

Use Of Icts as A Learning Strategy in Peruvian University Students

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Abstract

The use of ICTs applied to the educational field has had greater preponderance since the last pandemic, remote education has achieved that both teachers and students make greater use of technological resources for educational work; In university higher education, educational institutions make available to their students various technological resources that are used for synchronous and asynchronous sessions, in activities such as information search, evaluations or in the preparation of academic and research papers. This article aimed to know if the use of ICTs contributes to the learning of university students. The methodology selected was quantitative, basic, correlational descriptive level and non-experimental design; the research sample consisted of 211 students from a private university in Lima, to whom a questionnaire of 30 items was applied. The results obtained in the study allow us to affirm that the use of ICTs significantly favors learning in university professional training, in addition, from the scientific evidence achieved in the results, suggestions or recommendations are proposed.

Keywords: Distance education, vocational training, ICT in learning.

1. INTRODUCTION

Clinical The use of information and communication technologies (ICTs) in the educational field is increasingly frequent, especially to support the academic performance of teachers and students, being part of the culture that is practiced daily. This situation has motivated the interest to know if this cultural component contributes or favors learning during university vocational training. To facilitate the research process on this relationship, general theoretical models have been taken in order to assess the observable aspects of both the use of information and communication technologies, as well as learning in the development of competences by students, to subsequently establish whether ICTs contribute to learning. In this context, first we have identified student experiences in the use of ICTs and then the perception of ease and usefulness of such use, by them, from theoretical models that seek to explain the attitudes of an individual to accept technology and show an attitude oriented to its profitable use. Then, the qualities that allow us to discover the perception of ease or friendliness of the use of ICT, as well as its usefulness, were identified. This research was carried out by reviewing models related to learning ranging from behaviorist and constructivist approaches to knowledge, to multiple intelligences and teamwork, which lead to the achievement of the graduation competencies of their professional career. For the measurement and establishment of the relationship between both variables, we have worked with the integration of all the indicators of each variable, using the average of these, and thus apply the statistical tests of the validation of the hypotheses that were raised at the beginning of the study.

2. BACKGROUND, MOTIVATION AND OBJECTIVE

The use and acceptance of ICT has been studied by different authors, starting with the Technology Acceptance Model, TAM, developed by (Davis, Bagozzi and Warshaw, 1989)[1], then the Technology Acceptance 2,

TAM2, model proposed by (Venkatesh and Davis, 2000)[2] and finally, the Technology Acceptance Model 3, TAM3, formulated by (Venkatesh and Bala, 2008). The TAM model developed by (Davis, 1989) was a pioneering study conducted to explain the acceptance of information and communication technology by end users[3]. Subsequently, (Venkatesh and Davis, 2000) they propose a new version of the TAM model called TAM2, where they provide more detailed explanations and include new variables to the initial model such as: social influence and instrumental cognitive processes. The study is based on users' perceptions of the usefulness of technologies when assessing the achievement of work objectives through their application[2].

Then, the TAM3 model was proposed by (Venkatesh and Bala, 2008), who propose a unified theory on the acceptance and use of technology combining the TAM2 model and the determinants of perceived ease of use. The results achieved with this model show a strong relationship of perceived ease of use with perceived utility as a result of applying information technology.

Among other studies conducted on the subject we have (Park, S. Y. 2009), who determines how university students adopt and use virtual learning or e-learning. The study was carried out in South Korea with the objective of carrying out an analysis of the model of acceptance of technologies that allows to understand the behavioral intention of university students regarding e-learning. In Peru there are few studies referring to the influence or contribution of ICT in learning processes or skills development. An investigation at the Universidad Nacional Mayor de San Marcos by (Vega, C. 2017) found that there is a probability that there is a significant influence between the use of information technology and the communication stage in the teaching and learning of the English language. The study also determines that there is an influence of the auxiliary means and technological didactic resources, including the field of study, in said learning. Also (Olaya, J. 2004) he researched on "The use of information technologies in two Peruvian universities: cases PUCP and UNMSM", analyzing the accelerated growth of Internet use by undergraduate students. With regard to the design of network strategies, (Yañez, 2013), in an interview at the PUCP indicates "that ICTs should be used to execute tasks that are difficult to do in the classroom, such as proposing simulations, incorporating advances from experts from anywhere in the world, delivering immediate feedback, personalizing the learning experience, etc.". In this case, the need to use ICTs in the learning process is established in order to raise situations that cannot be carried out without their support.

Frame of reference. The first aspect to understand the use of ICTs and their influence on the learning process is the process of acceptance of technology by students from the two dimensions proposed by (Davis, 1989), to then understand the perceived usefulness to strengthen individual performance, along with ease of use in order to make less effort. Likewise, it should be considered that the use of ICT is facilitated when it is recognized as a useful tool to develop certain competences during the learning process. Secondly, it is necessary to consider how ICTs influence learning processes; thus, according to the stages of the model proposed by (Handy, Ch. 1995) there is a cycle in the learning process that begins with the questions, then follows the ideas, continues with the tests and ends with the reflection. The questions are related to the use of information technology for activities other than social or cultural, the ideas are linked to the attention span and motivation to use ICTs in other processes; the tests refer to the contribution of ICTs to these processes and, finally, the reflection includes the provision of stimuli and information of ICTs for the various activities in the learning process. The analysis of these approaches allows us to propose a model for research, where we can establish the observable variables to evaluate how the use of ICTs contributes to the learning process in university students.

According to (Castro et al., 2007), the most used ICTs currently are: Communication equipment and peripherals: computers, digital phones, tablets, digital cameras, among others, computer programs, such as: word processors, spreadsheets, support for presentations, Internet, search engines, among others and digital communication: blogs, WhatsApp, chat, email, video conferences by Skype, Facebook, Instagram, Twitter, YouTube, Slideshare, cloud, Dropbox, LinkedIn, among others. According to (Herrera, 2004), the use of ICTs by the new generation encompasses social activities, entertainment and also learning processes. These findings guide to redefine teaching practices to incorporate these new tools in the processes of university professional training and thus achieve the development of new competencies in students.

In Peru, the use of ICTs by university students in their social and academic activities is growing through different communication equipment, especially the cell phone.

In this framework, this research will focus on the influence of the use of ICT on learning processes in students of Administration and Accounting of the María Auxiliadora University.

Technology Acceptance Model.

To explain the behavior of people and the acceptance of the use of ICTs we take the TAM model proposed by (Davis, 1989) to explain the attitude of the user of information technology, regarding its acceptance or rejection. The model has two essential dimensions: The perceived utility, related to the user's belief about the improvement in their individual performance at work or in their life, when using ICTs; and ease of use, is related to the expectation of achieving results with less effort.

Learning Development

Learning is a process through which knowledge is built, or skills are developed, from reflecting on a concrete experience that is generated by interaction with the natural and social environment, (Herrera, 2004).

The learning model proposed by (Handy, Ch. 1995), is based on a cycle that considers learning as a biopsychosocial process in which the person transforms his behavior and acquires new forms of action depending on the situations he has faced in interaction with the environment. The new act is added as a product of learning in the mental pattern of the person, causing change in the rules that follow in the decision process. This model is circular and continuous since it comprises four phases or stages: Questions: considers the possible effects of acting in a given situation, ideas: seeks to understand the impact of acting by associating the circumstances, tests: testing the general principle under similar circumstances and reflection: using the general principle in new circumstances within the intended range.

3. CONTRIBUTION STATEMENT/METHODS

The study is exploratory - causal. It is exploratory since there is little research in Peru on this problem, while it is causal because it tries to find the existence of a relationship of dependence between the use of ICTs and the learning process. The research is of non-experimental design, since the behavior has not been manipulated to observe a variation in the results. It is also cross-sectional or transsectional, since the data have been obtained from information collected in a given period. The population was made up of 429 students of the Faculty of Business Sciences of the María Auxiliadora University, who were the students enrolled in the 2019 semester II. The population comprises two strata: N1 = 243 students of administration and N2 = 186 of accounting., the sample was selected by probabilistic criteria, being finally conformed by 211 participants. The independent variable "Use of ICTs" has two dimensions: ease and usefulness, with a total of 12 indicators. The dependent variable "Learning" has four dimensions with 7 indicators. Additionally, in the survey, a previous variable "Experience in using ICT" with 11 indicators is foreseen. In this way, the survey is formulated with a total of 30 questions, one per indicator, with 5 answer alternatives according to the Likert scale. The survey had a pilot test with 30 students in order to fulfill the purpose of the instruments to measure what is expected to be measured. It was then applied to all enrolled students attending class and then the number of questionnaires from each stratum was randomly selected. Each selected questionnaire was coded, and its data digitized for processing using the SPSS statistical package. (Statistical Package for the Social Sciences), version 25 for personal computer. As these are qualitative variables, descriptive statistics and the sum of their indicators were used to evaluate the independence of criteria in at least two ranges per variable.

4. RESULTS.

The reliability process of the instruments was carried out through Cronbach's alpha coefficient, resulting in a value of 0.897 and 90.80%, based on the typified elements that indicate high reliability. (Nunnally, 1978).

Table 1. *Reliability statistics.*

Cronbach's alpha	Cronbach's alpha based on typified elements	N of elements
,897	,908	30

Validity: It is the degree to which the instrument measures the variable to be measured, considering in this case content and criteria. To validate it is necessary to have similar research, which in the absence of it, the questionnaire was applied to a group of 30 students chosen at random and the results obtained were compared, observing a lot of relationship between them, which validates the instrument.

Model consistency test: It was determined that the dimensions of the observed variables are grouped according to what is established in the theoretical model. The result is that for the independent variable its indicators are grouped in the dimensions of the theoretical model.

Descriptive results of the study sample. The first descriptive results are that 80% of students live in the area of immediate access to the university that is the district of San Juan de Lurigancho in the province of Lima, Peru. In terms of gender, 61% are women.

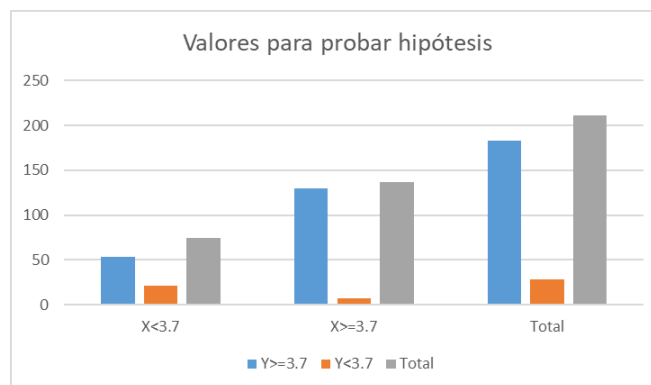
In general, university students use ICTs for their learning process, while 9.5% of students use ICTs very little to develop their learning and the rest make frequent or occasional use, with emphasis on the internet and cooperating network. The overall average of its 11 indicators is 3.45. Highlighting that the least used utilities are Facebook, Blog and Twitter. Without these, there are 8 indicators with an average of 3.8. The results achieved in the dimensions refer that just under 5% of students consider that it is not easy to use ICT. The overall average of its 6 indicators is 3.85; 1% of students consider that it is not useful to use ICT to learn. The overall average of its 6 indicators is 4.18 and 1% of students consider that ICT does not contribute to learning. The overall average of its 7 indicators is 4.09. The descriptive results indicate that the answers are loaded towards the three major options, with greater concentration in the last two and with greater emphasis on the ICT utility dimension and the dependent variable. This makes it necessary to incorporate the dimension Use of ICT as part of the dependent variable and to consider only the averages of the indicators of each variable, per student, and only two strata of both variables, around 3.7; because it is the average between the minimum and maximum values observed in the dependent variable; being also that 3.7 is the line in which students are more clearly in favor than against that variable X contributes to variable Y. With these considerations, hypothesis testing was applied using the criteria independence model with the Chi-Square test function with a degree of freedom.

The hypothesis test was first performed strictly following the dimensions of the theoretical model; that is, considering only the indicators of ease and usefulness for the variable X and the table to apply the Chi-Square test is as follows:

Table 2: Observed values to test the hypothesis.

	X<3.7	X>=3.7	Total
Y>=3.7	31	152	183
Y<3.7	17	11	28
Total	48	163	211

Figure 1: Variation of the strata of Y by influence of the strata of X



The observed value for the Chi-Square test function, according to the values in Table 1, is 26.48, higher than its tabular value for a degree of freedom, which is 6.63; so the null hypothesis H0 is rejected and the alternative hypothesis H1 is accepted, that is; "The Use of ICT does contribute to Learning".

5. DISCUSSIONS

About the theoretical model and the survey.

In this study, the theoretical model for the independent variable is well applied, but the authors consider that this model is improved if one related to the real experience in the use of ICT is incorporated as an antecedent dimension, with about 5 to 7 indicators, related to the most used utilitarian ones in the learning or development of competences in university vocational training. This is consistent with what was stated by (Cuen, C. and Ramírez, J. 2013) when it indicates that "undergraduate teachers consider that ICT is of vital importance and students mostly consider that they know how to use them to a high degree".

The applied survey already contains this possible new dimension for variable X although with more indicators than absolutely necessary. This can be seen in the result of section 3.2.2 when talking about the least used utilities. With the current results, a hypothesis test could be tested incorporating this proposal, by adding the first 8 indicators of the survey to the independent variable.

In the survey, the error is perceived that the indicators of the variable Y are not only not distributed by the dimensions enunciated in the model, but that, more than one dimension (tests and reflection) does not have indicators. The task remains to distribute indicators according to the dimensions of the model, although with the prudence of considering no less than 2 indicators per dimension and no more than 4. Although a complementary reflection is that the independent variable has no more than 18 indicators and the dependent no more than 12.

The last topic of reflection on the survey is the answer options in the first part on frequency of use and in the last three on agreeing or disagreeing. The options presented have not been good discriminators in this case. A good improvement would be to present four options or just three.

About hypothesis testing

Although the ideal for the hypothesis test was to apply a contingency table of 5 levels or ordinal values per variable, as considered in the survey, but the observations have not allowed it due to the lack of information for more than half of the possible table, which forced to consider only two levels per variable. Although with limited information the essential purpose of the study has been achieved.

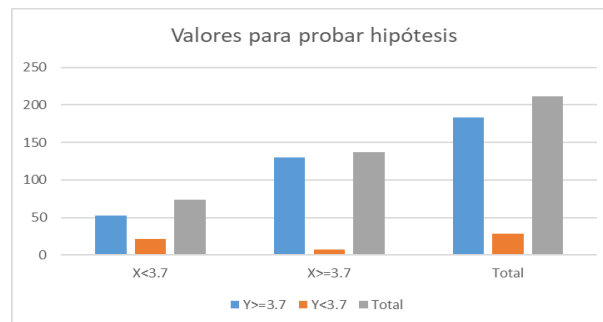
In response to the suggestion of paragraph 2 of section 4.1, it is convenient to take advantage of the available information and make a new hypothesis test by expanding the indicators of the independent variable from 12 to 20, by including the answers for the first 8 indicators of the survey.

The new two-dimensional table to apply the Chi-Square test is as follows:

Table 2: New values observed to test the hypothesis.

	$X < 3.7$	$X \geq 3.7$	Total
$Y \geq 3.7$	53	130	183
$Y < 3.7$	21	7	28
Total	74	137	211

Figure 2: New variation of the strata of Y due to the influence of the strata of X



Although there is variation in the number of observations in each stratum, in relation to Table 1, the new value observed for the Chi-Square test function, according to the values of Table 2, is 22.60, greater than its tabular value for a degree of freedom, which is 6.63; so the null hypothesis H_0 is also rejected and the alternative hypothesis H_1 is accepted, that is; "The Use of ICT does contribute to Learning".

Accepting that the use of ICT contributes to learning is consistent with the premises of the basic model (Vankatesh and Bala, 2008), in the sense that perceiving easy and useful to use ICT motivates learning, as well as with the results of (Park, S. Y. 2009), in the sense that it is effective to use ICT in the processes of developing work skills, and also with the perspectives of (Vega, C. 2017) that the growth of ICT application in learning is growing. Likewise, the contribution of ICT to learning processes agrees very well with the prospective of networked learning that it proposes (Yáñez, 2013), in the sense that it facilitates cooperation between learning subjects and that of (Morrissey, J. 2018) when it indicates that "ICT are essential in the education of the XXI century".

About the sample size for similar cases

In section 3.2 we saw that less than 5% of students consider that it is not easy to use ICT, 1%, that they are not useful and 1%, that they do not contribute to learning. This induces that for new studies the value of q to obtain the sample size, in the formula of section 2.5.1 is no longer 0.5 but, at least 0.05, or better still 0.025, and the value of p equal to $1-q$. For example, for a similar new study in a population of 429 students, if you decide to use $q = 0.05$, you require a sample of 104 students, instead of the current 203.

6. CONCLUSIÓN

This study has allowed us to accept the hypothesis that "Using ICT" does favor "Learning" in university students.

Davis' initial theoretical model, on ease and usefulness of using technologies, and its evolution, together with Handy and Herrera's models of learning using technologies, have allowed us to raise and measure the indicators of the variables under study and test the aforementioned hypothesis.

It is proposed to improve the design of the survey to achieve better results, based on completing and ordering the dimensions of the variables, as well as the number of indicators and response options.

The dimension "real experience in ICT use" was incorporated into the independent variable, with 8 more indicators, which were already in the survey, and the same hypothesis was tested, achieving the same result, which broadens the theoretical framework.

The value of q to obtain the sample size, in new similar studies, should no longer be 0.5 but, at least 0.05, or better still 0.025, and the value of p equal to $1-q$.

Contributions of the study.

Due to the importance of non-face-to-face learning, which is a trend and also a requirement in circumstances of health and environmental care, the results found indicate that the study should be replicated in other areas of learning or development of competences.

It is very necessary to improve the theoretical models and the design of the survey both in the structure of the dimensions of each variable and in its indicators and response options.

Take into account the final discussion of this work, on the sample size, to apply it in new similar studies.

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