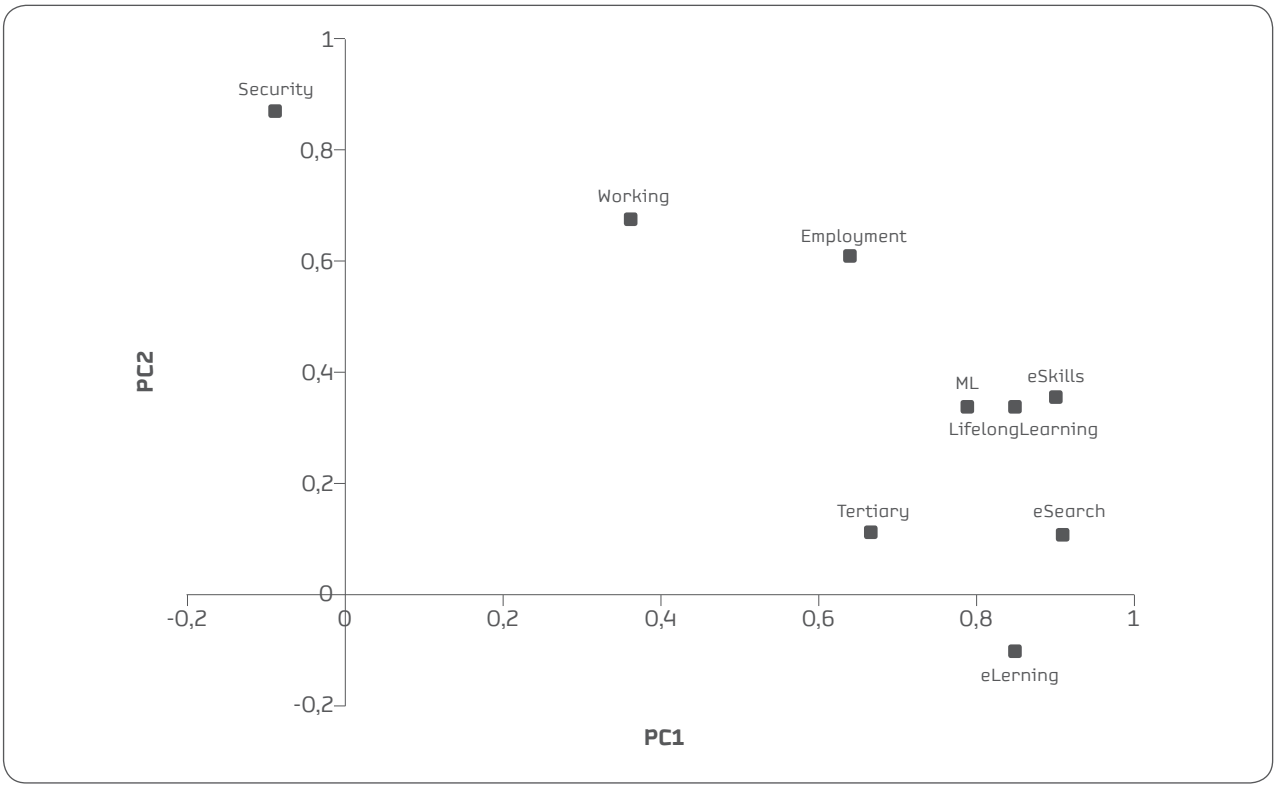


Figure 3. Countries and PCA coordinates, 2007

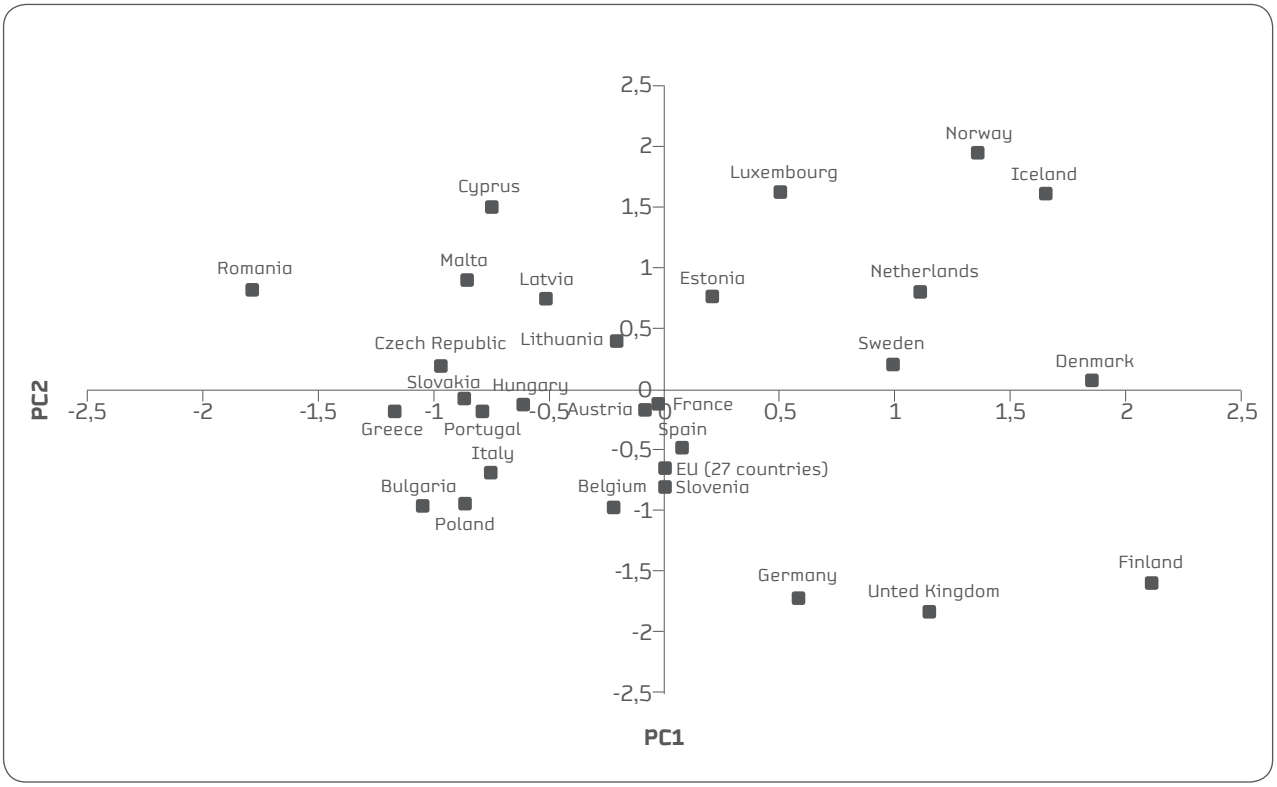
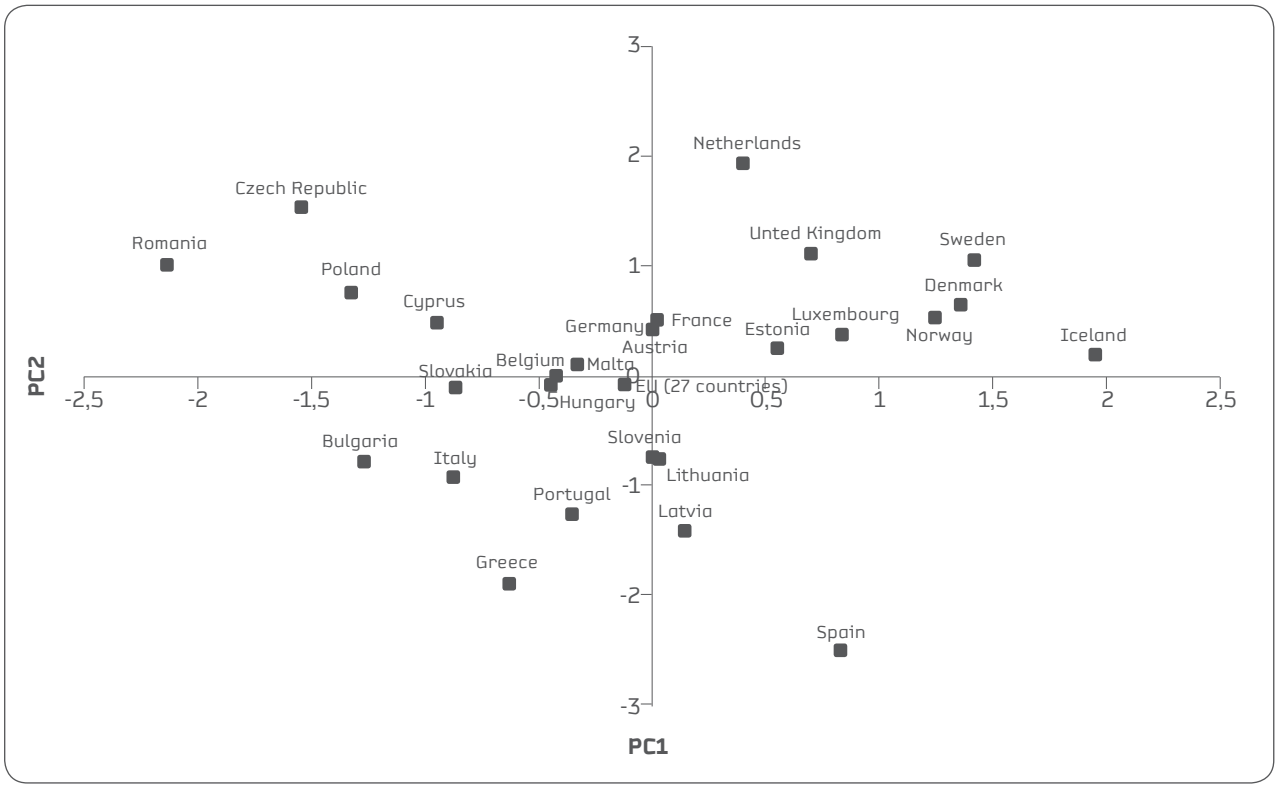


Figure 4. Countries and PCA coordinates, 2013



the lowest), based on e-learning. Thus, it is observed that the level of existing e-learning is a very good indicator which greatly simplifies the process for estimating job security in Germany.

CONCLUSION AND IMPLICATIONS FOR E-LEARNING

The research was begun with a view to discerning whether there is a relationship between the e-learning and employment and education and e-skills factors in Europe. Data analysis has helped to prove that e-learning can be one of the most valid factors for helping simplify the number of dimensions for studying the employment, education and e-skills situation in 28 countries and for the period 2007-2013. Furthermore, it has been observed that the level of e-learning can become one of the two axes for representing the factors in the countries studied on the coordinates axes.

We have also analysed the possibility of establishing a formula based on the e-learning factor to estimate job security in Germany, a country which, unlike the majority of Europe, has maintained good economic results during the period of economic crisis between 2007 and 2013. Thus, the importance of e-learning in aspects related to professional development and employability has been demonstrated.

Table 3. Linear regression analysis in Germany, 2007-2013

VARIABLE	COEFFICIENT	STD. ERROR	T VALUE	PR(>|T|)	R^2	F-STATISTIC	P-VALUE
Model I	$Y_{Security} = \beta_0 + \beta_{Tertiary} X_{Tertiary} + \beta_{e\text{-}Learning} X_{e\text{-}Learning} + \beta_{e\text{-}Skills} X_{e\text{-}Skills} + \beta_{ML} X_{ML} + \varepsilon$						
B_0	63.56297	5.01111	12.68400	0.00616*	98.01%	24.64	0.03939
$B_{Tertiary}$	0.59299	0.38010	1.56000	0.25910			
$B_{e\text{-}Learning}$	0.11978	0.14000	0.88000	0.47165			
$B_{e\text{-}Skills}$	-0.08968	0.16983	-0.52800	0.65000	Adjusted R^2 = 94.04%		
B_{ML}	0.10511	0.13764	0.76400	0.52484			
Model II	$Y_{Security} = \beta_0 + \beta_{Tertiary} X_{Tertiary} + \beta_{e\text{-}Skills} X_{e\text{-}Skills} + \beta_{ML} X_{ML} + \varepsilon$						
B_0	62.10371	4.54763	13.65600	0.000849***	97.24%	35.24	0.007720
$B_{Tertiary}$	0.60108	0.36543	1.64500	0.19854			
$B_{e\text{-}Skills}$	-0.02593	0.14772	-0.17600	0.87183			
B_{ML}	0.11626	0.13180	0.88200	0.44269	Adjusted R^2 = 94.48%		
Model III	$Y_{Security} = \beta_0 + \beta_{Tertiary} X_{Tertiary} + \beta_{e\text{-}Skills} X_{e\text{-}Skills} + \varepsilon$						
B_0	64.17065	3.78778	16.94100	0.0000712***	96.53%	55.55	0.001208
$B_{Tertiary}$	0.77262	0.30068	2.57000	0.062.			
$B_{e\text{-}Skills}$	-0.01812	0.14331	-0.12600	0.90500	Adjusted R^2 = 94.79%		
Model IV	$Y_{Security} = \beta_0 + \beta_{Tertiary} X_{Tertiary} + \beta_{e\text{-}Learning} X_{e\text{-}Learning} + \beta_{e\text{-}Skills} X_{e\text{-}Skills} + \varepsilon$						
B_0	65.53243	3.98697	16.43700	0.00049***	97.43%	37.92	0.006937
$B_{Tertiary}$	0.74612	0.29964	2.49000	0.08848.			
$B_{e\text{-}Learning}$	0.12934	0.12576	1.02900	0.37938			
$B_{e\text{-}Skills}$	-0.08777	0.15758	-0.55700	0.61639	Adjusted R^2 = 94.86%		
Model V	$Y_{Security} = \beta_0 + \beta_{Tertiary} X_{Tertiary} + \beta_{e\text{-}Learning} X_{e\text{-}Learning} + \varepsilon$						
B_0	66.79248	2.98656	22.36400	0.0000237***	97.17%	68.55	0.0008036
$B_{Tertiary}$	0.60625	0.14871	4.07700	0.0151*			
$B_{e\text{-}Learning}$	0.09924	0.10330	0.96100	0.39110	Adjusted R^2 = 95.75%		
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' '							

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