# Gender Influence in Perception and Adoption of E-Learning Platforms

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*Abstract:* - The main objective of this study is to examine gender differences and the adoption of technology in higher education students. TAM model is the tool used to measure the acceptance and use of e-learning of the respondents. We used Partial Least Squares (PLS), specifically, the PLS multi-group analysis was used to compare differences between groups. In summary, results show that students' behavior of acceptance of e-learning technology do not manifest statistically significant differences between women and men.

*Key-Words:* Tam model, e-learning platforms, gender analysis, tertiary education, Partial Least Square, multi-group analysis

## 1 Introduction

The adoption of e-learning environments by university students is growing. While most institutions fully Web programs are less than 5% of total enrollment, the number of students enrolled in at least one course with a relevant online presence would be from 30% to 50% of total enrollment, and this is a growing trend. The purpose of this growth is to supplement traditional instruction [11], making possible to develop methods for more portable and flexible learning [42]. According to this idea, many universities around the world are using e-learning environments in the last decade.

In terms of Web technology, [32] indicated that women and men would differ on the level of trust, risk aversion and information processing, but also in their attitudes of use and instrumental motives of acceptance of Web environments. In this sense, we propose that diagnostic usefulness and perceived ease of use of e-learning environments must be a first step towards correcting possible deviations and promoting the appropriate use of these constructs in university teaching. And in turn, results may help to the proper design of such environments to respond to the different motivations of students.

In a broader context, gender is considered a cornerstone to explain the inequalities and identities in modern society [40]. In the background of adoption of information technologies, and particularly from the theoretical perspective of Technology Acceptance Model (TAM), the literature recognizes that gender is a key element to understand the differences in perceptions of usefulness and ease of use as determinants of technology adoption [39]. But with regard to e-learning platforms. Does gender affect on how college students adopt information technology to provide learning solutions efficiently and effectively? Unfortunately, the effect of gender roles in TAM has been scarcely research [23], even less in relation to e-learning platforms. And as [13] manifest, evidence on the effect of gender is far from conclusive. This lack of findings justifies the purpose of this work.

The main objective of this study is to explore gender differences and the adoption of technology in virtual learning platforms for a sample of college students. In addition a model based on TAM in this type of educational tools is tested. To achieve these goals, a

review of the literature on e-learning platforms and technology acceptance model is developed. Based on such review a model based on TAM to measure the acceptance and use of e-learning by respondents is proposed. Third, the results of applying the Partial Least Squares (PLS) analysis to the TAM model on the entire sample, and the sub-samples of women and men are presented. ANOVA was used to compare constructs measurement, and PLS multi-group analysis was used to compare differences between groups. Finally the main conclusions are exposed.

# 2 Literature review

## 2.1 E-Learning in higher education

E-Learning is defined as an Internet-enabled learning process [8]. The first courses over the Web started to emerge in 1995 and there has been a rapid expansion of on-line learning since then. One of the main reasons for the widespread use of on-line learning in many institutions is that most students now have access to the Internet. The University of British Columbia, in Vancouver, Canada, offered its first credit courses delivered entirely over the Internet to distance education students in 1996. The same year Murray Goldberg developed a software package called WebCT designed to enable Web based courses to be offered over the Internet [1]. In order to support e-learning, various Web-based learning systems have been developed for colleges and universities. Such as the Web Course Homepage System (WebCH), Blackboard Learning System, the System for Multimedia Integrated Learning (Smile) and Web Course Tools (WebCT). However, Web-based learning must take into consideration that education has activated a shift from the teaching paradigm to the learning paradigm. As a result, students are becoming more independent from the teacher. Unfortunately, much of the development of Web-based learning is carried out without a true understanding of issues that are proper to Web-based learning [9]. In general, Internet-based activities have been incorporated into regular face-to-face classes as an added resource, without reducing classroom time, but in many cases teachers have reduced the number of face-to-face classes [1]. For lecturers and students, the implications of e-learning are extensive. Increasingly universities must provide quality and flexibility to meet the diverse needs of students – this will inevitably involve tailoring courses to suit differing educational needs and aspirations. Another implication of virtual learning is the increase of

international competition for students by many universities, new communication methods are useful tools that encourage internationalization of tertiary learning [21]. Furthermore, e-learning reflects the new dynamic response to the needs of a knowledge society and implies freedom and equality to access knowledge beyond cultural and social boundaries [27]. Therefore, it is necessary to investigate whether there are gender differences in the use or perception of e-learning. In case they exist it would be indispensable to implement policies of integration or adaptation of these technologies.

## 2.2 E-Learning and TAM

Proposed by Fred Davis [6], TAM posits that individual behavior intention to use information technology is determined by the perceived usefulness and perceived ease of use. Also, perceived ease of use is directly impacted by perceived usefulness. Since then, several revisions and expansions have developed the original model. The most popular developments have been TAM2 [37] and TAM3 [36]. The literature presents several studies using TAM to assess users' acceptance of e-learning technology. In most of these studies, TAM was extended using factors predictors or moderators, such as: subjective norms ([35]; [26]); computer self-efficacy ([23]; [2]; [26]); perceived playfulness; [29]); cognitive absorption ([31]; [17]); system features ([2]; [17]; [26]); computer anxiety [35]; gender ([23]); motivational factors ([25]; [29]); personal innovativeness [35]; technical support [20]; perceived credibility; and compatibility [2].

# 3 Proposed Model

We have proposed a model based on the basic TAM, which relates the constructs of Perceived Usefulness (PU), Perceived Ease of Use (PEOU) and Behavioral Intention (BI). It also includes the effect of BI on the Use of the Platform e-Learning (USE). This basic TAM model is enriched with three antecedents on the one hand, result demonstrability (RES) precedes PU, and secondly, Perception of External Control (PCE) and Perceived Enjoy (ENJ) precedes PEOU. The proposed TAM model including 7 hypotheses is shown in Figure 1.

TAM model has been used successfully in the context of e-learning [30]. In particular, results of [10] suggest that students use e-learning environment (USE), if they perceive it is useful (PU) and easy to use (PEOU). Previously, [20] indicate that perceived ease of use (PEOU) and perceived usefulness (PU)

are the main factors affecting the attitude of university students to use e-learning (BI). Also, it is verified that perceived usefulness (PU) directly affects the student's intention to continue using e-learning (BI).

Figure 1. Proposed model
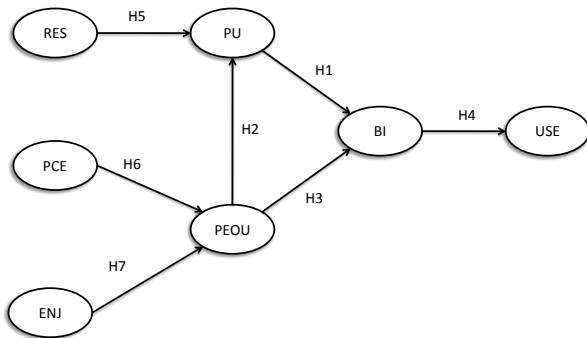


[36] proposed that result demonstrability (RES) is an antecedent of perceived usefulness (PU). On the other hand, the same authors proposed that perception of external control (PCE) is an antecedent of perceived ease of use (PEOU).

Perceived enjoyment using information technology (ENJ) is defined by [29] as the degree to which the activity of using an information technology is perceived as pleasant by itself, apart from the intrinsic instrumental value of the technology. [36] proposed that perceived enjoyment using information technology (ENJ) is positively related to perceived ease of use (PEOU). In the context of e-learning environments, results of [29] reported that perceived enjoyment (ENJ) directly affects perceived ease of use (PEOU).

The evidence about the effect of gender on the acceptance of information technology is not conclusive [13]. Results of previous studies show conflicting evidence in relation to whether gender affects or not the likelihood of using a computer system. For example, results of [33] indicate the existence of such effects, and on the contrary, results of [18] indicate that these effects may disappear, especially in a young population. Also in Web environments not clear evidence on gender-related effects exists. [15] reported not statistically significant differences between men and women in the process of adopting a particular Web technology. In contrast, there is previous evidence of gender-related effects in the context of the adoption of e-learning. Particularly, [23], based on a sample of Taiwanese workers, show that men's scores on the perceived usefulness (PU), perceived ease of use (PEOU) and behavioral intention to use e-learning

(BI) are higher than scores of women. In addition, perceived usefulness (PU) influences the behavioral intention to use e-learning (BI) more strongly for men than for women. And, similarly, perceived ease of use (PEOU) influence the perceived usefulness of e-learning (PU) more strongly in women than in men. Considering the controversy explained above and the importance of a replica in a culturally distinct sample, and based on the study of [23], the following hypotheses are proposed:

*H8a: Statistically significant differences between men and women exist in the scores of adoption of e-learning variables in college students.*

*H8b: Statistically significant differences between men and women exist in relationships between variables of the adoption of e-learning in college students.*

## 4 Methodology

Empirical research was based on a nonrandom sampling method. Data were collected in Spain through an online questionnaire from May to July 2009. The online questionnaire was sent to students of a main University from the south of Spain. Respondents were taking courses in the areas of Marketing and Business Management using e-learning platform WebCT. The exclusion of invalid questionnaires provided a final sample size of 189 students, 66 males and 123 females. The average age of interviewees was 23.8 years old and they have been studying for 4.21 years (on average) at the University. So, they are students with extensive experience as college students.

The applied measurement scales have been widely tested in other research. Specifically, to measure TAM construct the scales proposed by [36] have been adapted.

ANOVA was used to analyze if gender differences in the different constructs of the model exist. Then a multi-group analysis of the proposed model was applied using Smart-PLS software.

## 5 Results

Results of the descriptive statistics are shown in Table 1. The scale used is a 5-point Likert type, except variable USE that is measured in minutes per week. SPSS software was used for this test.

As you can see in the last two columns of Table 1, ANOVA test results indicated no statistically significant differences between the scores of men and women. As the variables did not meet the requirement of normality, nonparametric techniques (Mann-Whitney and Kolmogorov-Smirnov) to corroborate the ANOVA results were applied. The

estimates provided similar results. Therefore, hypothesis H8a is refuted.

Table 1. Scores and ANOVA Test

| Latent Variable | Males (N=66) | | Females (N=123) | | ANOVA | |
|---|---|---|---|---|---|---|
| | Average | Typ. Dev. | Average | Typ. Dev. | F | Sig. |
| PU | 3.7 | 0.75 | 3.87 | 0.67 | 2.71 | 0.1 |
| PEOU | 4.1 | 0.71 | 4.3 | 0.62 | 3.01 | 0.084 |
| BI | 4.1 | 0.80 | 4.2 | 0.83 | 0.125 | 0.72 |
| ENJ | 2.98 | 0.88 | 3.14 | 0.67 | 2.26 | 0.134 |
| RES | 3.43 | 0.54 | 3.53 | 0.52 | 1.22 | 0.27 |
| PCE | 3.45 | 0.57 | 3.6 | 0.51 | 3.22 | 0.074 |
| USE | 80.45 | 81.17 | 89.58 | 92.6 | 0.44 | 0.507 |

Partial Least Squares (PLS) approach is a type of Structural Equation Modeling (SEM) that was used to test the proposed research model [4]; [34]. Initially, the proposed model was validated for the whole sample (189 cases). Then the sample was divided into two groups: males and females. Multi-group PLS analysis was used to compare differences between groups. SmartPLS software was used for this analysis [28]. A PLS model is described by two models: the measurement model and the structural model.

As a previous step to the structural model analysis is necessary to analyze reliability and validity of the measurement model. Reliability was evaluated by examining individual loads ($\lambda$) or simple correlations of the measures with their respective latent variables (indicators with $\lambda \geq 0.7$ were accepted). Cronbach's $\alpha$ coefficient was used as the reliability index of the latent variables (variables with $\alpha > 0.7$ were accepted). In addition, composite reliability was calculated. The convergent validity of latent variables was assessed by examining the average variance extracted (AVE), (variables with AVE$> 0.5$ were accepted). Discriminant validity of latent variables was tested analyzing whether the square root of AVE of each one was greater than the correlations with the rest of latent variables.

After analyzing validity and reliability of the measurement model, relationships between the constructs were addressed. Hypotheses were tested by examining path coefficients ($\beta$) and their significance levels ($\beta > = 0.2$ were accepted). A bootstrapping with 500 sub-samples was performed to verify the statistical significance of each of the path coefficients. The variance explained (R-squared) in the endogenous latent variables and p-values of regression coefficients (F-test) serve as indicators of the explanatory power of the model. Figure 2 shows the result for the model considering the whole sample.

Figure 2. PLS results for the whole sample.



Sig. * p =0,05 ** p=0,01 *** p=0,001
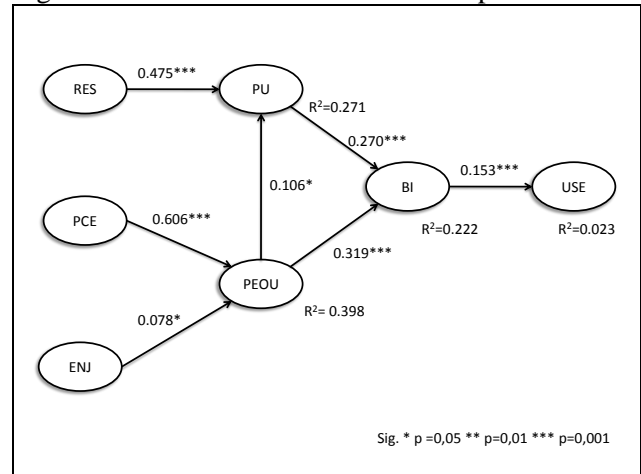
Results of PLS analysis for the model with the groups of males and females are shown in Table 2. Based on these results hypotheses H1, H2, H3, H4, H5, H6 and H7 are accepted.

Table 2. Path coefficients

| Path | Males | (Sig.) | Females | (Sig.) | t-spooled | (Sig.) |
|---|---|---|---|---|---|---|
| BI -> USE | 0,24 | *** | 0,10 | * | 0,86682 | n.s. |
| ENJ -> PEOU | 0,09 | * | 0,06 | n.s. | 0,14556 | n.s. |
| PCE -> PEOU | 0,49 | *** | 0,68 | *** | -1,43107 | n.s. |
| PEOU -> BI | 0,40 | *** | 0,29 | *** | 0,71114 | n.s. |
| PEOU -> PU | 0,13 | * | 0,08 | n.s. | 0,24288 | n.s. |
| PU -> BI | 0,18 | *** | 0,32 | *** | -0,71906 | n.s. |
| RES -> PU | 0,45 | *** | 0,49 | *** | -0,21174 | n.s. |

From this table we can refute hypothesis H8b.

# 6 Conclusions

In conclusion, we highlight four main contributions of this study. Firstly, a version of TAM model, that includes elements of TAM2 and TAM3, to explain the process of adoption of e-learning in higher education in a Spanish university has been used successfully. This means you can use a tested tool in other areas of technology in the field of virtual education platforms, helping to test and to improve these educational techniques that will undoubtedly gaining weight in college learning.

Secondly, the finding of a strong and significant relationship between Perception of External Control and Perception of Ease of Use of e-learning platform is remarkable. This has implications for the design of these platforms in relation to control and resources given to users. This can be interpreted as an indication that users of these platforms like having

control over the system. Probably, students like to customize the platform environment.

Thirdly, according to previous literature, a significant relationship between Perceived Enjoy and Perceived Ease of Use and between Results Demonstrability and Perceived Utility is found. If students conceive the use of the platform as fun and enjoyable they show a higher perception of ease of use of it. Another consequence is that students who communicate to others the possibilities of the platform give more value to it.

Last but not least, the study indicates no statistically significant differences between males and females when adopting e-learning platform according to the tested model. However, multi-group analysis holds some information differentiating between both genders. The relationship between behavior intention and use is stronger among males, this suggests a greater willingness of men to a greater use of the platform when behavior intention exists. It is also stronger among the males of the sample the relationship between the perception of ease of use and behavioral intention. By contrast, among female students is stronger the relationship between perception of external control and perception of ease of use. This seems to indicate that this group of students value more perception of greater control of the virtual learning platform. It is also stronger among the women of the study the relationship between perceived usefulness and behavioral intention. Although the results of [23] report different reactions to gender in the adoption of e-learning platforms, the results of this study are in line with [15] and [18]. Consistently with [18], we believe that analyzing a sample of university students (not employees) is a key point to explain this result. Students both men and women have equal educational technology in the classroom. Often, they have similar previous training, especially in the higher courses with a very similar experience as learners. This may be one reason why gender inequalities regarding the perception of new technologies that often occur in other areas do not appear among higher education students. Further research is necessary to continue the work on this topic.

This study has some limitations that guide future work. First, the validation of results requires a larger sample of individuals. Second, the use of a non random sample within a single organization is a limitation to the generalizability of findings. Third, the study is cross sectional, a longitudinal study would be advisable to compare the different stages of the adoption of e-learning. Finally, it would be useful to incorporate more students from other areas of knowledge different of marketing and business organization, such as engineering, exact sciences or other social sciences and humanities. Also, including students in early grades with less experience as learners and users of these e-learning platforms may yield more complete and detailed studies.

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