USE OF VIRTUAL PLATFORM AND THE QUALITY OF LEARNING PERCEPTION: THE CASE OF TWO UNIVERSITIES IN SOUTHWEST ANDALUSIA

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1. INTRODUCTION

Since the mid-1980s, public interest in and concern about quality standards in higher education institutions has led to spend considerable efforts to the provision of well-designed teaching and learning aids (Harvey, 2005). Efficiency gains have been achieved largely by changes in the traditional approach of teaching and learning toward the development of student-centred learning approaches, where the staffing input shifts from that of teacher to facilitator. The parallel development in these decades of information and communication technologies has been decisive as a provider of teaching and learning's tools so that this new approach has been built in such a way that that the it can be based on a solid technological environment (Sife et al., 2007).

In this context, both face-to-face and online universities worldwide have massively introduced software called learning management systems (LMSs) or virtual platforms into their processes to manage, distribute and control the training activities of their students, becoming an essential element of the teaching and learning processes (Torrente et al. 2009).

Considering only Moodle platform with almost 316 million users worldwide and 42 million courses in 42 languages gives an idea of the magnitude, impact and potential of LMSs in the learning processes. Therefore, it is not surprising that (LMSs) have become increasingly a topic of interest to researchers.

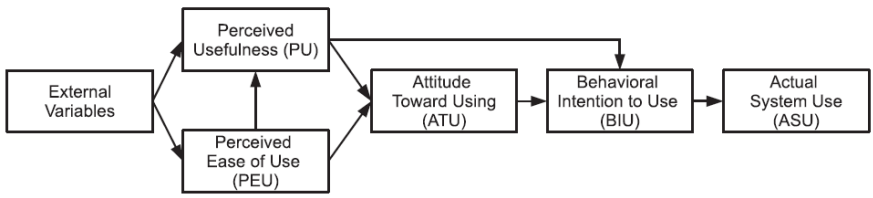
There have been reported many benefits of using LMSs to support the lectures in higher education. Its implications for student support and online interaction, lead to educational agents to a collaborative of different learning environments, where they can combine face-to-face instruction with computer-mediated instruction or blended-learning, increasing the possibilities for better quality and quantity of human communication in a learning background. In general components of learning management systems contain synchronous and asynchronous communication tools, management features, and assessment utilities Lopes (2014).

Several studies have been undertaken that show the advantages that LMSs offer. Regarding the benefit of ease-of-access to learning materials (Yunus, 2021; Chaw and Tang, 2018; Cavus, 2015; Islam & Azad, 2015). Another disruptive impact of the introduction of LMSs is related to the possibility of online instructor feedback which allows to remove barriers of the traditional face-to-face tutoritation work (Fernando, 2020; Hölbl and Welzer, 2010; Oertig, 2010). Other studies show evidence that LMSs enhance collaborative learning with peers (Lu and Law, 2012; Tiantong and Teemuangsai, 2013; Sun et al. 2017). However, although there is strong evidence that LMSs is a useful teaching-learning tool, some individuals may experience technical issues with the system. Moreover, the perception of the students about their experience with these tools could condition the efficiency of the system. Therefore, the perception of students regarding the usefulness and ease of these technological products are determinants and key success factors in the quality of student learning experience in higher education.

In this context of educational research, the popular Technological Acceptance Model (TAM) Davis et al., (1989) and some of its extensions such as the unified theory of acceptance and use of technology (UTAUT) have become the most spread and extended models for studying technology acceptance in the context of education (Šumak et al.,

2011; Granic´ and Marangunic, 2019). Based on Ajzen's Theory of Planned Behaviour (TPB) (Ajzen, 1985), Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975) original TAM premise relies on determine whether we form an intention to use a technology and then actually use it, which is the main purpose when a piece of technology is designed and implemented by decision makers.

FIGURE 1. *Technology Acceptance Model (TAM)*



Fuente: Davis et al. (1989)

As we can see in Figure 1, the end- point is "Actual System Use (ASU)" which is the purpose of the implementation of an educational technology. The question is, what are the factors that lead users to actually use a technology? Firstly, individuals have to form a "Behavioral Intention to Use (BIU)" and that in turn is influence by they "Attitude Toward Using (ATU)". Attitudes involve issues such as what they think of the technology, if they like it, general impression, etc., and depending on these attitudes, they form intentions and then go on an use it.

What feeds into ATU is the crucial question and the subject of TAM. User motivation to use a technology can be explained by two factors: Firstly, the Perceived Ease of Use (the degree to which the person considers that using that particular technological system does not demand extra efforts or skills) such as calculating something or accessing a record or loading a document. Secondly, the Perceived usefulness (degree to which the person believes that using this technological is useful for his/her everyday life). External variables influence both Perceived Use and Perceive Ease of Use. These variables are linked to the user's predisposition to certain type of technology evaluated such a computer or a phone, previous experience with similar technology, and the so-called "social norms" related to if and how other individuals are using the

technology evaluated, the technical support, acceptance of the technology for they peer, it is a technology compulsory or it is optional.

Under the umbrella of TAM, there are many studies that focus on the analysis of factors that explain the perception of students regarding their experience with the use of LMSs or virtual platforms. However, there are no studies that relate specifically these factors with the output quality of learning, an important gap in the literature that constitutes the object of our investigation.

1.1. Literature Review

Several studies have been undertaken to validate TAM's hypothesis in the field of education. Following ˇSumak et al. (2011), who undertook a meta-analysis to determine the causal effect sizes between main determinants of user motivation to use a technology in the context of e-learning, is not surprising to find that Perceived Ease of Use and Perceived Usefulness are the two factors that most influence the attitudes of users in using a given learning technology. This can be understood as we can reduce to two the factors that explain the motivation toward the use of LMSs. Hence the Perceived Ease of Use and the Perceived Usefulness the factors that indeed determine if the user will actually use the system or not. Gammble (2018) found positive and significant relationships for each TAM construct when measuring acceptance of the utilization of Google Sites (GS) in a Japanese university. In a similar approach, Brezavšček et al., (2014) and Hsu et al. (2009) validate TAM studying the acceptance of widely used programs for statistical analysis among students of social sciences of three Slovenian universities and MBA students in Taiwan respectively.

Several studies aim to taste TAM hypotheses regarding t LMSs. From these studies, it can be concluded that the Perceived Ease of Use is the most analysed construct and Perceived Ease of Use as a determinant of Perceived Usefulness has been the most accepted hypothesis of Davis's TAM evidencing the importance of importance of achieving the acceptance and use of an LMS. Teo et al., (2019) found that Students' PEU has a positive influence on their PU. Other studies that validated the

main constructs of TAM evaluating LMs are Sánchez-Prieto et al., (2017); Eraslan and Kutlu (2019) and Rahmi et al., (2018)

Regarding the use of extension of TAM, to testing the acceptance of LMSs, Abdullah and Ward (2016) developed a general extended TAM called GETAMEL to measure e-learning adoption identifying the key external factors that influence the constructs Perceived Use and Perceive Ease of Use. Garone et al. (2019) use a modified TAM to investigate the technology acceptance of a new learning management system (LMS) by Belgian university teaching staff. Based on original TAM, a growth model is used by Yuen et al., (2019) to analyse the student's satisfaction with a learning management system.

Although the most studies have validated TAM's hypothesis in testing the acceptance of LMSs Nistor (2014); Scherer et al., (2019) evidenced contradictions when findings of some of these studies were generalized and compared. These authors suggest the cultural specificity, external variables used and the specificity of technologies evaluated as main causes of divergences.

Beyond the internal links between the factors argued by TAM, some authors reported findings extending TAM with external variables. For example, Abdullah and Ward (2016) focus on external factors such as Self-Efficacy, Subjective Norm, Enjoyment, Computer, Anxiety and Experience as drivers of motivation to use LMSs and conclude that Self-Efficacy is the best predictor of the variable Perceived Ease of Use. Similarly, Ponce et al. (2014) identified "Performance expectancy", "effort expectancy", "social influence", "self-efficacy", and "anxiety" when they study the variable acceptance of learning technologies through a survey carried out in a Spanish university context. Other studies that include external variable to analyse acceptance of LMSs under the umbrella of TAM are Ye et al. (2010), Liu et al. (2010) and Joo et al. (2014).

Regarding quality of learning, some studies use surveys to measure it through students' satisfaction or perceptions of effectiveness (Marouchou, 2011; Aziz et al. 2012). However, there appears to be consensus on the idea that students' quality of learning outcomes is strongly linked to basically two approaches to learning. From one hand, the

surface approach is characterized by low cognitive level activities motivated by the desire to perform the task with minimum effort. On the other hand, the deep approach involves efforts towards conceptual learning through the identification of principles, main ideas and well as applications.

For example, Qureshi and Raza (2014) examine how the students' approaches to learning affect the quality of the learning outcomes. These authors state that those students that have a strong intention to understand the subject matter and focus their efforts to integrate both previous and new knowledge, identified as the so-called deep approach, obtain high-level quality of the learning outcomes. Similarly, Trigwell and Prosser (1991) use SOLO taxonomy to measure qualitative learning outcomes and conclude that the quality of learning outcomes is associated with the capacity to relate ideas a deep approach when a student faces a new knowledge.

Finally, Doo and Bonk (2021) using an extension of TAM, found positive and significative the effects of relevance for learning and the quality of learning outcomes on students' perceived usefulness and intention to use tools linked to flipped learning at a Korean university.

2. OBJECTIVE

The aim of this study is to analyse which factors related to the perceptions of students' intention to use virtual platform has higher impact on the output quality in the southwest of Andalusia. In this sense, it is intended to analyse not only whether there is a significant effect, but also the sign of the effect.

3. DATA AND METHODS

3.1. PARTICIPANTS

The participants in this questionnaire were 104 university students from the University of Seville and the University of Huelva, two universities belonging to the southwest of Andalusia. All of them belong to Bachelor's degree programs and more specifically in the Accounting and

Finance area during the academic year 2022/2023. Namely, we will analyse the case of two universities in the southwest of Andalusia with similar socio-demographic characteristics, trying to have as homogeneous a sample as possible.

3.2. PROCEDURE

Data were collected with the help of instructor at university. The survey was created on Google Forms using the items category included on variables. The instructors perform the survey using the questionaries' forms in the classroom after explaining the concepts asked. The duration of the questionnaire took fifteen minutes, although most of the students completed it in only ten minutes.

3.3. VARIABLES

The survey was designed incorporating a set of socio-demographic questions such as age, gender, class assistant, tutorial hours, location of the two universities and the students' number of times enrolled. The survey also has a set of questions related to perceptions of students' intention to use virtual platforms, these questions are defined using a 5-point Likert scale, where the answer 1 is defined as totally disagree and 5 totally agree. It should be noted that the questionnaire is carried out and validated using previous literature on the matter. Concretely, it is followed the work of Teo et al. (2019) and in Table 1 the details for each items can be observed: i) Output quality; ii) Perceived usefulness; iii) Perceived ease of use; iv) Attitude towards using; v) Technology complexity; vi) Behavioural intention; vii) Perceived behavioural control; and vii) Anxiety.

Table 1 also includes the questions used to generate each of the measures. For its generation, the Principal Components Analysis (PCA) methodology has been used from the weights of the eigenvalues for a significance of 95% and using varimax. Once the eigenvalues are obtained, they are normalized and rescaled.

3.4. MODEL SPECIFICATION AND VARIABLE DEFINITION

$$Output\ Quality_i = Const + \beta_1 \cdot Behavioral_i + \beta_2 \cdot Technology_i + \beta_3 \cdot Intention_i + \beta_4 \cdot Attitude_i + \beta_5 \cdot Anxiety_i + \beta_6 \cdot Ease_i + \beta_7 \cdot Usefulness_i + \beta_1 \cdot Age_i + \beta_1 \cdot Gender_i + \beta_1 \cdot Assistant_i + \beta_1 \cdot Tutorials_i + \beta_1 \cdot Enrolled\_number_i + \varepsilon_i$$

4. RESULTS AND DISCUSSION

In this section, we analyse the results obtained from the descriptive statistics, matrix correlation and the model with the aim of capturing the perceptions of students' intention to use virtual platforms, as well as to see what factors impact on the output quality by using virtual platforms.

4.1. DESCRIPTIVE RESULTS

Table 1 shows the descriptive statistics of all the variables analysed in the current study. The results obtained are divided into two panels. Panel A presents the socio-demographic characteristics and Panel B shows the perceptions of students' intention to use virtual platforms.

Panel A presents that the mean age of the participants in the current study was 21.77 year (standard deviation= 3.37) where 68% were female (standard deviation= 0.47), 15% were from the Huelva University and 85% from Sevilla University. On the average, the students attended classes in more than 75% and they went to the tutorial hours one or two times in the semester. Finally, the number of times enrolled showed a mean of one time enrolled (1.31) with a standard deviation of 0.71.

Regarding our dependent variable, table 1, panel B, the perceptions of students' intention to use virtual platforms, the findings show the following results. Output quality variable is measured with four questions where the results present that the students using virtual platforms has improved the quality of learning in a mean of 3.71 with a standard deviation of 0.78. Compared to what students had done in the past, using virtual platforms at university have made learning easier in a mean of 2.80 and with a deviation of 0.70. The figures present that using virtual

platforms has increased the effectiveness in a mean of 3.64 and the productivity in learning in a mean of 3.57.

***TABLE 1**. Descriptive statistics*

Variable	Mean	Standard deviation	Min.	Max.
Panel A: Socio-demographic characteristic				
Age	21.77	3.37	20	47
Gender	0.68	0.47	0	1
Class assistant	3.13	0.79	1	4
Tutorial hours	1.09	0.30	1	2
Huelva University	0.15	0.36	0	1
Sevilla University	0.85	0.36	0	1
Number of times enrolled	1.31	0.71	1	4
Panel B: Perceptions of students' output quality (Dependent variable)				
Output quality				
Improvement the quality of learning	3.71	0.78	1	5
Learning easier	2.80	0.70	1	5
Effectiveness	3.64	0.90	1	5
Productivity	3.57	0.84	1	5
Panel C: Perceptions of students' intention to use virtual platforms (Independent variables)				
Perceived usefulness				
Learn more quickly	2.80	0.72	1	5
Improves my performance in learning	3.66	0.81	1	5
Increases my productivity in learning	2.64	0.82	1	5
Enhances my effectiveness in learning	3.38	0.96	1	5
Useful to learning	3.11	0.75	1	5
Perceived ease of use				
Easy to use virtual platforms in learning	4.06	0.82	1	5
Interaction with virtual platforms	3.98	0.81	1	5
Good at using virtual platforms	4.12	0.77	1	5
Virtual platforms are easy to use in learning	4.11	0.90	1	5
Attitude towards using				
Hard to stop	2.78	.991	1	5
Look forward to using and learning	2.95	1.01	1	5
Use virtual platforms in learning	3.37	1.02	1	5
Positive feelings	3.76	0.89	1	5
Technology complexity				
So complicated	2.19	0.91	1	5
Too long to learn	2.08	1.08	1	5

Complex activity	2.11	1.09	1	5
Behavioural intention				
To continue to use	3.48	0.92	1	5
Use virtual platforms in the future	3.49	0.96	1	5
Use virtual platforms in learning the future	3.40	1.00	1	5
Perceived behavioural control				
Control over virtual platforms	2.97	0.75	1	5
Resources necessary to use	3.27	0.61	1	5
Knowledge necessary to use	3.23	0.70	1	5
Easy for me to use	3.24	0.67	1	5
Anxiety				
Feel apprehensive	2.36	1.05	1	5
Making mistakes	2.14	0.98	1	5
Intimidating	2.05	1.04	1	5

Source: Own elaboration

In table 1, panel C, it can be seen the independent variables related to the perceptions of students' intention to use virtual platforms highlighting the following aspects:

Firstly, the perceived usefulness variable captures that the perceptions of students' intention to use virtual platforms has enabled to learn quickly in a mean of 2.80, to improve the performance in learning in a mean of 3.66, to increase the productivity in learning in a mean of 2.64 and to enhance the effectiveness in learning in a mean of 3.38.

Second, the perceived ease of use variable shows that it is easy to use virtual platforms in the learn process in a mean of 4.06 and with a standard deviation of 0.82 and the perceptions of students show that it is easy form them to become good at using virtual platforms in a mean of 4.12 with a dispersion value of 0.77.

Third, the attitude towards using variable presents that the perceptions of students of having positive feelings toward using virtual platforms in learning have a mean of 3.76 over 5 points with a deviation of 0.86. Besides, the perceptions of students show that students like to use virtual platforms in learning in a mean of 3.37 over 5 point and with a standard deviation of 1.02.

Fourth, the technology complexity captures that the perceptions of students' intention to use virtual platforms are complicated in a mean of 2.19 and with a standard deviation of 0.91, are too long to learn in a mean of 2.08 with a deviation of 1.08 and are complex activity in a mean of 2.11.

Fifth, the behavioural intention variable presents that the students' intention to use virtual platforms continue in the future (mean of 3.49 and standard deviation 0.96) and in the learning process in the future (mean of 3.40 and standard deviation 1.00).

Sixth, the perceived behavioural control variable shows that students have control over virtual platforms with a mean of 2.97, have the resources necessary to use virtual platforms with a mean of 3.27, have the knowledge necessary to use virtual platforms with a mean of 3.23 and for them it is easy to use virtual platforms with a mean of 3.24.

And, seventh, the anxiety variable presents that student's perceptions show that they feel apprehensive about using virtual platforms (mean 2.36 and standard deviation 1.05), they make mistakes (mean 2.14 and standard deviation 0.98) and they feel intimidated when use virtual platforms in the learning process.

The Table 2 presents the descriptive statistics of the factors that were constructed with the principal components analysis methodology. The dependent variable, the output quality, shows a mean of 2.82 and a standard deviation of 1.12. The independent variables related to the intention of use of university students when using virtual platforms highlight that the perceived ease of use variable has a mean of 3.40, the perceived behavioural control variable has a mean of 3.4, the perceived usefulness variable has a mean of 3.03 and the perceived behavioural control variable has a mean of 3.37. With values over the mean value Table 2 presents the means of the Technology complexity (mean 0.68 and standard deviation 1.34) and anxiety (mean 1.97 and standard deviation 1.38).

***TABLE 2**. Descriptive statistics of the factors*

Variable	Mean	Standard deviation	Min.	Max.
Dependent variable				
Output quality	2.82	1.12	1	5
Independent variable: Perception of Intention of use of university students when using virtual platforms				
Perceived usefulness	3.03	0.94	1	5
Perceived ease of use	3.40	1.08	1	5
Attitude towards using	2.79	1.02	1	5
Technology complexity	0.68	1.34	1	5
Behavioural intention	3.07	1.12	1	5
Perceived behavioural control	3.37	1.20	1	5
Anxiety	1.97	1.38	1	5

Source: Own elaboration

Table 3 presents the correlation matrix with the Pearson's bivariate correlation to analyse the degree of linear relationship between the variables of this study. This matrix shows that there is a positive and significant correlation between the perceived usefulness, perceived ease of use, attitude towards using, technology complexity and perceived behavioural control and the output quality. Besides, there is a negative and significant correlation between the anxiety and output quality. Regarding the control variables, the matrix correlation has a positive and significant correlation between the students' age and the output quality. The coefficients of these significant and lineal relationships are lower than 0.7 in all cases. Thus, there is evidence to rule out multicollinearity.

***TABLE 3**. Correlation matrix*

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Output quality	1														
2. Perceived usefulness	0.54***	1													
3. Perceived ease of use	0.25***	0.40***	1												
4. Attitude towards using	0.50***	0.61***	0.51***	1											
5. Technology complexity	0.31***	0.33***	0.250***	0.53***	1										
6. Behavioural intention	-0.14	-0.18*	-0.35***	-0.15	-0.08	1									
7. Perceived behavioural control	0.41***	0.42***	0.48***	0.45***	0.25***	-0.52***	1								
8. Anxiety	-0.19*	-0.25**	-0.38***	-0.30***	-0.12	0.55***	-0.57	1							
9. Age	0.35***	0.33***	0.19**	0.3***	0.21**	-0.17*	0.19**	-0.15	1						
10. Gender	-0.01	-0.01	0.08	-0.06	0.02	-0.22	0.17	-0.06	0.03	1					
11. Class assistant	0.14	0.13	-0.05	0.06	0.06	0.06	0.89	0.02	0.03	0.14	1				
12. Tutorial hours	0.09	0.11	0.08	0.10	0.09	0.32	-0.03	0.10	0.20**	-0.06	0.110	1			
13. Huelva University	0.54***	0.45***	0.28***	0.52***	0.41**	-0.22***	0.36***	-0.27***	0.50***	-0.11	0.20	0.20	1		
14. Sevilla University	-0.54***	-0.45***	-0.28***	-0.52***	-0.41***	0.22**	-0.36***	0.27***	-0.50***	-0.11	-0.20	-0.20	-1	1	
15. Number of times enrolled	-0.01	0.08	-0.04	-0.02	-0.12	-0.02	-0.02	-0.03	0.24**	0.21**	0.21**	-0.04	-0.14	-019*	1

Note: *** Significant at the 1% level; ** Significant at the 5% level;
* Significant at the 10% level.

Source: Own elaboration4.2. model results

Table 4 reveals the model results. The model study which factors related to the perceptions of students' intention to use virtual platform impact on the output quality. The findings reveal how perceived behavioural control ($\beta = 0.203$; $p<0.001$) and perceived usefulness ($\beta = 0.336$; $p<0.001$) to use virtual platform impact positive and significant on the output quality. Regarding the control variables, our results show that using Universidad of Huelva as the reference category, the students from Universidad of Sevilla have higher output quality ($\beta = 0.183$; $p<0.001$) than those from Universidad of Huelva. related to the students' academic performance. The model is significant ($F = 8.438$; $p<0.001$) and the variables explain 44.3% (R2) of the variation in students' output quality.

***TABLE 4**. MODEL*

	Output quality
Perceived behavioural control	0.203*
	(0.095)
Technology complexity	0.049
	(0.605)
Behavioural intention	-0.016
	(0.870)
Attitude towards using	0.152
	(0.272)
Anxiety	0.054
	(0.566)
Perceived ease of use	-0.093
	(0.315)
Perceived usefulness	0.336**
	(0.012)
Age	0.004
	(0.349)
Gender	0.007
	(0.854)
UHU	0.183***
	(0.009)
Class assistant	0.002
	(0.914)
Number of times enrolled	0.002
	(0.949)
Tutorial hours	-0.011
	(0.862)
Constant	0.053
	(0.675)
N	104.000
F	8.438
df_m	13.000
df_r	90.000
r2	0.443
p	0.000
test	

Note: *** Significant at the 1% level; ** Significant at the 5% level;
* Significant at the 10% level.

Source: Own elaboration

5. CONCLUSIONS

In this work on teaching innovation, we have analysed which factors related to the perceptions of students' intention to use virtual platform has higher impact on the output quality in the southwest of Andalusia. This work has been carried out with students enrolled in Bachelor's degree programs and more specifically in the Accounting and Finance area during the academic year 2022/2023.

As we have cited in the previous literature, the use of virtual platforms by both instructors and students has been imposed in learning management systems, as highlighted by Costa et. al (2016) and Yeou (2016). However, there are many authors who demand further analysis in this use since the response may be conditioned by the context (Hölbl and Welzer, 2015).

In this work we have been able to verify that although the a priori was the existence of a significant relationship between the different factors related to behaviour, technology, intention, attitude, anxiety, ease of use or the perception of usefulness with the output quality, the empirical evidence does not corroborate it. Only the perceived behavioural control and the perceived usefulness were positive and significant on the perception of quality. That is, the more positive the perception of control and utility of the platform is, the more positive the perception of quality achieved.

It is also striking how variables that the literature accepts as having an effect do not. Even some with signs contrary to what was expected as the intention (Teo, 2009), although not significant. Also contrary to the literature (Teo et al. 2019) the results show that anxiety is not a determining factor, which leads us to think that it is necessary to continue with the analysis to know the transmission channels of the behaviour on the final quality.

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