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Research Article

Investigating Factors Influencing Undergraduate and Postgraduate Students' Preferences in Learning Management Systems (LMS) in higher educational context of West Bengal

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Abstract— presently, educational institutions commonly employ their proprietary Learning Management Systems (LMS), harnessing internet capabilities to offer a diverse array of intelligent learning tools catering to various learner requirements. This study seeks to categorize the pivotal factors shaping student's preferences regarding LMS utilization. It delves into how the adoption of LMS can augment learning outcomes, examining two primary perspectives: Performance Expectancy and Effort Expectancy, along with three moderating dimensions—Social, Environmental, and Individual intention—on a dependent construct encompassing behaviour and intention. By surveying 417 undergraduate and postgraduate students from different Private Universities and B-Schools in West Bengal, this research utilizes a validated Technology Acceptance Model (TAM) to gauge students' perceptions of LMS adoption. The findings of this study illuminate the viability of Learning Management Systems as perceived by students within the higher education landscape in West Bengal.

Keywords— LMS, TAM, moderating dimensions, higher education system, West Bengal

1. Introduction

In modern times, there is a tendency among students to embrace new information and communication technologies. As a result, a specialized online Learning Management System (LMS) emerged. Frequently implemented in higher education, LMS act as an online platform that facilitates communication between teachers and students. It is a space for sharing classroom materials and activities, and fosters interaction outside of a traditional classroom setting. With the spread of the internet in urban areas, especially where there are many Universities and B-Schools, LMS continue to have a significant impact in shaping student engagement, learning, and cognitive processes. Performance expectancy (PE), effort expectancy (EE), and facilitating conditions (FC) are key components of the Unified Theory of Acceptance and Use of Technology (UTAUT), developed by Venkatesh, Morris, and Davis (2003). These concepts aim to predict user acceptance and the subsequent use of a system or information technology. Performance expectations, which have been extensively studied in various industries, are defined as the perceived benefits and benefits of using information systems. An innovation in the UTAUT model is effort, expectations measure how ease of use associated with information technology. Furthermore, facilitating conditions related to organizational and technical infrastructure necessary for the availability of management systems further influences LMS adoption by graduate and undergraduate students, because easy access to relevant information in a short amount of time affects their online learning experience. To empirically examine these dynamics, this study examines the influence of two independent constructs, Performance Expectancy (PE) and Effort Expectancy (EE), along with three moderating constructs—Social, Environmental, and Individual—on the dependent construct Behavioural Intention (BI) and the utilization of LMS by students from various Private Universities and Business schools in West Bengal.

2. Related Work

As in [1] researcher highlighted social networking sites can serve as formal learning environments in business education and positively influence learning effectiveness in developing countries. Similarly, the other researchers mentioned as in [2] there is a notable difference in satisfaction and continuance with a learning management system between educators and students. Researchers mentioned as in [3] a systematic review of LMS acceptance and adoption in Sub-Saharan African higher education revealed significant models, methodologies, and challenges. As in [4] researchers explored student acceptance of learning management systems, focusing on demographic factors. Similarly, other researchers proposed as in [5] a structural model for understanding students' adoption of

learning management systems in higher education. Researcher reviewed as mentioned in [6] research on mobile learning in teacher education. As in [7] researchers investigated IT faculty resistance to learning management system adoption using latent variables in an acceptance technology model. As in [8] the effect of learning management system quality and perceived usefulness on students' satisfaction was explored. Moreover, few researchers mentioned as in [9] the e-learning readiness of academic staff and students in higher education institutions in Gujarat, India, were assessed. Some researchers explored as mentioned in [10] students' perceptions of the utilization of learning management system features in a geology course at KFUPM, Saudi Arabia. As mentioned in [11] researcher highlighted student attitudes towards YouTube integration in online, hybrid, and web-assisted courses were influenced by the course modality. As in [12] few researchers explored students' and teachers' perceptions of introducing a learning management system at a Russian university. Similarly, as mentioned in [13] the effectiveness of digital resources in the learning management system for online education of future entrepreneurs was assessed by the researchers. As mentioned in [14] researcher discussed mobile education in the context of transforming education with new media, participatory pedagogy, interactive learning, and Web 2.0. Few researchers explored as mentioned in [15] business undergraduates' perceived use outcomes of Moodle in a blended learning environment, focusing on usability factors and external support. As in [16] researchers proposed a personal learning environments acceptance model, highlighting the role of need for cognition, eLearning satisfaction, and students' perceptions. As in [17] few researchers conducted a fuzzy cognitive mapping analysis of LMS users' quality of interaction within a higher education blended-learning environment. Similarly, few researchers explored as mentioned in [18] lecturers' perceptions of learning management systems through an empirical study based on the Technology Acceptance Model (TAM). As mentioned in [19] some researchers identified factors predicting online university students' use of a mobile learning management system (m-LMS). Moreover, researchers explored as mentioned in [20] the influencing factors of learning management systems' continuance intention in a blended learning environment.

3. Theory

3.1 Exploration of Research Gap

Several noteworthy gaps have been identified through a review of the literature and are listed below.

- Most of the studies on the perceived benefits of LMS have been conducted abroad as compared to India, especially in the case of West Bengal, where previous studies are limited.
- The concept of LMS is relatively emerging in West Bengal. Although online teaching and learning pedagogy existed in the past, there is a notable lack of literature on widespread adoption of online teaching and learning on LMS platforms.

3.2 Research Objectives

An attempt has been in the present study to pursue the use and implementation of LMS in the higher educational institutes of West Bengal. The objectives of the study are summarized as follows:

- To construct a theoretical framework driven by the variables that influence students' actual use of LMS systems in the higher educational institutes of West Bengal using an adapted TAM model
- Three moderating constructs—Social, Environmental, and Individual—with items of Behavioural Intention (BI) as dependent constructs were identified, to define components that provide autonomous constructs of Performance Expectancy (PE) and Effort Expectancy (EE) are clear.
- To measure the level of influence of all the items considered in Performance Expectancy(PE), Effort Expectancy(EE), Social, Environmental, Individual on Behavioural Intension (BI) to explore the strategy of Learning Management System

4. Experimental Method/Procedure/Design

4.1 Theoretical Framework

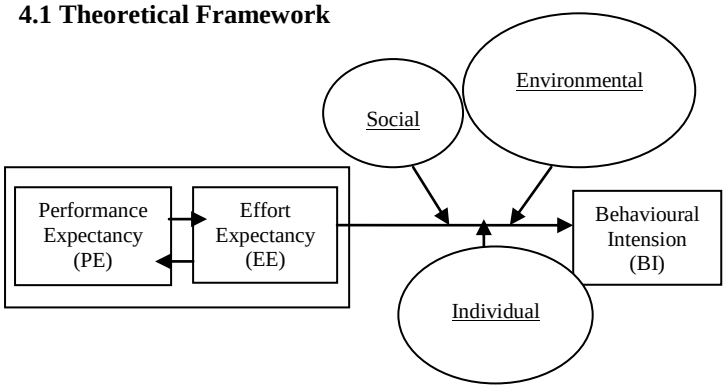

Figure 1. Proposed Research Framework

In Figure 1: Performance Expectancy (PE) and Effort Expectancy (EE) are two distinct independent constructs, where Performance Expectancy denotes the degree to which a person believes that using certain system would enhance his or her job performance. On the other hand, Effort Expectancy denotes the ease of use that means a person believes that using a certain system would be free of effort or as easy to use. Both PE & EE jointly influence students' Behavioural Intentions (BI) which acted as dependent construct in the Research Framework. Moreover, as per Proposed Research Framework Social, Environmental, and Individual factors serve as moderating constructs, shaping both the magnitude and direction of the relationship between Performance Expectancy (PE), Effort Expectancy (EE), and Behavioral Intention (BI).

4.2 Methodology

a. Survey Instrument Development: For the survey instrument development (structured questionnaire) of this research study six constructs were identified and their respective parameters with sources. Performance Expectancy (PE) and Effort Expectancy (EE) includes six parameters and acted as independent constructs where Social, Environmental, Individual includes twelve parameters and served as a moderating constructs to evaluate the strength of the relationship between independent and dependent constructs. Finally Behavioural Intension (BI) includes two parameters acted as dependent construct.

b. Data Collection: This study involved 417 undergraduate and postgraduate students from various Private Universities and B-Schools of West Bengal to capture the perceptions of all the identified items in the theoretical framework using the structured questionnaire. To collect the data convenience sampling was used as purposively those educational institutes of West Bengal were selected where LMS had been already implemented and the learning institutes used the LMS into their teaching learning pedagogy.

c. Pilot Survey and Final Survey: To testify survey instrument (designed questionnaire) at the initial stage a pilot survey conducted having 120 sample sizes and the outcome of the reliability measurement Cronbach's Alpha was 0.911 was the strong evidence of reliability of the designed questionnaire. At the time of final survey having 417 sample sizes where Cronbach's Alpha was 0.930 (Table 1: Cronbach's Alpha Summary).

d. Validity and Reliability of the Instruments: More specifically reliability and validity of the instruments(designed questionnaire) two tests namely, Cronbach's Alpha & Split-Half test conducted on the final survey having 417 data in SPSS Version 21 platform and the results of the tests are illustrated below-

Table 1. Reliability-Cronbach's Alpha Output

Reliability Statistics

Cronbach's Alpha	N of Items
.930	20

Table 2. Reliability-Cronbach's Alpha Output

Reliability Statistics

Cronbach's Alpha	N of Items
.937	19

Table 3. Split-Half Output

Cronbach's Alpha	Part 1	Value	.932
		N of Items	10[a]
	Part 2	Value	.822
		N of Items	9[b]
	Total N of Items		19
Correlation Between Forms			.806
Spearman-Brown Coefficient	Equal Length		.892
	Unequal Length		.893
Guttman Split-Half Coefficient			.871

The alpha value from Table 1 is 0.930, indicating strong internal consistency or scale reliability of the developed questionnaire (since alpha > 0.9) where number of designed variables were 20 (N=20) but as per the study out of 20 variables one variable PR3 found insignificant and after deletion of PR3 variable Cronbach's Alpha value will be the highest 0.937. So insignificant variable namely PR3 deleted for the next iteration of Cronbach's Alpha calculation and this time designed variables were 19 (N=19). In contrast, a split-half test, as illustrated in Table 3 , revealed a Cronbach's alpha value of 0.932 (alpha > 0.9) in the first half, indicating good internal consistency in the first 10 questions and the Cronbach's alpha in the second half was 0.822 in the next 9 questions. Besides showing good internal consistency (alpha > 0.8), for equal length the Spearman-Brown correlation coefficient was 0.892 and 0.893 for odd length, providing strong evidence of inter-item reliability for the hypothesized questionnaire. Also from the test, Guttman Split-Half Coefficient value was 0.871 indicating highly reliable value for the designed questionnaire.

e. Method: For the first stage an Exploratory Factor Analysis had been performed based on 17 items where emerged factors were 5 as an outcome of the factor analysis. For the second stage, regression analysis had been performed in two separated models. For the Model I considering all the emerged factors as independent variables (X: All emerged factors) and Behavioural Intension as dependent variable (Y: BI_1) where Y signifies "Sustained use of online learning system". Similarly, for the Model II considering all the emerged factors as independent variables (X: All emerged factors) and Behavioural Intension as dependent variable (Y: BI_2) where Y signifies "Sustain growth of LMS System".

f. Analysis and Findings: An exploratory factor analysis had been performed based on 17 items where emerged factors were 5 as an outcome namely, "Performance Expectancy driven by Social Influence" as Factor1, "Facilitating Environmental Condition" as Factor2, "Individual Perceived Usefulness" as Factor3, "Effort Expectancy" as Factor4 and "Assessment Perceived Risk" as Factor5. To measure the influence of 5 emerged factors on Behavioural Intension (BI), multivariate regression analysis were conducted where criterion or responding variable was Behavioural Intension (BI) and explanatory or controlled variables were 5 emerged factors. The regression analysis findings are illustrated below-

REGRESSION ANALYSIS

a. Model I

Considering all the emerged factors as independent variables (X: All emerged factors) and Behavioural Intension as dependent variable (Y: BI_1) where Y signifies "Sustained use of Online Learning system". The regression analysis findings are illustrated below-

Table 4: Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	Segmentation based on UG /PG = Undergraduate (Selected)			
1	.816[a]	.665	.660	.6355

Overall Model Fit:

R^2

The R^2 value represents the proportion of variance in BI_1 (sustained use) explained by the independent variables. A higher R^2 indicates a better model fit.

Adjusted R^2

This value accounts for the number of predictors in the model, offering a more precise measure of model fit, particularly when there are many independent variables.

Standard Error:

This value indicates the variability of the estimated coefficient.

b. Model II

Considering all the emerged factors as independent variables (X: All emerged factors) and Behavioural Intension as dependent variable (Y: BI_2) where Y signifies "Sustain growth of LMS system". The regression analysis findings are illustrated below-

Table 5: Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	Segmentation based on UG /PG = Postgraduate (Selected)			
1	.799[a]	.639	.603	.7018

Overall Model Fit:

R^2

The R^2 value reflects the proportion of variance in BI_2 (sustained use) explained by the independent variables. A higher R^2 indicates a better fit of the model.

Adjusted R^2

This value adjusts for the number of predictors in the model, providing a more accurate measure of model fit, especially when the number of independent variables is high.

Standard Error:

This value indicates the variability of the estimated coefficient.

5. Results and Discussion

From Regression Model Summary (Table 4), it was evident that the correlation (R value) was robust, standing at 0.816 or 81.6%, indicating a strong relationship between the five emerged factors and BI_1. For BI_1, an R^2 of 0.665 indicates that 66.5% of the variation in Behavioural Intention (BI1) among UG students is explained by the five emerging explanatory factors. Additionally, the adjusted R^2 for BI_1 is 0.660, showing a slight decrease from the original R^2 of 0.665. This suggests that there is no need to include additional independent variables beyond the five emerging factors.Given the influential effect of online system among UG students highlighted by regression analysis in Model I, there was a strong emphasis on "Sustained use of Online Learning system" in the teaching-learning pedagogy of higher education in West Bengal. In the second regression analysis test for Model II (from Table 5: Regression Model Summary) R value was very good 0.799 or 79.9% of the co-relation exists between 5 emerged factors & BI_2. For BI_2: R^2 =0.639 means 63.9% variations or change of Behavioural Intension (BI_2) of Post graduate (PG) students due to change in 5 emerged explanatory factors. The study shows that for BI_2, the adjusted R^2 decreased from 0.639 to 0.603, indicating that there is no need to introduce new independent variables, except for the five emerging factors.Since Model II of regression analysis emphasizes "Sustain growth of LMS system" and the outcome of regression analysis reflect high influential effect of LMS among the Post graduate (PG) students, so it emphasizes the more rapid growth of the LMS system in teaching-learning pedagogy of higher educational sector of West Bengal.

6. Conclusion and Future Scope

This article provides a comprehensive review of the literature, and highlights a noticeable shift towards finding factors that influence UG and PG students' perceptions of LMS adoption and acceptance. Through research it has become clear that of LMS many benefits for users, including students. Integrating an LMS into a classroom environment aims to enhance teaching and learning processes and increase student engagement, ultimately improving learning outcomes. The survey indicated that most of the UG & PG students were quite computer literate and had no significant barriers to using the LMS. Furthermore, it emphasizes the importance of UG & PG student's perspectives for the success of an LMS program. For the context of defining the adoption and use of LMS, the important role of students as agents of change is emphasized, taking the development of education in Universities and B-Schools to the next level. The analysis of the study builds on primary source of data and that were collected from UG and PG students of different Private Universities and B-Schools of West Bengal where Govt. Colleges or Universities did not consider which can be a future scope of study. The study did not also consider the

other major stakeholder of education system like: Teachers and their perception and adoptability rate of LMS into the teaching learning pedagogy which can be a vibrant future scope of the study.

Data Availability
None

Conflict of Interest
Do not have any conflict of interest.

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Authors' Contributions
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