

## Numerical-Technological Skills and Work Experience in the Perceived Usefulness in an Accounting Virtual Learning Environment

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### ABSTRACT

The purpose of this study was to analyse the perceived usefulness of a set of Information and Communication Technologies (ICT) applied in a virtual learning environment (VLE) in a distance education model. We analysed whether the numerical and technological preferences of the students could explain the perceived usefulness related to the ICT applied to teaching. We also tested whether the work experience of the students can modify the perceived usefulness. Diverse ICT were applied to the teaching of accounting in undergraduate courses, in a distance education model in the European Higher Education Area (EHEA). The research had an experimentation phase to implement the ICT teaching tools, one of data collection and another for the data analysis. The perceived usefulness of the ICT was measured through a questionnaire with evaluation using a Likert scale. The evaluations given by the students allowed modelling each ICT according to the variables of numerical and technological skills, including work experience as a dichotomous variable. The results of this research suggest that the perceived usefulness of the ICT is, in part, explained by numerical and technological skills. Furthermore, there are indications that work experience can diminish the perceived usefulness for a set of teaching ICT.

**Keywords:** EHEA, ICT, Numerical and technological preferences, Virtual Learning Environment (VLE), Accounting Teaching, Distance Teaching, Distance Education Model.

### INTRODUCTION

The educational innovation applied to the teaching has been studied in recent decades at the theoretical and empirical level (Salinas, 2004). The university academic world has joined the educational technological development to achieve greater efficiency in the learning processes (Salmon, 2005). This supposes the assumption of a new model based on self-learning and on the student's involvement (Arvaja et al. 2007). Models that involve students lead to self-learning and to better levels of knowledge (Magin, 2001; Bushell, 2006). It can be said that the ICT in education have been the catalyser of this process. Traditional teaching-learning model has been leaved in order to another based on different teaching resources in a virtual environment (Smith, 2012; Arquero-Montañó & Romero-Frías, 2013).

In 1996 Wilson anticipated that virtual learning environments (VLE) are environments based on computers with relatively open systems that allow interaction and meeting with other participants. It does not deal with individual computerised learning environments, but instead it is framed as learning within a group. Currently these environments are not conceived as a website of education, virtual technology or a virtual campus, but rather it is a symbiosis of all these elements, in which the student is the principal actor in the learning process (Dillenbourg, Schneider, & Synteta, P., 2002). At present the virtual environment is a usual part of the teaching-learning process (Pituch & Lee, 2006) and it combines tools, resources, contents, educational assistance and discussions, in a space without time or space limitations, but the acceptance by student is a critical factor for its success (Martins & Kellermanns, 2004).

Learning environment in which the technology is applied can improve the students' performance (Wetzel et al. 1994; Maki et al. 2000). Prior studies have shown that the use of VLE combined with face to face education has a positive effect on academic performance (Stonebraker & Hazeltine, 2004; Lim & Morris, 2009). Furthermore, it has been shown that the students' performance in VLE is higher than that of their colleagues in traditional

environments (Chou & Liu, 2005). In these environments there is a function of educational production that links the educational methodology, the material resources and the individual characteristics of the students with the training achievements reached by them (Gandía & Montagud, 2011). The question is, what is it that makes a VLE successful?

In the framework of research on the acceptance of educative technologies, the perceived usefulness has been established as an important factor for the success of the VLE, analysing, therefore, the technological support (Selim, 2003). This analysis is based on the study of the perceptions of the students and their measurement (Ma & Liu, 2004; Schepers & Wetzels, 2006). Other factors of the success of the environment are the social characteristics of the students, which can affect the perceived usefulness of the learning (Sun & Zhang, 2006). In distance education, the social characteristics are more marked than in the face to face education and the teaching is usually carried out in virtual environments (García, 2012; Gooley & Lockwood, 2012), through visual tools (Leton et al., 2009; 2011) combined with ICT (O'Malley & McCraw, 1999).

A typical characteristic of the students in a distance education model is that they are employed. This has been studied in the area of management qualities and skills (Simpson, 2013). It is well known that the students who combine studies with other obligations drop out of their studies earlier due to the disconnection of the training process (Yorke & Longden, 2008). This makes the use of ICT in distance education models be especially useful (Paniagua et al., 2014). In this regard, the VLE can eliminate the geographical barriers in the learning process (Hackbarth 1996; Massy & Zemsky, 1995), promoting interest, creativity and motivation of the students (Amar, 2006). This process is mediated by the professor, who has to give it cohesion (Huertas & Pantoja, 2016).

Specifically, in accounting learning, VLE results in a better academic performance (Montagud & Gandía, 2014) and the students perceive a high usefulness in the improvement of comprehension (López Pérez, Pérez López & Rodríguez Ariza, 2013). Also in distance education models a relationship has been found between the performance and the perceived usefulness of the ICT in accounting (Herrador-Alcaide & Hernández-Solis, 2016). The activities of a VLE in distance education are assessed as useful by the students as it permits linking objectives with contents (Del Campo & Esteban, 2011). In the relationship between the success of a VLE and the perceived usefulness by the student, some personal and social variables that could affect the perceived usefulness of the learning are not considered. In this respect, the numerical and technological skills are analysed in this paper.

Diverse factors have been studied that can affect the university performance in accounting (Koh & Koh, 1999; Crawford, Dale & Toney-McLin, 2003; Clinton & Kohlmeyer, 2005; Byrne & Flood, 2008). In the area of higher education in accounting, it is considered that the lack of numerical skills can subsequently affect other disciplines such as finance and management (Burgess, 2007; Curland & Lyn Fawcett, 2001), which can condition the success of the learning (Nelson & Dopson, 2001). The financial skills are studied as essential skills for life (Bernheim et al., 2001; Hoff, 1999). They are considered necessary skills in any individual for their interaction in the current society and daily decision making (Gross, 2005; Lusardi & Tufano, 2009; Willis, 2008). In addition, they are skills required by employers (Cappelli et al., 1997) and financial management processes are required within higher education (Hoff, 1999). Therefore, in this research, it was analysed if the numerical skills in the framework of financial economics may affect the perceived usefulness of the ICT-accounting in a VLE.

In the area of accounting the introduction of technology based on the Internet (IT technology) is also considered necessary, since the companies require the accounting professionals have skills related to virtual environments (Arrufat et al., 2010; Moreira, 2010; Muñoz, 2003). The debate on the possible benefits associated with the introduction of IT in accounting education does not yet have conclusive results related to findings of a positive effect (Fetters et al., 1986, Abdolmohammadi et al., 1998) and others related to a negative effect (Dickens & Harper, 1986; Togo & McNamee, 1997). In studies on the effectiveness of learning in virtual environments, the capacity of the student in handling computers has been analysed (Chou & Liu, 2005) and this is attributed to the skills of the students by themselves (Piccoli et al., 2001). In learning accounting, it has been found that the skills in the handling of computers are greater in a VLE than in the traditional environment (Chen & Jones, 2007). The question that is posed in this research is whether the technological skill of the student can affect the perception of the ICT usefulness.

Another issue to consider in the research on learning in accounting in a VLE is the impact of the student's work experience. It has been analysed whether this affects the learning of accounting (Ballantine & Larres, 2004; Laffarga & Lucuix, 2012), as the learning is transferred to the work environment both in accounting (Araiza et al., 2013) and in general undergraduate studies (Lu & Lambright, 2010), and how the students are more involved in the work environment as they advance in the course (Betancourt et al., 2015). However, whether the work

experience can affect the perceived usefulness of the educational ICT, a possible association between both two has not been analysed in- prior papers.

## LITERATURE REVIEW

### Theories applied to study of VLE

The discussion on the conceptual framework to analyse perceptions on VLE is majority based on the Social Cognitive Theory (SCT). SCT has been applied to the study of information systems traditionally (Bandura, 2001). This theory is focused on the study of the interaction among human behaviour, personal factors and the social network, mainly by analysing new styles of behaviour in social networks (Bandura, 2001). Currently, in the framework of this theory, the relationship between personal cognition and computer use-internet behaviour (Compeau & Higgins, 1995; Hsu & Chiu, 2004 ) has being analysed (mainly self-efficacy and outcome expectations), specially for considering virtual communities as a social network which combines information and knowledge in a virtual area focused on common objectives, tools and interaction roles. Furthermore, SCT has been applied to analyse the undergraduate students' participation in communities of online games and the applicability of SCT in virtual communities (Lin, 2010).

Nevertheless, the SCT has been focused on the analysis of the influence components on the individual's behaviour in social networks, being necessary to introduce the Social Capital Theory (SCpT) in order to explore how social networks can affect to the Knowledge sharing in virtual communities (Chiu, Hsu & Wang, 2006). This second theory is based on the analysis of the network relationships possessed by an individual and how this relationships can influence on the interpersonal knowledge sharing (Chiu, Hsu & Wang, 2006). Thus, it has been shown the self-efficacy applied for students in web-community affects to the knowledge shared. This is known as Web-Specific Self-Efficacy. Some authors have analysed the Web-Specific Self-Efficacy and knowledge Create Self-Efficacy in the analysis of the human capabilities in the use of different functions in a VLE (Chen, Chen, & Kinshuk; 2009). Constructivism approach in the learning process carries out more responsibility for learners, not only for building their knowledge but also by being involved in the assessment activities (Rastgoo *et al.*, 2010). In accounting research the constructivism has led to an awareness that students' experience may provide a new focus in the accounting learning process (Lucas, 2000). In the context of constructivism and regarding above theories, accounting innovative experience by educational technology has been studied by analysing of the acceptance of VLE. The major problem in a VLE is the temporal and physical separation between learners and teachers so that social network ties are required for the sharing of knowledge. Thereby, different learning tools are being testing with the only goal of improving social network ties to try to assurance the success of VLE. This issue has led to the analysis on usefulness of tools applied in VLE.

### Learning Tools and Virtual Learning Environment

Different tools are usually applied to distance learning in VLE, such as video, test, chats, forum and other ICT. Role of video as an educational tool in accounting has been studied (Martin *et al.*, 1995; Evans & Foster, 1997; Stanley & Edwards, 2005; Brecht & Ogilby, 2008; Holtzblatt & Tschakert, 2011), both through TV (Halabi, 2005; Jacobs *et al.*, 2006) and through IT technologies (Brecht, 2012). Short videos have been made by using ICT (Letón *et al.*, 2011) and currently these are supported by a web conference system. Such as in previous studies (Alcaide & Solís, 2013; Ortíz, 2013) the videos were usually made *ad hoc* because to find videos perfectly adapted to the learning's necessities is not easy (De-Juan-Vigaray & González-Gascón, 2014).

Also interaction among students and teachers has been studied and this has been focused on the analysis of different levels of knowledge and comprehension (Chi & VanLehn 1991; Collins, 1991; Piccoli, Ahmad & Ives, 2001). In the analysis of accounting education, it has been found that virtual interaction improves students' performance (Potter & Johnston, 2006). This interaction in VLE is made by forums as usual virtual tutorial support. Usefulness of the virtual tutorial support resides in eliminating barriers and in shortening distances for models no based in a face-to-face teaching (Cano, 2009; Castillo, 2008; García *et al.*, 2004).

Currently, online-test has actually been another resource used in VLE because students can see their results faster than in a traditional model. The major advantage of online test is the numerical grade obtained from them. This is useful to know about his or her level of knowledge, which is an important procedure in online education processes (Oosterhoff, 2008). Training is considered an important strategy for the maximisation of the learning opportunities (Rodríguez & Ibarra, 2011), thus, several previous studies analysed this online learning tool. These research was focused on the acceptability of this tool for students (Rudland, Schwartz, & Ali, 2011), and mainly on the students' perception on the assessment in online and computerizing support (Alsadoon, 2017; Hassanien *et al.* 2013; Petrisor *et al.*, 2016; Sorensen, 2013).

For all above, these three learning tools have been selected in this research as dependent variables, in order to analyse the statistical association between the perceived usefulness for each tool and several numerical-technological skills. Thereby, this paper extends the study of factors related to success of VLE to the analysis related to perceived usefulness in EVL, but focusing it on the usefulness of specific tools used in the knowledge sharing in VLE. Therefore, short videos, online self-test and forums are the main objectives of this paper. The purpose of this paper is establish a function of statistical association between the students' perceived usefulness for each of these tools and a set of students' numerical-technological skills.

### **Usefulness and Virtual Learning Environment**

Usefulness in VLE has been studied focused on the individual acceptance of the technology and the student use of this technology in a research line of Technology Acceptance Model (TAM) and this more recently in TAM2 (Davis, Bagozzi, & Warshaw, 1989; and Venkatesh & Davis, 2000) with the goal of predicting user adoption of innovative technologies in VLE. Currently, studies on the acceptance and use of VLE are increasing more and more every day (Pituch & Lee, 2006; Sellim, 2003). Several factors have been analysed in the acceptance of VLE. One of these factors is the perceived usefulness. Perceived usefulness is determining on the based on the four-item performance expectancy scale used (Venkatesh *et al.*, 2003; Van Raaij & Schepers, 2008) but the items in this paper have been adapted to the three ICT selected as a dependent variables. Thus, these items have been adapted in order to be applied to the three constructs related to usefulness of short videos, online self-test and forums.

### **OBJECTIVE AND RESEARCH QUESTIONS**

The main objective of this paper is to analyse the usefulness perceived by the students related to the educational ICT in a VLE, but exploring a possible function of association by linear regression between the usefulness perceived by students and numerical and technological students' skills. The paper is conceived as an exploratory analysis. Numerical profile associated with accounting, technological profile required by employers, and work experience as a sociodemographic characteristic of the distance student have considered in this research. Specifically, this paper tries to respond to the following research questions:

1. What is the perceived usefulness related to a set of ICT applied to the teaching of accounting in a virtual environment?
2. Can the numerical and technological skills of the students explain the usefulness that they perceive on the ICT?
3. Can the existence of work experience related to accounting affects the perceived usefulness of the ICT?

In this way, the research is framed within the analysis of the acceptance of new technologies in the area of accounting education. It is not aimed at establishing a global evaluation model of acceptance of the virtual environment. It is directed to analyse the usefulness perceived by the student in relation to the ICT as an important factor for its acceptance. The novelty of the focus of this research is that this perceived usefulness is established as a dependent variable which is explained by a set of variables of numerical and technological skills, which are not being considered in another models.

### **METHODOLOGY**

#### **Sample**

Different tools have been implemented in a VLE of a second course financial accounting subject in undergraduate studies in the EHEA. The studies are framed in the UNED, which applies a distance education model. This subject supposes a teaching load of 6 ECTS. The students interact in the virtual learning environment implemented for the university. In this environment an area with online resource materials, chats, forums, online surveys, web conferences and other ICT are established mandatorily. The ICT selected for the study were the short videos, the forums and the online self-test. The sample was composed by 156 students who participated in the research from a potential research population of 391 students who were examined in the final test in February of 2016. The questionnaire was carried out in the platform developed for the university –aLF – to support the VLE by an online system, which made a response rate of 39.89 %.

#### **Instruments and Model**

After the application of the ICT tools to the subject, data collection was carried out on the usefulness perceived by the students. The usefulness was collected through an online questionnaire, which was prepared *ad-hoc* as in previous papers on accounting education (Boza & Toscano, 2012; Hurtado & Lara, 2015).

The measurement of the perceptions of students on the usefulness of the VLE was made by a questionnaire based on prior relevant studies, which were validated in order to ensure that the use of suitable items. In this study a list of these items were included to measure the perceptions by combining validated instrument on

functionality and interaction (Pituch and Lee, 2006, Johnston *et al.*, 2005; Kreijns, Kirschner, and Jochems, 2003), on learning satisfaction (Chiu, Hsu, and Sun, 2005; Wu and Wang, 2005), on the numerical and technological skills (Concannon *et al.*, 2005; Gámiz-Sánchez & Gallego-Arrufat, 2016; Harnar *et al.*, 2000; Martínez *et al.*, 2016)

Regarding prior discussion, the questionnaire for this study consisted of two major parts. The first part was developed to collect the demographic and social characteristics of students (e.g. age, previous education, gender, work experience, and others). The second part was focused on collecting the student’s perception of each variable in the model.

All items are measured by using a 5-point scale ranging (“1”=“strongly disagree” to “5”=“strongly agree”). Once the initial questionnaire was constructed, a personal interview process with professors in accounting, education and psychology areas was made. Thus, the validity of the questionnaire was ensured by obtaining feedback of these experts. Afterward this feedback, the questionnaire was modified according to their instructions. Subsequently, the questionnaire was piloted with a small group of students in order to test the completeness, comprehension and appropriateness of the measurement instruments. Consequently, some items were rejected and other modified for semantics reasons. This process is usually applied to the questionnaires in the educational research (Alsadoon, 2017). After this pre-test, 14 items were finally included in 4 dimensions (see figure 1). 14 items in a Likert scale 1-5. For the reliability of the questionnaire, the Cronbach's Alpha was calculated and this took a value from 0,844 for items in overall. Also Cronbach's Alpha was calculated for each dimension (See appendix 1). Minimum value for reliability in social sciences research should be 0.7 (Chen, Chen and Kinshuk, 2009). Items in this study take a good reliability and discriminant validity and therefore the model can be assured. Thus, the model is shown in the figure 1.

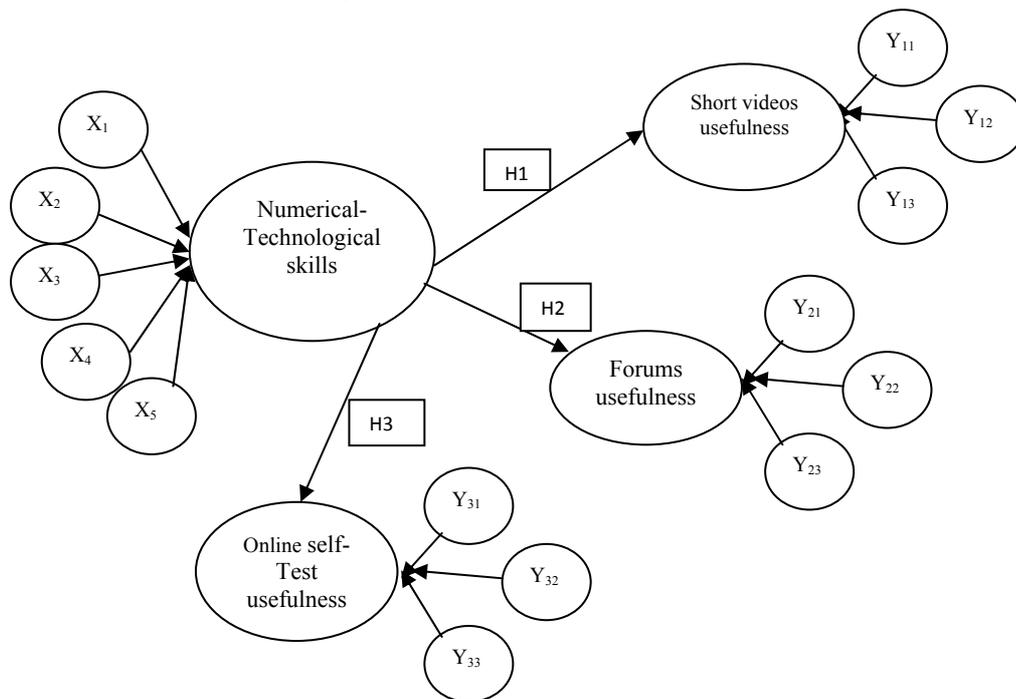


Figure 1. The Research Model for ICT Perceived Usefulness in an Accounting VLE

**Hypotheses, variables and linear regression model**

Regarding above and after the review of specific literature on usual ICT set in accounting e-learning, three instruments were selected: video, forums and online self-evaluation, in order to test the perception of the VLE.

With the collected data, an analysis was conducted in various phases.

- A descriptive exploratory analysis by means of frequencies. It is aimed at summarising quantitatively the characteristics of the sample and the descriptive statistics of the variables under study. An exploratory analysis has previously used by means of the distribution of the frequencies of the usefulness perceived by the students (Polo *et al.*, 2012; Salagre & Serrano, 2008).
- An analysis of the fit of a multiple linear regression model. It is oriented to see if the usefulness perceived by the students in relation to the ICT tools ( $Y_i$ ) can depend on the numerical and technological perceptions of the students ( $X_i$ ).

- A fit of the model according to work experience. We analyse whether introducing work experience related with business modifies the perception of the usefulness.

Thus, three models were purposed (Figure 2).

Model 1

H<sub>1</sub>: The perceived usefulness of short videos (Y<sub>1</sub>) is a dependent variable from the numerical and technological skills (X<sub>i</sub>)

Model 2

H<sub>2</sub>: The perceived usefulness of forums (Y<sub>2</sub>) is a dependent variable from the numerical and technological skills (X<sub>i</sub>)

Model 3

Figure 2. Models and hypotheses

H<sub>3</sub>: The perceived usefulness of forums (Y<sub>3</sub>) is a dependent variable from the numerical and technological skills (X<sub>i</sub>)

Usefulness perceived by students related to the three ICT studied are dependent variables and students' evaluations on the numerical and technological perception are explanatory variables (Tables 1 and 2).

Table 1. Variables and Models of ICT usefulness perceived by the students

DEPENDENT VARIABLES (Y <sub>j</sub> )	EXPLANATORY VARIABLES (X <sub>i</sub> )
Forums usefulness (Y1) Short videos usefulness (Y2) Online self-evaluation usefulness (Y3)	Numerical preferences (X1) Numerical knowledge (X2) Numerical capacity (X3)
	ICT management (X4) Interaction in forums (X5)
MODELS OF ICT USEFULNESS	
<p>H1: Perceived usefulness of the short videos: <math>Y1 = B0 + B1 X1 + B2 X2 + B3 X3 + B4 X4 + B5 X5 + e</math>            H2: Perceived usefulness of the Forums: <math>Y2 = B0 + B1 X1 + B2 X2 + B3 X3 + B4 X4 + B5 X5 + e</math>            H3: Perceived usefulness of the online Self-evaluations: <math>Y3 = B0 + B1 X1 + B2 X2 + B3 X3 + B4 X4 + B5 X5 + e</math></p>	

Questions directly linked to the explanatory variables are five (table 2).

Table 2. Questions and variables

X1: Numerical preferences	Evaluate your <b>preferences</b> for subjects with a numerical and financial profile
X2: Numerical knowledge	Evaluate your numerical <b>knowledge</b> in financial economics.
X3: Numerical capacity	Evaluate your <b>capacity</b> in numerical and financial subjects
X4: ICT management	Evaluate your capacity of <b>management</b> of <b>IT</b> technologies
X5: Interaction in forums	Evaluate your active <b>participation</b> in the <b>VLE</b>

For the analysis, it is assumed that there is a statistical association function between the usefulness of the educational ICT and a set of variables. Thus, this relationship could be explained by a multiple linear regression model between dependent variable (Y<sub>i</sub>) and a set of explanatory variables (X<sub>i</sub>). This method has been used in previous studies on the analysis of online learning in accounting area (Herrador-Alcaide & Hernández-Solís,

2016; Montagud & Gandía, 2014) and in massive open online courses (Ospina-Delgado, Zorio-Grima & García-Benau, 2016).

For each ICT tool, the nil hypothesis would suppose that the perceived usefulness of the ICT ( $Y_i$ ) is independent of the numerical-technological perceptions ( $X_i$  variables). Accepting  $H_0$  would indicate that the model is not explanatory and that the numerical-technological skills of the student are not determining factors in the perceived usefulness of the learning tools. Accepting  $H_1$ ,  $H_2$  or  $H_3$  would indicate that the model is explanatory. Thus, short videos usefulness ( $Y_1$ ), online-test usefulness ( $Y_2$ ) and forums usefulness ( $Y_3$ ) would be explained by numerical-technological skills overall ( $X_i$ ).

In order to measure the effectiveness of the linear relationship, the coefficient of linear determination ( $R^2$ ) was taken, by means of its square root or coefficient of linear correlation ( $r$ ).  $R^2$  measures the realised linear goodness of fit.  $R^2$  represents the percentage of common linear causes existing between the variables, taking values between “0” and “1”. The value 0 indicates absolute linear independence and the value 1 indicates absolute linear dependence.

The coefficient “ $r$ ” indicates whether there is a relationship of linear dependence. It can take values of “-1” to “+1”. When “ $r$ ” takes the value of “-1” there is perfect negative linear dependence and the variables evolve in the same proportion but in opposite directions. When it is “+1” it is a perfect positive linear dependence and the variables evolve in the same proportion and direction. If it takes the value of 0, there is no linear dependency between the variables, which would not impede the variables being able to have another type of relationship (logarithmic, etc.).

### FINDINGS

The findings of this research are shown in three lines of results on:

- The descriptive exploratory analysis;
- The multiple linear regression model of association between perceived usefulness by students and a set of numerical-technological skill of students; and
- The fit of the model according to work experience.

#### Descriptive exploratory analysis

The sociodemographic profile of the students is shown in Table 3. It is observed how the profile of prior studies is framed in the social sciences (79 students). The mean age of the student is between 34 and 50 years (78 students), with the predominant sex being female (101 students). The majority of the students access the undergraduate studies by passing the entrance exam to the university (112 students).

Table 3. Sociodemographic characteristics of the students

Profile of previous studies	Humanities and Legal Sciences	Social Sciences	Pure Sciences
	42 students	79 students	35 students
Mean age	18-30 years	34-50 years	More than 50 years
	65 students	78 students	13 students
Gender	Male	Female	No answer
	50 students	101 students	5 students
Entrance exam	Entrance or access	Bachelor’s degree, master’s degree, certificate, or unfinished degree in engineering	Doctorate, master’s degree, bachelor’s degree, certificate or unfinished degree in engineering.
	112	18	26

The evaluations given by the students in relation to their numerical and technological skills are shown in Table 4. One may observe that most of the students perceive their numerical skills as medium (Likert 3), while the technological skills are perceived as high (Likert 4). The descriptive statistics for the numerical and technological skills are shown in Table 5. It can be highlighted that two variables related to numerical skill ( $X_1$  and  $X_3$ ), are situated above 3 points out of 5. The score related to prior knowledge ( $X_2$ ) is also near 3 points. Thus, the student perceives himself at a medium level of numerical skills in the framework of financial economics. The technological skills are self-perceived as higher (4.15 for  $X_4$  and 3.6 for  $X_5$ ). When the technological skills are related to communication (forums) they are perceived as lower. In general the students consider themselves adept in technology.

Table 4. Numerical and technological skills perceived by the student

	Self-evaluation of numerical skills in the framework of financial economics			Self-evaluation of technological skills	
	X1	X2	X3	X4	X5
Likert Scale 1	7	19	20	1	12
Likert Scale 2	17	41	22	7	14
Likert Scale 3	<b>52</b>	<b>67</b>	<b>64</b>	22	41
Likert Scale 4	45	25	33	<b>64</b>	<b>46</b>
Likert Scale 5	35	4	17	62	43
Total students	156	156	156	156	156

Table 5. Descriptive statistics of the financial-technological skills

Xj	N	Minimum	Maximum	Mean	Standard deviation
Numerical preferences (X1)	156	1	5	3.54	1.092
Numerical knowledge (X2)	156	1	5	2.71	.965
Numerical capacity (X3)	156	1	5	3.03	1.144
ICT management (X4)	156	1	5	4.15	.871
Use of forums (X5)	156	1	5	3.60	1.200
Valid N (per list)	156				

The students’ perception on the usefulness of the three ICT is shown in Table VI. Of the three dependent variables under analysis, the one related to the online self-evaluations is perceived as the most useful.

Table 6. Descriptive statistics of the ICT

Yj	N	Minimum	Maximum	Mean	Standard deviation
Forums usefulness (Y1)	156	1	5	3.153	1.443
Online Self-Test usefulness (Y2)	156	1	5	2.946	1.255
Short videos usefulness (Y3)	156	1	5	2.303	1.153
Valid N (per list)	156				

The introduction of two dichotomous variables in the model were considered. As an individual characteristic, the knowledge of the accounting subject of the previous course, which took the value “1” for being passed and “2” for failure. The second, within the sociodemographic characteristics is the work experience related to accounting. This variable was already used as a control variable in the analysis of the academic performance in accounting (Laffarga & Lucuix, 2012). This variable also takes the value of “1” or “2”.

The results of the two dichotomous variables indicate that 87% of the students had the knowledge required to pass the preceding accounting course, therefore, this variable was not used for the division of our sample. As for the previous work experience, 61% of the students had such experience compared to 39%. This variable was considered for the division of the sample into two groups, one for students with work experience and the other for students without it.

**Lineal Regression Model**

The results that the multiple regression analysis summarise for each of the three models is shown in Table 7.

Table 7. Linear model of perceived usefulness related to the ICT

Short videos _ Usefulness (Yj) Model						
Model	R	R-squared	Adjusted R-squared	Standard error of estimation	F	Sig.
1	.469 <sup>a</sup>	.220	.194	1.294	8.420	.000 <sup>b</sup>

Forums _ Usefulness ( $Y_2$ ) Model						
2	.453 <sup>a</sup>	.205	.178	1.124	7.680	.000 <sup>b</sup>
Online Self-Test Usefulness ( $Y_3$ ) Model						
3	.409 <sup>a</sup>	.167	.139	1.259	5.976	.000 <sup>b</sup>
a. Predictors: (Constant), Preferences_Numerical, Knowledge_Numerical, Capacity_Numerical, Management ICT, Use Forums						

### Fit of the model according to work experience

Prior work experience could be contributing non-assessed knowledge. This knowledge could affect the perceived usefulness of the ICT. Prior financial experience can lessen the perceived usefulness, making the ICT tool less attractive by including the learning of knowledge they already possess. The usefulness models were tested but with the dichotomous variable “work experience”, which divides the sample into two. In this way, in the regression lines the variable  $\delta$  = “Work experience” was included, which only takes the value “1=Yes” or “2=No”. The new results for the three ICT analysed are shown in Table 8. It is observed that only for the mini-videos does the “r” coefficient have a higher value (0.514) for the students with work experience. The same does not occur for the forums, or for the online self-evaluations, whose coefficient “r” is higher in the group of students without work experience.

Table 8: Linear model of perceived usefulness related to the ICT considering work experience

Summary of the Usefulness Short videos Model		
Model	r-MINI-VIDEOS	
	Finan. Work Exp = Yes (Selected)	Finan. Work Exp = No (Not selected)
1	.514 <sup>a</sup>	.467
Summary of the Usefulness Forums		
Model	r-FORUMS	
	Finan. Work Exp = Yes (Selected)	Finan. Work Exp = No (Not selected)
2	.399 <sup>a</sup>	.532
Summary of the Usefulness Online Self-evaluation		
Model	r-SELF-EVALUATIONS	
	Finan. Work Exp = Yes (Selected)	Finan. Work Exp = No (Not selected)
3	.408 <sup>a</sup>	.461
a. Predictors: (Constant), Preferences_Numerical, Knowledge_Numerical, Capacity_Numerical, Management ICT, Use Forums		
b. Unless the contrary is indicated, the statistics are based only on the cases for which Exp Laboral Finan = Yes.		
c. Dependent variable: Usefulness mini-videos, usefulness forums, usefulness self-evaluations.		

In the Figure 4, a comparative graphic analysis can be seen of the coefficient of linear correlation (r) before and after considering work experience.



Figure 4. Coefficient of linear correlation considering the variable “Work Experience”

### LIMITATIONS

Despite the positive outcomes, this study must acknowledge some limitations. No generalist results could be extrapolated for any accounting teaching in VLE, not even for any university or for any models of distance education, because sociodemographic characteristics of the students could affect results. Nevertheless, despite the limitations inherent to this experimental empirical analysis, results do show a certain impact of the numerical and technological skills on the perceived usefulness of the ICT in teaching in an accounting VLE. Thus, if researchers considered a more heterogeneous group of student there could be different findings. Also the context of the VLE could be affect to the results. Nonetheless, the results agree with previous studies, and because of that the findings regarding the perceived usefulness can be considered as a significant contribution to a greater knowledge of VLE in accounting education.

### CONCLUSIONS AND DISCUSSIONS

Regarding the first research question related to the perceived usefulness measured by a set of ICT applied in an accounting VLE, the results suggest that the students assign a medium-high usefulness in the ICT for the teaching of accounting in a distance education model. According to findings on the positive effect of the use of a VLE on the student (Fetters *et al.*, 1986, Abdolmohammadi *et al.*, 1998), Montagud & Gandía (2014), comparable results have been found in this research but focusing on the satisfaction related to the accounting VLE in a distance education model. Moreover, the findings of Magin (2001) and Bushell (2006) lead to the conclusion that methods that involve students can be considered as a positive stimulus in the deep and self-regulated learning. The self-regulated learning is a very important factor in a distance education model. Thereby, a first conclusion of this paper is that innovation by using of the educational technology in a VLE can be defended as an improvement of the learning process, and this experience is considered as a positive advance by students. This paper shows that in a distance education model applied to the degree studies, VLE can be considered as good system in order to support a learning process involving students, and thus, the VLE is perceived as a usefulness environment by them.

Specifically, students’ perception on the usefulness of a set of distance learning tools in VLE takes good values. The short videos, forums and online self-evaluations used in this research have been valued as a positive contribution to the VLE. The tool evaluated as the most useful for the sociodemographic profile of university distance education is that which encompasses the online self-test, with a very similar usefulness for the short video tool. The forums are perceived as less useful and this finding was already found in previous studies (Martínez *et al.*, 2016), in spite of students valued that this tool allows the development of communicative skills (Feliz, 2012; Rodríguez-Hoyos & Salvador, 2011). This may be an interesting line in future researches in order to analyse differences in the perceived usefulness between student in first year and student in second year of degree. Related to online-test, the findings of this research are according to other researches where students considered that online assessment add value to their learning (Sorensen, 2013; Petrisor *et al.*, 2016; Alsadoon, 2017) and they assigned a highly satisfaction by its advantages (Hassanien *et al.*, 2013).

For the second research question related to the statistical association between numerical-technological skills of the students and the perceived usefulness, results show that perceived usefulness of the ICT is explained to some extent by these skills. Findings suggest that numerical-technological skills could be introduced in a model as explanatory variables to the justification of the perceived usefulness in VLE. Nonetheless, in this paper only a first approach has been made. This approach indicates that these explanatory variables are perceived as an influent factor in the distance learning process in accounting. However, they could be analysed in a joint context with other variables. According to Montagud & Gandía (2014) the experience of educational innovation in an

accounting VLE has been valued positively by students and they perceived the usefulness for the accounting learning. Thus, such as the research line of the TAM, the perceived usefulness of the short videos, online-test and forums could be considered influent factors into a VLE and these should be included in a model focusing on predicting adoption of innovative technologies in VLE (Venkatesh *et al.*, 2003; Van Raaij & Schepers, 2008).

When the “work experience” variable is introduced, according to the third research question, it was verified that this affects in a positive way the perception that the students have of the usefulness of the short videos, but it does not influence in the perceived usefulness for online-test and forums. In learning accounting, some authors found that the academic results in the prior accounting subject was a significant control variable (Gandía & Montagud, 2011; Potter & Johnston, 2006). Nevertheless, this study is the first to find a positive relationship between the work experience and the perceived utility by students related to tools applied in a VLE. This finding may be due to that some skills could have been acquired outside the educational model through work and thus some tools could show a minor perceived usefulness due to students’ work experience. This finding will be an important research line for the future. In distance teaching models for adult, educational model involves to students in the VLE without considering their prior work experience, but this experience is conditioning their learning process. For this reason, the inclusion of the work experience to analyse the model’s usefulness is an important improvement.

For all above, the major objective of the research has been confirmed and thus, it is possible to understand that exists a statistical association between perceived usefulness of online tools applied in accounting VLE and the students’ numerical-technological skills. Furthermore, these skills partially explain the perceived usefulness.

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**APPENDIX 1. QUESTIONNAIRE RELIABILITY AND VALIDITY**

The questionnaire encompassed the following item. It was required to valuated the items on a Likert scale from 1 to 5 where “1”=”strongly disagree” to “5”=”strongly agree”

	Mean	Standart desvitation	N	Alfa Cronbach	Alpha for each dimension
<b>Dimension 1 Numerical-technolgical skills</b>					
X1: I Prefer for subjects with a numerical and financial profile	3,54	1.092	156	,843	,838
X2: I have a high numerical knowledge in financial economics?	2,71	.965	156	,843	
X3: I consider I have a good numerical capacity	3,03	1.144	156	,852	
X4: I manage well of IT technologies	4,15	.871	156	,830	
X5: My participation in the VLE has been active	3,60	1.200	156	,821	
<b>Short Videos Usefulness</b>					
Y11: I am satisfied with short videos	2,88	1,398	156	,827	0,692
Y12: Short videos are suitable for learning the subject	3,38	1,474	156	,823	
Y13: My frequency of use of short videos	3,20	1,475	156	,825	
<b>Online-Test Usefulness</b>					
Y21: I am satisfied with online-test	2,25	1,129	156	,826	,783
Y22: Online-tests are suitable for learning the subject	3,52	1,400	156	,822	
Y23: My frequency of use of online-test	3,07	1,238	156	,827	
<b>Forum Usefulness</b>					
Y31: I am satisfied with forums	1,88	1,087	156	,841	,893
Y32: Forums are suitable for the learning the subject	2,77	1,258	156	,830	
Y33: My frequency of use of forums	2,26	1,133	156	,827	