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Implementation of Technology Acceptance Model (TAM) in Business Research on Web Based Learning System

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***Abstract*— In contemporary society, Web based learning system (e-learning) is playing a significant role in our lives, it enable us to easily to access different internet sources and make students to study much more efficiency and effective. This study developed and empirically tested a model testing on the perceived usefulness and perceived ease of use toward intention to use web based learning system.**

In our study, we aim to find out the fundamental factors that influence intention to use web based learning system (e-learning). Quantitative survey is carried out among undergraduate students to explore how the independent variables and mediating variables will affect the dependent variable using e-learning. We apply Technology Acceptance Model (TAM) to construct a theoretical framework.

Our sample size is 150 students' data from Universiti Sains Malaysia based on convenience sampling. The data gathered through questionnaire was coded and analyzed using the computerized Statistical Software Package for Social Science (SPSS) software. We apply frequency analysis, descriptive analysis, validity and reliability test, correlation test and multiple regression analysis in our research.

Based on our findings, the mediating variables perceived usefulness and perceived ease of use had the strongest impact on using web based learning system. These findings also very useful to provide insights for future research and management practice on the improvement of web based learning system

***Index Terms*—Web-Based Learning, E-learning, SPSS, Technology Acceptance Model (TAM), Regression Analysis.**

I. INTRODUCTION

Web learning has become common in classroom teaching with most of the higher education institutions engaging in web learning or some form of online teaching [21][1]. Most of the higher education institutions are engaged in web learning. The popularity of web learning is mainly due to the concept of "anywhere" and "anytime" [9][11]. Universities are becoming more involved in e-learning activities as lecturers are uploading teaching materials onto e-learning systems.

Through this research, we intend to understand deeply about web based learning system and the current views of undergraduate students in Malaysian towards the usage of web based learning system. The purpose of adopting Web-based learning system is not only to improve learning effectiveness and efficiency, but also to provide an alternative approach in instruction. Besides that, Web-based instruction is not capable of duplicating the live instructor, but would probably be second best to face-to-face instruction.

We believed that use of online functions can enhance traditional teacher-centered courses. Some studies even showed that students in e-learning outperformed those in traditional classes.

1.1 Research Objectives

Research objectives are the objective that we intend to achieve after identifying research problems. There are some of research objectives that are highlighted in this research [12][14].

1) The primary purpose of this research is to implement the web based learning system for undergraduate student.

2) The other purpose of this research is to determine the acceptance and support of undergraduate students in the use of e-learning.

3) This study will also seek to understand the role and importance of web based learning system among the undergraduate students.

1.2 THEORETICAL FRAMEWORK AND MODEL DEVELOPMENT

Theoretical frameworks in quantitative research help to "provide a conceptual guide for choosing the concepts to be investigated, for suggesting research questions, and for framing the research findings" [14][20][19].

Based on the above theoretical model (Figure1) was developed to study the perceived usefulness and perceived ease of use towards using web based learning system [13]. System functionality, system interactivity, system response, self-efficacy and internet experience are the key determinants of attitudes towards perceived usefulness and perceive ease of use in this study [15]. Then, perceived usefulness and perceived ease of use modelled as the mediator between the independent variables and dependent variable use for supplementary learning.

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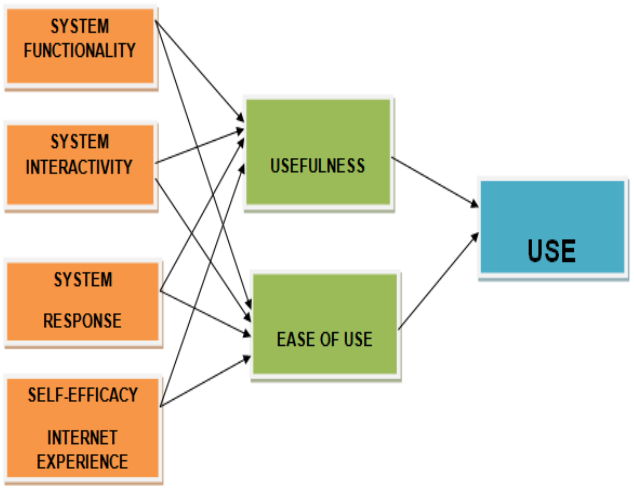

Figure1. Theoretical Frameworks

1.3 HYPOTHESIS

H1: System functionality is positively related to perceived usefulness
H2: System functionality is positively related to perceived ease of use
H3: System interactivity is positively related to perceived usefulness
H4: System interactivity is positively related to perceived ease of use
H5: System response will positively affect perceived usefulness
H6: System response will positively affect perceived ease of use
H7: Self-efficacy is positively related to perceived usefulness
H8: Self-efficacy is positively related to perceived ease of use
H9: Internet experience will positively affect perceived usefulness
H10: Internet experience will positively affect perceived ease of use
H11: Perceived usefulness will positively affect the intention to use e-learning
H12: Perceived ease of use is positively related to the intention to use e-learning

II. RESEARCH METHODOLOGY

Research design constitutes a blueprint for the collection, measurement, and the analysis of data[17]. It is a plan and structure of investigation to obtain answers for research questions. This design aids the researcher in the collection of limited resources by posing crucial choices in methodology [16].

2.1 Type of study

This study is characterized by correlational study. It was conducted among the undergraduate students in University Science Malaysia who are personally using web based learning system Hypotheses testing were undertaken to explain the variance in dependent variables to predict the relationship between independent and dependent variables.

2.2 POPULATION, SAMPLE SIZE AND SAMPLING TECHNIQUE

The population is undergraduate students from USM who are using web based learning system (e-learning).
The sampling Frame is equal and there are 150 respondents or even a substantial portion to achieve reliable results. In the ideal case, the sampling frame should coincide with the population of interest.
The sampling technique used is non-probability sampling method as time constraint and convenience to get enough respondents. In addition, the cost of using this method is relatively cheap and it is feasible. We selected 150 undergraduate students from USM everywhere regardless of gender, age, race, religion and nationality. So every student has the same chance of being included in the research. . There are 150 sets of questionnaires that were distributed among these respondents and all 125 set of questionnaires were then collected again for further research.

2.3 QUESTIONNAIRE DESIGN

For this research, we have distributed some questionnaires. Total have one hundred and fifty respondents from USM voluntarily responded and completed the questionnaire. The questionnaire has 12 sections and 46 questions to measure the intention to use the web based learning system of undergraduate students as well as some demographic questions. Table 1 depicts that all instruments used in this study had a corresponding Cronbach alpha >0.70.

Table1. Questionnaire Source and Validity

Variable	Construct	Items	Cronbach	Author
Independent	System functionality	6	>0.844	Hair et al. (2003)
	System interactivity	3	>0.756	Hair et al. (2003)
	System response	3	>0.832	Hair et al. (2003)
	Self-Efficacy	4	>0.752	Hair et al. (2003)
	Internet experience	6	>0.849	Hair et al. (2003)
Dependent	Use for supplementary learning	2	>0.761	Hair et al. (2003)
Moderating	Perceived usefulness	4	>0.871	Hair et al. (2003)
	Perceived ease of use	4	>0.846	Hair et al. (2003)

2.4 Data Collection Technique

The relevant data for this study was collected through structured questionnaires. The questionnaires were distributed to students in USM, Penang. Survey questionnaire is appropriate in this research because it is the most suitable method to achieve the research's objectives and make the selected respondents easier in their evaluated. This method able to reduce and limit the chances of failure for reacquires the questionnaire after being filled by the respondents.

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2.5 Statistical Data Analysis

The data collected from questionnaire will be coded and entered into computer for analyzing. The data will be analyzed using the Statistical Software Package for Social Science (SPSS) version 15. Analyzations using the SPSS software will be run on frequencies test, reliability test, descriptives test, correlations test and multiple regressions test.

III. ANALYSIS AND RESULT

3.1 Multiple regressions

Multiple regressions is not just one technique, but a family of techniques that can be used to explore the relationship between one continuous dependent variable and a number of independent variables or predictors (usually continuous). In our research, we will test the relationship between system functionality, system interactivity, system response, self efficacy and internet experience, perceived usefulness, perceived ease of use and use for supplementary learning [18][4].

3.2 Multiple regressions 1

The first regression was run to determine the relationship between system functionality, system interactivity, system response, self-efficacy and internet experience toward perceived usefulness. Hypotheses 1, 3, 5, 7and 9 were tested at this stage [2][7].

Table 2. Result of multiple regressions 1

Variables	Standardized beta
System Functionality	0.388
System Interactivity	-0.004
System Response	0.255
Self -Efficacy	0.101
Internet Experience	0.167
R^2	0.526
Adjusted R^2	0.510
F value	32.024
Durbin-Watson	1.831

Note: **p<.01, *p<.05

From the output of ANOVA table, the model fit as the model is tested significant (p<0.01) with F=32.024. The regression test had presented a strong inference with R square of 0.526. Approximately 52.6% variations of dependent variable Perceived Usefulness can be explained by independent variables (system functionality, system interactivity, system response, self-efficacy and internet experience).The adjusted R square value is 0.510.

The Durbin-Watson value in the table 2 is 1.831. This value is in the acceptance range (1.5-2.5). This means that there was no autocorrelation of error terms. All the independent variables have variance inflation factor (VIF) values that less than 10, so multicollinearity problems did not exist [6]. Although the condition indexes of the independent variables are exceed the limit 30, but the variance proportions for the independent variables did not have more than two values that exceed 0.9, so multicollinearity problems still did not exist. The normality of the sample was demonstrated by a bell shape histogram. The Diagnosis of the scatter plots showed a linear graph. P-P plots also indicated no sign of normality of the error. No clear relationship between the residuals and the predicted values confirmed the assumption of linearity [8].

The multiple regression analysis indicate that the following tested variables were highly significant at p<0.01, a 99% degree of confidence. The beta value (standardize coefficients) of System functionality (β=0.388) and System response (β= 0.255) indicates that the independent variable are related to dependent variable. The following variable were found significant at p<0.05, 95% degree of confidence [5]. The variable is Internet experience (β= 0.167) indicates that is related to dependent variable. The following variables were found not significant at p<0.05, 95% degree of confidence. The variables are System interactivity (β= -0.004) and Self-efficacy (β = 0.101).

Hypothesis 1(System functionality is positively related to perceived usefulness) was accepted at p<0.05. Hypotheses 3(System interactivity is positively related to perceived usefulness) was rejected at p>0.05. Hypothesis 5(System response will positively affect perceived usefulness) was accepted at p<0.05. Hypothesis 7 (Self-efficacy is positively related to perceived usefulness) was rejected as p>0.05. Hypothesis 9 (Internet experience will positively affect perceived usefulness) was accepted at p<0.05.

3.3 Multiple regressions II

The second multiple regressions were conducted to determine the relationship of system functionality, system interactivity, system response, self-efficacy and internet experience toward perceived ease of use. Hypotheses 2, 4, 6, 8, and 10 were tested at this stage [3].

From the output of ANOVA table 3, the model fit as the model is tested significant (p<0.01).

Table 3. Result of multiple regressions II

Variables	Standardized beta
System Functionality	0.446
System Interactivity	0.064
System Response	0.139
Self -Efficacy	0.230
Internet Experience	-0.037
R^2	0.496
Adjusted R^2	0.479
F value	28.370
Durbin-Watson	1.856

Note: **p<.01, *p<.05

With F=28.370. The regression test had presented a strong inference with R square of 0.496. Approximately 49.6% variations of dependent variable Perceived ease of use can be explained by independent variables (system functionality, system interactivity, system response, self-efficacy and internet experience).The adjusted R square value is 0.479.

The Durbin Watson value of 1.856 is confined to the acceptable range.

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It indicated that there was no autocorrelation of error terms. Multi-co linearity problems did not exist as the variance inflation factor (VIF) values were below 10 and the Condition indexes were below the safety limit of 40. The normality of the sample was demonstrated by a bell shape histogram. The Diagnosis of the scatter plots showed a linear graph. P-P plots also indicated no sign of normality of the error. No clear relationship between the residuals and the predicted values confirmed the assumption of linearity.

The multiple regression analysis indicate that the following tested variables were highly significant at p<0.01, a 99% degree of confidence. The beta value (standardize coefficients) of System functionality (β=0.446) and Self-efficacy (β= 0.230) indicates that the independent variable are related to dependent variable. On the other hand, we found Internet experience was no related with the perceived ease of use because the significant level was p>.05 and the beta value is negative (β= -0.037).The beta value of System response (β=0.139) and the beta value of System interactivity (β=0.064) are also no related to perceived ease of use because the significant level above 0.05.

Hypotheses 2(System functionality is positively related to perceived ease of use) was accepted at p<0.05. Hypotheses 4(System interactivity is positively related to perceived ease of use) was rejected at p>0.05. Hypotheses 6 (System response will positively affect perceived ease of use) was rejected at p>0.05. Hypotheses 8 Self-efficacy is positively related to perceived ease of use) was accepted at p<0.05. Hypotheses 10 (Internet experience will positively affect perceived ease of use) was rejected at p>0.05.

3.4 Multiple regressions III

The third multiple regressions were conducted to determine the relationship of perceived usefulness and perceived ease of use toward use for supplementary learning. Hypotheses 11,12,13,14 were tested at this stage.

Table 4. Result of multiple regressions III

Variables	Standardized beta
Perceived usefulness	0.413
Perceived ease of use	0.224
R^2	0.350
Adjusted R^2	0.342
F value	39.637
Durbin-Watson	1.894

Note: **p<.01, *p<.05

From the output of regression from the ANOVA table 4, the variables were tested significant with (p<0.01) and F = 39.637. The regression tests had presented an inference with R square of 0.350. Approximately 35% variations of use e-learning for supplementary learning can be explained by Perceived Usefulness and Perceived Ease of Use. The adjusted R^2value is 0.342.

The Durbin-Watson value in the table 4 is 1.894. This value is in the acceptance range (1.5-2.5). This means that there was no autocorrelation of error terms. Multicollinearity exists when the independent variables are highly correlated, with a bivariate correlation of 0.7 or more. Based on the data, Multicollinearity is not exist because all the Pearson Correlation value is below 0.7. Besides that, the Collinearity diagnostics is acceptable because the Tolerance > 0.10 and VIF <10. The normality of the sample was demonstrated by a bell shape histogram. The Diagnosis of the scatter plots showed a linear graph. P-P plots also indicated no sign of normality of the error. No clear relationship between the residuals and the predicted values confirmed the assumption of linearity.

The multiple regression analysis indicated that the following tested variables were highly significant at p<.01 or 99% degree of confidence. The beta value (standardize coefficients) of Perceived Usefulness (β= 0.413) indicates that the independent variables are positively related to dependent variable use for supplementary learning. Besides, Perceived Ease of Use (β=0.224) also indicated that the independent variables are positively related to dependent variable use for supplementary learning.

Hypothesis 11 (Perceived usefulness will positively affect the intention to use e-learning) was accepted at p<0.05 and Hypotheses 12(Perceived ease of use is positively related to the intention to use e-learning) was accepted as its p value is below 0.05.

IV. CONCLUSION

The results from this study provide us several managerial recommendations. Base on this result, we can know which one is a main source to influence the implementation to use web based learning system. Besides that, the government and universities can find out the solutions to increases the number of students to use web based learning system.

There are several main factors which can be influence the intention to use web based learning system as a supplementary learning:

1) Perceived Usefulness
2) Perceived Ease of Use
3) Self efficacy

Based on the main factors listed above, we can found out several recommendations to increases the number of e-learning users.

In this study, we found that perceived usefulness plays an important role to influence the intention to use web based learning system as a supplementary learning among undergraduate students in USM. Perceived usefulness refers to the degree to which a person believes that using a particular system would enhance his or her job performance. Government and universities can focus more to the perceived usefulness of web based learning system (e-learning) to increase the number of e-learning users. When e-learning functions will enhance the study performance of students, they will be more likely to use web based learning system. The second main factor is perceived ease of use. Earlier studies revealed that if an individual perceives a system to be easy to use, he/she is more likely to perceive the system to be useful. Therefore, government and universities have to focus to the perceived ease of use of web based learning system. If students found that web based learning system is easy to use, they will be more likely to use it. The user's self-efficacy is the most important factor to influence the intention to use web based learning system as a supplementary learning among undergraduate students in USM. Self-efficacy is the measure of one's own ability to complete tasks and reach goals. Self-efficacy affects every area of human endeavor.

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By determining the beliefs a person holds regarding his or her power to affect situations, it strongly influences both the power a person actually has to face challenges competently and the choices a person is most likely to make. Besides that, high self-efficacy increases one's persistence and focus on a given task beyond previous levels. Therefore, government and universities can be more creative in designing more software and give challenges to the students to create positive feeling of students towards e- learning.

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