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RESEARCH ARTICLE

Student's Attitude and Perception with the Use of Technology in the University

Actitud y percepción estudiantil con el uso de la tecnología en la universidad

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Summary

This study aims to know the relationship between the variables attitude toward social networks, attitude toward technology, perception about technology and use of technology by university students. The methodology used has been a questionnaire, which has been applied to students of the Technological University of Santiago (UTESA) of the Dominican Republic. The data has been analyzed through the statistical programs SPSS and SmartPLS (Partial Least Square technique -PLS-). Among the main results, it has been found that students 'attitude toward technology influences their perception about technology, and that students' attitude toward social networks has a positive influence on the use of technology.

Keywords: Technology, tools, higher education, student's attitudes, Dominican Republic.

Resumen

Este estudio tiene como finalidad conocer la relación existente entre las variables actitud hacia las redes sociales, actitud hacia la tecnología, percepción de la tecnología y uso de la tecnología de los estudiantes universitarios. La metodología empleada ha consistido en la aplicación de un cuestionario, el cual ha sido aplicado a estudiantes de la Universidad Tecnológica de Santiago (UTESA) de República Dominicana. Los datos han sido analizados a través de los programas estadísticos SPSS y SmartPLS (técnica Partial Least Square -PLS-). Entre los principales resultados, se ha podido comprobar que la actitud hacia la tecnología por parte de los estudiantes influye en la percepción que tiene sobre la tecnología, y que la actitud de los estudiantes ante las redes sociales influye positivamente en el uso de la tecnología.

Palabras clave: Tecnología, herramientas, enseñanza superior, actitudes de los estudiantes, República Dominicana.

Introduction

The term technology refers to any type of application, including hardware, software, computers, databases, the Internet and e-mail (Tubaishat, Al-Rawajfah, Habiballah & Akhu-Zaheya, 2016), i.e. this concept is broad and is used to refer to hardware and software applications used to store, create, exchange and use information (Nkosi, Asah & Pillay, 2011). Since the introduction of the first personal computers in the 1960s, there has been significant progress in technology, leading to the fast adoption of personal and mobile devices (Law, Thome, Lindeman, Jackson & Lidor, 2018). As the use of mobile technology devices has proliferated, so has the concept that such devices can be useful in teaching and learning processes (Eppard, Nasser & Reddy, 2016). The use of mobile technology in education gives teachers the opportunity to re-imagine teaching and learning (Heflin, Shewmaker & Nguyen, 2017). This creates a more flexible learning model that gives faculty members and students access to multiple sources of information and a change from a learning structure based on the concept of a community of learners (Hamm, Saltsman, Jones, Baldridge & Perkins, 2013).

The use of mobile technologies in education and learning has been studied in recent years (Briz-Ponce, Juanes-Mendez & García-Penalvo, 2014; Huang, Lin & Chuang, 2007), confirming that mobile learning is beneficial for increasing student independence, commitment, and communication (Dunn, Richardson, Oprescu & McDonald, 2013). Thus, the use of mobile devices in learning enhances commitment by providing immediate access to information, providing enhanced hands-on learning (Cheng, Yang, Chang & Kuo, 2016), although mobile devices better contribute to learning when the instruction has been carefully designed to make optimal use of technology (Heflin, Shewmaker & Nguyen, 2017). In this regard, the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2009) pointed out that technology has great potential in the quality of learning and enhances students' good outcomes. Mobile devices and educational applications should not complicate the learning process, but rather facilitate student

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learning (Jeng, Wu, Huang, Tan & Yang, 2010). To this end, teachers are using mobile applications in the classroom because they allow students to answer their questions based on the course content (Heflin, Lin & Chuang, 2017), confirming that this enhances students' perceptions of learning (Denker, 2013). The use of these applications gives teachers the opportunity to use mobile technology to promote meaningful learning (Heflin, Lin & Chuang, 2017). The integration of mobile devices into student learning has shown that the overall effect of mobile device use may prove to be better for learning than using desktop computers or not using devices at all (Sung, Change & Liu 2016).

Today's students are digital natives (Palfrey & Gasser, 2011). This increases the importance of teachers developing comfortable learning strategies (Denker, Manning, Heuett & Summers, 2018), e.g. through technology. This form of participation extends the university classroom into virtual spaces (Denker, Hermann & Willits, 2015), where students are connected through information and communication technologies (Denker, Manning, Huett & Summers, 2018), positively influencing the teaching-learning process (Pando, 2018). Technology also helps students to participate in the classroom from other spaces (Denker, 2013). In this sense, Finn & Ledbetter (2013) found that university students want their teachers to allow them to use technology in the classroom. Ledbetter (2009) concluded that online communication attitudes of students as a form of cognitive and affective orientations can foster or inhibit an individual's tendency to communicate online. Guo, Li & Stevens (2012) offered a model of attitudes that shape the use of technology, although those models do not explain the relationships between attitudes and the use of technology. In this sense, as more classes continue to add technological elements, such as the use of social networks (Tyma, 2011), it becomes necessary to examine students' attitudes toward technology and learning, especially with the increase in popularity of social media (Domínguez-Vergara & Ybañez-Carranza, 2016).

Factors that could influence student behavior to use technologies in learning have been considered to be an attractive element to develop much research (Briz-Ponce, Pereira, Carvalho, Juanes-Méndez & García-Peñalvo, 2017). For example, Hong, Thong & Tam (2006) compare three models to understand the behavior of mobile Internet use. Sánchez and Hueros (2010) analyzed the virtual teaching platforms for distance-learning and the use and acceptance of technology. Additionally, the findings published by Chen (2011) show that educational compatibility and expectation are important determinants of the acceptance of e-learning. Espuny, González, Lleixá & Gisbert (2011) found a favorable relationship between student attitudes and the use of social networks. Arteaga, Duarte & García (2013) studied the determining factors of the acceptance of the online learning system in students. Lee & Lehto (2013) conducted a research based on a model of acceptance of technology and behavioral intention to use new technologies. Thakre & Thakre (2015) explained the main uses of smartphones by students and concluded that communication, learning, and entertainment are the most popular uses. Furthermore, Sezer (2016) revealed that the gender factors and academic success significantly affect student attitudes toward learning and technology. For their part, Briz-Ponce, Pereira, Carvalho, Juanes-Méndez & García-Peñalvo (2017) found a strong attitude of university students toward the use and recommendation of mobile technology.

Cheung & Vogel (2013) concluded that the user's positive attitude will lead to a greater intention to use technology for learning. Sujeet & Jyoti (2013) postulated that a greater behavioral intention may be influenced by student attitude and perceived ease of use. For their part, Rupak, Greg, Jei & Ben (2014) found that technology has a positive and significant relationship between perceived usefulness and perceived ease of use, and both elements have a positive effect on the behavioral intention. In short, attitude plays an important role in persuading student intention to use online learning (Hussein, 2017) because attitude is a vital component in the use of technology (Altawallbeh, Soon, Thiam & Alshourah, 2015). The use of Web

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2.0 tools, such as Wikipedia, has also shown that it significantly improves students' some basic skills, such as interaction and communication, reading comprehension, writing or research capabilities (Soler, Pavlovic & Font, 2018).

Thus, the study raises the problem that the variables of attitude toward technology and social networks have not been thoroughly analyzed using student perception about technology, which can cause inappropriate behavior of Web 2.0 users in the university and, consequently, a waste of the technological resources to improve the teaching-learning process. Thus, it is relevant to deepen the relationship of these variables with the mission of generating implications to promote adequate use of technology and the technological resources in the university. Consequently, the scientific literature mentioned in the previous paragraphs supports the following hypotheses: H1, attitude toward technology positively influences the perception about technology; H2, attitude toward social networks positively influences the perception about technology; H3, attitude toward social networks positively influences the use of technology; and H4, perception about technology positively influences the use of technology. In order to know if these hypotheses are supported, a quantitative fieldwork has been carried out with the students of the Santiago University of Technology (hereinafter, UTESA) in the Dominican Republic. Thus, the objective of this research is to know the existing relationship between the variables university students' attitude toward social networks, attitude toward technology, perception about technology and use of technology.

Method

Design, Structure and Participants

The participants of this study were the students from UTESA located in the Dominican Republic. They were students from the Main Campus located

in Santiago de los Caballeros, which has 21,147 undergraduate students (UTESA, 2017). The study was carried out in the university classrooms between January and June 2017, using a quantitative approach through simple random sampling, collecting a total of 693 questionnaires, but ultimately only 660 questionnaires turned out to be valid. With all this, a sampling error of 3.8% was obtained, using a 95% level of confidence. The questionnaire was applied using the simple random sampling technique, where the entire universe has the same options of being selected to fill in the questionnaire (Casas, Repullo & Donado, 2003).

The questionnaire was properly structured, and a 3-step validation process was carried out. In the first step, the items included in the questionnaire were selected from previous studies (Barczyk & Duncan, 2013; Cao, Ajjan & Hong, 2013; Eid & Al-Jabri, 2016; Pintado, 2015; Spiegel & Rodríguez, 2016). In the second step, two experts in the field reviewed the questionnaire in order to corroborate that the instrument design procedure was carried out correctly. In the third and last step, a *pre-test* of 20 surveys was applied to students from UTESA to detect possible deviations or errors in the interpretation of the questionnaires, since these were provided in two different languages (Spanish and French) to reach the greatest number of students, since the vast majority are of Dominican (Spanish-speaking) or Haitian (French-speaking) origin.

The structure of the questionnaire is divided into two clearly differentiated parts. The first part addresses the use of technology and social networks by students in the university, and this assessment is carried out using a *Likert* scale of five (5) points (where 1 means "disagree very strongly"; 3 means "point of indifference"; and 5 means "agree very strongly"). The second part addresses socio-demographic profile-related questions. The total number of items was 25.

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Data Analysis Procedure

The process of tabulation and previous statistical analysis consisted of checking the reliability of the items through the Cronbach's alpha. This procedure was carried out using the IBM SPSS v.24 statistical package. In this sense, item purging process through the Cronbach's alpha resulted in the removal of 7 items from the questionnaire because their corrected item-total correlation was less than 0.3 (Norussis, 1993). After this, the Cronbach's alpha valid for the other 18 items was 0.781, and the scale was valid because it was greater than 0.7 (Nunnally & Bernstein, 1994).

After the preliminary analysis using the IBM SPSS v.24 statistical program, another variance-based Structural Equations statistical program was applied using Partial Least Squares (PLS) through the SmartPLS v.3.2.6 program. This PLS analysis technique was selected because this program allows verifying whether the initial theoretical concepts have been measured properly using the different observed variables included in the model, analyzing their validity and reliability. Thus, in carrying out an analysis using partial least squares (PLS), two very clearly differentiated stages are proposed (Barclay, Higgins & Thompson, 1995). In the first stage, reliability and validity of the measurement model are evaluated, and in the second stage, the structural model is evaluated.

Results

In order to better understand the results, they have been divided into three parts. Firstly, the descriptive results of the socio-demographic profile of the sample are shown. Secondly, the first stage of the PLS model is shown: the evaluation of the reliability and validity of the measurement model. And, thirdly, the evaluation of the structural model is shown.

Previous Descriptive Results

Table 1 shows the results of the socio-demographic profile of the sample of university students. A greater number of female students (66.2%) than male students (33.8%) should be noted, and the most representative age group ranged between 18 and 25 (88.2%). The nationality of 90.2% of the sample was Dominican. The most represented university year of study is 1- 3 years (50.5%), and the university specialty most studied by respondents was Medicine (39.7%), followed by Odontology (9.6%), Accounting (9.4%), and Civil Engineering (9.0%), among others. It was verified that the mobile or cellular telephone is the most used device in the university, represented by 75.6% of the respondents, followed by the laptop (15.0%).

Table 1.

Socio-Demographic Profile of the Sample.

Variable	%	Variable	%
Gender (*N=642*)	33.8%	University years of study (*N=638*)	22.9%
Man	66.2%	Less than 1 year	50.5%
Woman		1-3 years	26.6%
		More than 3 years	
Age (*N=462*)	88.2%	Specialty (*N=647*)	39.7%
18-25 years old	10.6%	Medicine	9.6%
26-34 years old	1.1%	Odontology	9.4%
35-44 years old	0.0%	Accounting	9.0%
45-54 years old	0.0%	Civil Engineering	4.8%
55-64 years old	0.1%	Psychology	3.1%
Older than 65 years old		Bioanalysis	24.4%
		Other specialties	
Country of origin (*N=633*)	90.2%	Most used device (*N=419*)	75.6%
Dominican Republic	9.0%	Cellular	6.0%
Republic of Haiti	0.3%	Computer	15.0%
Mexico	0.3%	Laptop	1.7%
United States	0.2%	Tablet	1.7%
Venezuela		Smartwatch	

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Evaluation of Reliability and Validity of the Measurement Model

Table 2 presents the mode A (Perception about Technology -PT- and Use of Technology -UT-) and mode B (Attitude toward Technology -AT- and Attitude toward Social Networks -ASN-) composites. With respect to the mode A composites, their validity and reliability have been determined through factorial loads, and loads with values lower than 0.7 were removed (Cepeda & Roldán, 2004). Consequently, three items were previously removed. Internal consistency, measured through composite reliability and *Cronbach's* alpha (Werts, Linn and Jöreskog, 1974), must also be taken into account, but the most reliable and best-applied measure for internal consistency is composite reliability because it is not influenced by the number of items of the scale (Fornell & Larcker, 1981). Composite reliability exists when the composites have values of this index greater than 0.7 (Henseler, Hubona & Ray, 2016). Convergent Validity must also be taken into account in validating the measurement model and, for this purpose, the values of the Average Variance Extracted (AVE) must be higher than 0.5 (Fornell & Larcker, 1981). Subsequently, cross-loadings were used to calculate the Discriminant Validity, and the loadings between items of the same composite must be greater than the loadings of the other composites. Finally, the Heterotrait-Monotrait (HT-MT) ratio is a more demanding measure (Henseler, Hubona & Ray 2016) aimed at determining the existence of discriminant validity. To this end, it must show values lower than 0.85 (Kline, 2011) or 0.90 (Teo, Srivastava & Jiang, 2008).

It should be pointed out that the above indices are only applicable for mode A composites. Mode B composites are analyzed using their weights, indicating the relative importance of each item in the formation of its composite. The probable existence of multi-collinearity between these items of the mode B composites must also be taken into account. The existence of this multi-collinearity is measured through the Variance Inflation Factor (VIF) Test, indicating the existence of this problem in values higher than 5 (Hair, Sarstedt, Hopkins & Kuppelwieser, 2014) or 3.3 (Roberts & Thatcher,

2009). In this sense, tables 2 and 3 present the results of the process of validity and reliability of the measurement model, where no anomalous values are observed in any of the indices and calculated ratios, all of which are above the minimum value required, so that the validity and reliability of the measurement model is appropriate and correct.

Table 2.

Loads, Weights, FIV, Internal Consistency and Convergent Validity.

	Compound Reliability	AVE	Factorial loads	Weights	FIV
Perception about technology	0.824	0.702			
(PT)			0.907		
PT1			0.762		
PT4					
Use of technology (UT)	0.851	0.742			
UT2			0.789		
UT8			0.928		
Attitude toward technology	-	-			
(AT)				0.605	1.625
AT6				0.353	1.277
AT7				0.167	1.322
AT15				0.160	1.295
AT16					
Attitude toward social	-	-			
networks (ASN)				0.158	1.331
ASN17				0.113	1,465
ASN18				0.040	2.299
ASN19				0.823	2.452
ASN20					

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Table 3.

Discriminant Validity.

Cross-Loadings	PT	UT	AT	ASN
PT1	**0.907**	0.555	0.540	0.544
PT4	**0.762**	0.372	0.312	0.368
UT2	0.368	**0.789**	0389	0.381
UT8	0.588	**0.928**	0.558	0.614
AT6	0.481	0.481	**0.909**	0.552
AT7	0.379	0.445	**0.716**	0.419
AT15	0.322	0.359	**0.609**	0.389
AT16	0.316	0.350	**0.597**	0.455
ASN17	0.330	0.330	0.458	**0.569**
ASN18	0.365	0.372	0.319	**0.635**
ASN19	0.461	0.430	0.548	**0.767**
ASN20	0.543	0.594	0.595	**0.981**
	Heterotrait-Monotrait Ratio: 0.831			

Structural Model Evaluation

The bootstrapping technique was used to accurately estimate the measurement model (Roldán & Sánchez-Franco, 2012). The *t*-value and the associated limit probability for each of the hypotheses to be compared were obtained. Table 4 presents the comparison of the proposed hypotheses. It was observed that students' attitude toward technology influences their perception about technology (H2). Also, it was also supported that students' attitude toward social networks positively influences the use of technology (H3). It was not possible to support the existence of a positive influence of the attitude toward perception about technology (H1) and the relationship between perception about technology and use of technology (H4).

Table 4.

Hypothesis Comparison.

	Path Coefficient	Value *t*	p. limit	Supported?
H1: Attitude toward technology à **Perception about technology**	0.298^{NS}	2.265	.012	No
H2: Attitude toward social networks à **Perception about technology**	0.374*	2.488	.006	Yes
H3: Attitude toward social networks à **Use of technology**	0.412*	2.368	.009	Yes
H4: Perception about technology à **Use of technology**	0.338^{NS}	2.180	.015	No

*** p<.001, ** p<.005, * p<0,01. ($t_{(659)}$, a tail). t(.001; 659) = 3.090 ; t(.005; 659) = 2.576; t(0.01; 659) = 2.326. NS= not significant

The results obtained show the impact of exogenous variables on the endogenous variables. Thus, attitude toward technology explains 15.794% of the variable perception about technology. Attitudes toward social networks explain 20.862% of the variance of perception about technology and 24.761% of the variance of the variable use of technology. Finally, perception about technology explains 19.198% of the variance of use of technology. Moreover, information on the predictive power of the model is provided by the coefficient of determination or R^2 (Hair, Sarstedt, Hopkins & Kuppelwieser, 2014), although the Stone-Geiser's test (Q^2) shows greater predictive relevance (Stone, 1974). A Stone-Geisser's Q^2 value greater than 0 shows predictive relevance for the composite, while a value less than 0 indicates a lack of predictive relevance for that composite (Henseler, Ringle & Sinkovics, 2009). For this research, the endogenous constructs show Q^2 values higher than 0 (Q^2 Perception about technology = 0.135; Q^2 Use of technology = .018). The final model is thus shown in figure 1.

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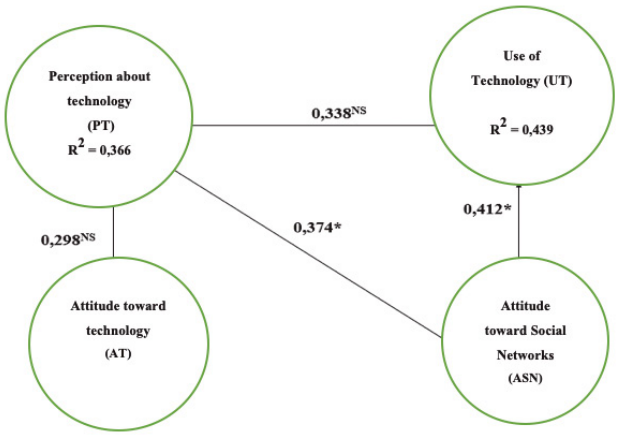

Figure 1. Final Structural Model

Discussion

The main finding of this study is that the study model proposed in this research supports that student attitude toward technology influences their perception about technology. It can also be concluded that student attitude toward social networks positively influences the use of technology. These results confirm a model that explains the relationships between attitudes and the use of technology, something that had not previously been confirmed (Guo, Li & Stevens, 2012). These results also indicate the existence of a relationship between attitude and the use of technology, a hypothesis supported in other studies (Cheung & Vogel, 2013; Briz-Ponce, Pereira, Carvalho, Juanes-Méndez & García-Peñalvo 2017; Rupak, Greg, Jei, & Ben, 2014). On the contrary, it has neither proven that the attitude toward technology positively influences students' perception about technology nor has it proven that technological perception influences the use of technology by students. As implications for management, these results may help the university to formulate strategies to encourage positive attitudes toward the use of Web 2.0 in the teaching-learning process between its community of students and teachers since it has been proven that there is a positive

relationship between both elements. It can also help to develop good practice policies for the use of web platforms and, above all, in order for the academic community to know the benefits of using technology and social networks in the teaching-learning process.

Among the main limitations of this study, we can mention that the period of the fieldwork was short due to the fact that data have been collected only during the first six months of 2017 and, therefore, it would have been more interesting to apply the questionnaire to student samples during a longer period of time. Also, the study is focused only from students' point of view, without knowing the perception on Web 2.0 use by other academic actors such as teachers, researchers or university directors. Moreover, it is possible that the extension of the questionnaire could have affected the quality of the respondents' answers. In this sense, and with the aim of overcoming this inconvenience, the purging process was very exhaustive, removing all questionnaires where there are doubts as to the veracity of their answers. As future lines of research, it would be interesting to study the university aspects or tasks in which students use the Web 2.0. Also, it would be prudent to know other aspects related to student behavior in the Web 2.0 and its use in the university as elements related to the academic stress in the teaching-learning process and the influence or benefits of Web 2.0 in the aspects that help to combat such stress. Finally, it would be advisable to apply the questionnaire in other universities to find out whether the relationships of the model are supported or not and, therefore, obtain more information on the relationship between the variables of the study.

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