

Investigating Students' Acceptance of a Learning Management System in University Education: A Structural Equation Modeling Approach

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Abstract. Tools emerged from information technology, such as Learning Management Systems (LMS), have been proven to significantly boost the students' performance and productivity. Hence, many higher education institutions have adopted such systems. Given the fact of the growth rates in adopting LMS in university education and the imperativeness of the factors' evaluation before the adoption of such a system at State University of Tetova in Macedonia, adds to the urgency to conduct a research by which factors that predict the students' intention to adopt LMS to be examined. In this paper, based on extant literature review and by utilizing the Unified Theory of Acceptance and Use of Technology (UTAUT), as the best model for predicting individual's technology acceptance, a research model is developed. By employing survey, the relations between the factors are described. Empirical data is gathered through purposive sampling technique. The results of this study, beside the theoretical contribution, are of a great importance to the university itself in promoting the use of technology in teaching and learning, and also confirm the need for adopting a LMS.

Keywords: Learning Management System, UTAUT, Intention, Adoption

1 Introduction

Over the years information technology (IT) is increasingly becoming an integral or imperative part of everyone's working and personal life. Information and knowledge is needed to be reached everywhere and at any time [1].

Learning Management System (LMS), as a tool emerged from IT, and it is considered as one of the most significant developments in the use of IT in universities in the last decades[2]. Such information system (IS) provides many benefits to individuals and organizations [3]. From the students' perspective, these systems provide them with the ability to access the course materials, delivered by the instructors, and use communication and interactive features in their learning activities, which in turn have been proven to significantly boost their performance and productivity [4]. Hence, many higher education institutions have adopted such

systems. The adoption of LMS is influenced by a number of factors, grouped as critical success factors into four categories [5] namely, instructor, student, IT, and university support, hence this paper takes into consideration the students' personal decision to adopt such a system.

Although, there are several studies that have focused specifically on the users' – students' intention to adopt such systems [6-11], however we should bear in mind that there are different institutional cultures and characteristics [12], thus the richness of each findings can help the worldwide community to enrich their understandings about the factors influencing LMS's acceptance. Moreover, given the fact of the growth rates in adopting a LMS in university education and the imperativeness of the factors' evaluation before the adoption [5] of such a system at State University of Tetova in Macedonia, adds to the urgency to conduct a research by which factors that predict the students' intention to adopt LMS to be examined.

Based on extant literature review and by utilizing the Unified Theory of Acceptance and Use of Technology (UTAUT), as the best model for predicting individual's technology acceptance by explaining nearly 70% of the variance in usage intention [13], a research model is developed.

The results of this study, beside the theoretical contribution- validation of UTAUT, are of a great importance to the university itself (the State University of Tetova), and also to other universities in promoting the use of technology in teaching and learning, confirm the need for adopting-deploying a LMS, if one is not deployed yet, and most importantly they identify and enrich the understandings of the factors that influence its acceptance.

2 Literature Review and Theoretical Framework

2.1 Learning Management System (LMS)

LMS is viewed differently among different perspectives [14] and also, as a relatively new concept, it is often confused with other similar concepts, such as e-learning, digital learning, virtual learning and distance learning etc.[1]. Since, all of these concepts represent modern achievements in the education process, for the purposes of this paper the term LMS will be used accordingly.

As an important platform to support effective learning environment, a LMS is defined as a system which employs a range of ICTs to offer an online platform over the internet, where a whole course can be planned, facilitated and managed by both the teacher and the learner [15]. Moreover, they are defined as web-based tools used to manage, implement and assess online learning and teaching. examples of which are categorized into proprietary systems such as Blackboard, WebCT, Desire2Learn, Angel etc and open – source systems such as Sakai, Moodle, OLAT etc [16]. All of the functionalities provided by these systems tend to motivate students, enhance their efficiency and cost-savings [14] and most importantly, tend to accelerate their learning processes [17].

2.2 Unified Theory of Acceptance and Use of Technology (UTAUT)

Many studies have been conducted and several theoretical models have been proposed to explain users' intention to use IT. The UTAUT model [18], developed in an effort to improve the predictive power of a user acceptance model, integrates elements across the eight prominent theoretical models, which are build up on each other. The newly developed UTAUT model includes four variables, performance expectancy, effort expectancy, social influence, and facilitating conditions, and up to four moderators of key behaviors, gender, age, experience, and voluntariness. While the eight models taken individually varied in explanatory power from 17% to 53% of the variance in user intentions to use IT, UTAUT explained 69% of the variance [19].

2.3 Reseach Model and Hypothesis development

Although TAM is considered to be one the most common theories in the field of adoption, due to the contradictory results in e-learning studies that adopted TAM [20, 21] cited in [22], and also due to UTAUT's novelty in the field of user acceptance [23], its high predictive power and the new significant relations-paths between its constructs found in recent e-learning studies [3, 22, 24], a research model is proposed, as shown in Fig. 1, which clearly utilizes UTAUT as a base theory.

2.3.1 Performance Expectancy, Effort Expectancy and Attitude

Within each individual model used to develop UTAUT, performance expectancy is the strongest predictor of intention [18]. Moreover, extant studies [24] and [22] found that performance expectancy has a positive effect on the users' attitudes.

H1: Performance Expectancy has a positive effect on the users' Behavioral Intention.

H2: Performance Expectancy has a positive effect on the users' Attitude.

On, the other hand, effort expectancy is defined as the degree of ease associated with the use of the system [18]. Similarly, as perceived ease of use of TAM which is found to have significant effect on perceived usefulness, attitude and behavioral intention, effort expectancy has been found to be influential on performance expectancy, attitude [3, 22, 24] and behavioral intention.

H3: Effort Expectancy has a positive effect on the users' Performance Expectancy.

H4: Effort Expectancy has a positive effect on the users' Attitude.

H5: Effort Expectancy has a positive effect on the users' Behavioral Intention.

Attitude has been found to be strong and important determinant of the users' behavioral intention in many studies. In the study in which attitude is incorporated into UTAUT model, the results indicated that attitude toward using technology can predict the users' behavioral intention [24].

H6: Attitude has a positive effect on the users' Behavioral Intention.

2.3.2 Social Influence and Facilitating Conditions

Social influence, as a strong and direct determinant of behavioral intention in UTAUT, it is incorporated in other models as well as an external factor having a positive effect on attitude [22].

H7: Social Influence has a positive effect on the users' Attitude.

H8: Social Influence has a positive effect on the users' Behavioral Intention.

Facilitating conditions are a direct determinant of the users' behavioral intentions [18]. Moreover, new significant relationships are identified between facilitating conditions and effort expectancy [3].

H9: Facilitating Condition has a positive effect on the users' Behavioral Intention.

H10: Facilitating Condition has a positive effect on the users' Effort Expectancy.

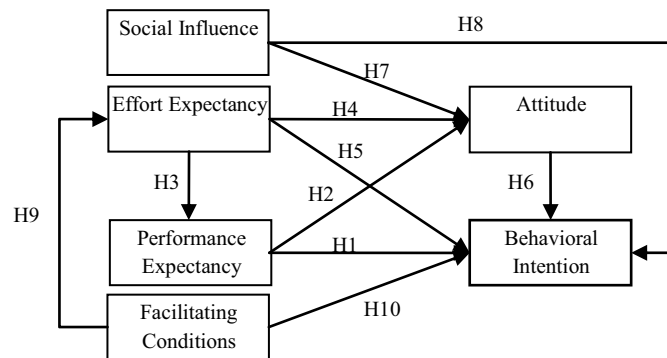


Fig. 1. Research Model

3 Methodology

3.1 Research Approach and Strategy

Since the study involves hypothesis testing through data collection and statistical analysis then it adopts a positivist knowledge claim [25], hence a quantitative approach was used in this study. Regarding the research strategy, survey was employed since the study focuses on contemporary event and it does not require control over behavioral events [26].

3.2 Sample, Data Collection, Questionnaire and Data Analysis Method

Purposive sampling, as a form of nonprobability sampling [27], was employed in this study as a sampling method. Thus, the empirical data is gathered through the first year students studying at different departments at State University of Tetova, to whom the course outlines and course materials were presented through authors' - instructors'

personal website. The designed questionnaire for the purposes of this study, was firstly distributed among 27 students, namely a pilot study was conducted to ensure its appropriateness and understandability. The final questionnaire, after the pilot study, comprised of 24 observed and 6 latent variables. The five point Likert scales, ranging from strongly disagree to strongly agree, was used for all the questions measuring the observed variables. Totally, 213 students completed the questionnaire.

IBM SPSS Statistics 20 is used for computing the reliability coefficients and the explanatory factor analysis, whereas for the confirmatory factor analysis, known as Structural Equation Modeling (SEM), LISREL 8.80 is used.

3.3 Validity and Reliability

To assess the validity in this study, distinct aspects of validity are considered such as content validity, which is achieved from the extensive literature review [28], and factorial validity as a subtype of construct validity, which can assess both convergent and discriminant validity are examined by using factor analytic techniques.

The results obtained from the factor analysis technique, namely the KMO and Bartlett's test of sphericity, show that that the partial correlations among variables are all greater than 0.5, ranging from 0.684 to 0.827, and the factor model is appropriate whereby all the relationships are significant ($p < 0.05$). To assess convergent and discriminant validity, Average Variance Extracted (AVE) of at least 0.5 [29] and the shared variance is calculated by the using the following equation $AVE = \frac{\sum (\text{factor loading})^2}{\sum (\text{factor loading})^2 + \sum \text{measurement error}}$ [3]. The results show that the amount of AVE ranged from 0.615 to 0.827, and the shared variance (squared correlation coefficient between constructs) was below the amount of average variance extracted.

To assess the reliability in this study, internal consistency reliability is applied by using the Cronbach's alpha value higher than 0.70 for the study to be internally consistent and acceptable. The results of this study indicate that the research instrument used is internally consistent and acceptable, having the total reliability equal to 0.835. The validity and reliability results of this study are shown in Table 1 and Table 2.

Table 1. Instrument Validity and Reliability

	KMO >0.5	AVE >0.5	Cronbach's Alpha >0.7	Total Reliability
Performance Expectancy (PE)	0.792	0.689	0.841	0.835
Effort Expectancy (EE)	0.779	0.615	0.782	
Attitude (A)	0.789	0.769	0.848	
Facilitating Condition (FC)	0.827	0.827	0.875	
Social Influence (SI)	0.800	0.821	0.871	
Behavioral Intention (BI)	0.684	0.747	0.790	

Table 2. Discriminant Validity

	PE	EE	A	FC	SI	BI
PE	0.83					
EE	0.58	0.78				
A	0.29	0.29	0.88			
FC	0.38	0.36	0.32	0.91		
SI	0.17	0.18	0.22	0.19	0.91	
BI	0.77	0.69	0.30	0.42	0.22	0.86

Inter variable correlation and the square root of Average Variance Extracted on the diagonal.

4 Results and Discussion

As mentioned above, structural equation modeling (SEM) or confirmatory factor analysis (CFA), which is one of the most used multivariate data analysis techniques in information systems (IS) research [30], is used for evaluation of the research model and the proposed hypothesis.

4.1 The Measurement Model

The measurement model fit in this study was estimated by using the common model-fit measures. As presented in Table 3, all the model-fit indices exceed their respective common acceptance levels [31] indicating a good model fit with the data collected.

Table 3. Measurement Model

Fit indices	Recommended Value	Result
$\chi^2/d.f.$	< 3	1.77
GFI (Goodness of Fit Index)	>0.8	0.85
RMSEA (root mean square error of approximation)	< 0.08	0.06
RMR (root mean square residual)	< 0.08	0.03
NFI (normed fit index)	> 0.9	0.96
NNFI (non-normed fit index)	> 0.9	0.98
CFI (comparative fit index)	> 0.9	0.98

4.2 Structural Model Test

Given the satisfactory model fit, standardized path coefficients and t-values of the structural model were studied to evaluate the research hypotheses. The research results of the structural model and discussion are presented as follows:

- The results reveal that performance expectancy is significantly related to behavioral intention ($\gamma=0.69$, $t=2.29$), hence the first hypothesis (**H1**) is supported. It implies that students find web-based learning – LMS useful in their education, improving their performance and also increasing the possibilities of communication with other students and instructors. On the other hand, the relationship between performance expectancy and attitude is not significant ($\gamma=-0.41$, $t=-0.74$), hence, the second hypothesis (**H2**) is not supported. Although H1 and H2 results with some prior related studies contradict and with some are consistent [3, 22, 24, 32], most importantly, they confirm prior findings of Venkatesh et al. [18] who developed the Unified theory of acceptance and use of technology (UTAUT).
- The third hypothesis (**H3**), namely the relation between effort expectancy and performance expectancy appears to be very significant ($\gamma=0.95$, $t=8.72$), which confirm the findings of Chiu and Wang [33], Sumak et al. [22] and Alrawashdeh et al. [3]. The fourth (**H4**) and the fifth (**H5**) hypothesis are not supported, since the relation between effort expectancy and attitude ($\gamma=0.95$, $t=1.69$) and the relation between effort expectancy and behavioral intention ($\gamma=0.47$, $t=1.37$) are not significant. These results indicate that students are not concerned with the ease of use of the system, rather, as mentioned earlier, the degree to which they believe that using the system will them attain gains in performance. This also in line with the TAM (Technology Acceptance Model), as Davis [34] claims that ease of use, referred to as effort expectancy in UTAUT, may be an antecedent to usefulness referred to as performance expectancy in UTAUT, rather than a parallel, direct determinant of usage.
- Hypothesis six (**H6**), according to the gained results is not supported ($\gamma=-0.11$, $t=-1.57$), confirms the finding of Venkatesh et. al. [18], that attitude does not have direct effect or it is not a direct determinant of behavioral intention.
- The results from the structural equal modeling reveal that both hypothesis seven (**H7**) ($\gamma=0.28$, $t=3.82$) and hypothesis eight (**H8**) ($\gamma=0.09$, $t=2.03$) are significantly related, hence both hypothesis are supported and the results in line with prior related studies [3, 22, 24], whereas contradicting with findings of Chiu and Wang [33] and Islam [32], who found significant relation between social influence and behavioral intention.
- Hypothesis nine (**H9**), which is about the relationship between facilitating condition and effort expectancy, is supported as the results show that facilitating condition has a significantly positive effect on effort expectancy ($\gamma=0.77$, $t=9.21$), which confirms the newly detected path found in the study conducted by Alrawashdeh et al.[3]. Hypothesis ten (**H10**), is not supported as the results show that the relationship of facilitating condition with behavioral intention is not significant ($\gamma=-0.06$, $t=-0.74$), which confirms prior study results and most importantly it confirms the findings of Venkatesh [18], who theorized facilitating condition as a construct not being a direct determinant of behavioral intention, rather, facilitating condition is a determinant of use intention.

5 Conclusion and Research Limitations

5.1 Conclusion

This study, by utilizing UTAUT, as a base theory, by integrating an additional construct (“attitude”) and also by adding new construct relationships, identified as significant in extant related studies, this study investigated the student’s behavioral intention to accept LMS, with an aim to advance the knowledge about the factors influencing its acceptance.

The results of this study show that performance expectancy and social influence are direct determinants of behavioral intention, whereas effort expectancy is identified as an antecedent of performance expectancy. Facilitating conditions and attitude are not found to have significant relationship with behavioral intention.

From this study’s results, several implications can be drawn. First, an important contribution is the use of UTAUT, namely its validation, as a novel model in the field of user acceptance [23] in an educational context, respectively at State University of Tetova, given the fact that there are different institutional cultures and characteristics [12]. Second, the findings implicate that students’ perception of the performance expectancy is crucial in fostering their behavioral intention to accept and use a technology, similar to prior findings [10] that the strongest driver of technology use is perceived usefulness, whereas their attitude may not be equally important. Moreover, beside confirming the university’s need for adopting-deploying a LMS at State University of Tetova, and also in other universities if such a system is not deployed yet, a key role in promoting the use of technology in teaching and learning, play course instructors – professors, who have to take advantage of the web technologies and other related services to facilitate the students’ needs.

5.2 Limitations and Future Work

Investigation of the research problem, construction of the research model, data collection and analysis, and documentation of the results in a limited time frame cause limitations in the scope and size of this study. Respectively, the sample size which is limited to students, to whom the course outlines and course materials were presented through instructors’-authors’ personal website. Further on, the fact the adoption of LMS is not only influenced by students, but also a number of other factors such as instructors, IT, university support [5] etc., which need to be addressed in future studies. In addition, due to time limitation, the UTAUT moderating effects such as gender, age, experience and voluntariness of use are not considered in this study, which make an avenue of future research.

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