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Measurement of User Experience (UX) of Learning Management System for Students in School of IT at SEGI University, Malaysia

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Abstract

The study aimed to investigate the measurement of Learning Management System implemented in SEGI University Kota Damansara using the User Experience Questionnaire framework. The quantitative study of this research reveals the relevancy of the efficiency of the LMS on the user experience and at the same time, reveals that gender and duration of the usage of the LMS does not affect the perception towards the LMS user experience. The study conducted in 2021 involving 50 students at the School of Information Technology. The Cronbach Alpha of the measurement criteria and hypotheses were investigated using Pearson Correlation, T-test and Anova testing in SPSS IBM Statistics to arrive at the conclusion that the perception on the efficiency of the system is related to the UX of the LMS and there is no relevancy between the gender of the user and the duration of the LMS usage on the UX rating.

Keywords: e-Learning, User Experience, Learning Management System, User Experience Questionnaire.

I. INTRODUCTION

Learning Management System has come a long way since the time of the inception of First Class, the first LMS in the late 20th century for the purpose of learning and training. Names like Moodle, Blackboard, MOOC, Schoology, Google Classroom and many others have become the platform for teaching and learning to take place in this era of e-learning. The existence of learning institutions has become dependent on their online presence through Learning Management System (LMS) products for its continuation and success. User eXperience (UX) has become one of the most pivotal factors for the success of any LMS product. UX can either make or break the LMS. In the Malaysian context there has not been a study that is conducted on this scope and previous studies has only been a partial review of the LMS usability aspects rather than an in-depth study on the UX quality of the LMS. SEGi College Kota Damansara is currently implementing Blackboard Ultra Experience as its LMS, which is an upgraded version of an overhauled design of Blackboard learn. According to a report presented to the Institute of Higher Learning Malaysia a decade ago, 100% Higher Education Institution in Malaysia was implementing LMS with 57.7% using open-source platforms, 34.6% have commercially purchased their LMS and 15.4% was implementing their own tailored made LMS (Mohd. Amin Embi, 2011). Since then, E-Learning in Malaysia has become not only on an upwards trend but identified as a necessity, more so importantly with the initiatives of the Malaysian government to call for the higher learning institutions to participate actively in Industrial Revolution 4.0 (IR4.0). KenResearch, a research-based Management Company, in its report titled Malaysia E-Learning Market Outlook 2023: By Technology, the E-Learning market of Malaysia is forecasted to grow at the CAGR (Compound Annual Growth Rate) of 16.1% at the period of 2019 – 2023 with a revenue expected to exceed USD 2 Billion (KenResearch, 2019). The Covid-19 pandemic has played a big role in inducing changes into the landscape of industries of all sizes and nature.. The Movement Control Order (MCO) imposed in Malaysia on March 18, 2021, was an action necessary to contain the outbreak of the pandemic in all the states in Malaysia and was a wakeup call to all education institutions in

the extreme importance and urgency of online classes. Learning Management System portals are expected to support the virtual existence of the institution and is put to its greatest challenge. The dependence on LMS has made it necessary for the LMS stakeholders to consider the relevance and effectiveness of the User Experience (UX) of the system because the dissatisfaction of the user will lead to improper use of the platform that will greatly affect the entire teaching and learning environment. This will lead to having a negative impact on the dedication of the institution in providing a dynamic and effective e-learning platform for the students.

Statement of The Problem:

User experience (UX) of a product is relevant to its design, usability, functions and various other aspects that makes the user have a positive response in using the system and keep on using the system for their benefits. 50% of LMS respondents suggested to change the current LMS that they are using (Pappas, Zaharias. 2016). Having an LMS that does not provide the students the right support that they are looking for from the system will make them shy away from using the platform. This will result in being a deterrence for the students to stay connected to the material and content shared by the educators. The challenge has always been there to measure the effectiveness of the UX of the LMS implemented.

Hypotheses 1

$H1_0$: There is a significant relationship between Efficiency and UXMeasurement.

$H1_a$: There is no significant relationship between Efficiency and UXMeasurement.

Hypotheses 2

$H2_0$: Gender has NO significant effect on the UXMeasurement.

$H3_a$: Gender has significant effect on the UXMeasurement.

2 Objective

To aid the institution in making efficient choices in the LMS that are chosen to represent the learning and teaching environment.,

To analyze the measurement of student's user experience (UX) on the Learning Management System (LMS) perspective based on gender and usage duration.

II. LITERATURE REVIEW

Studies of LMSs has been produced by many researchers internationally and locally in the past decades emphasizing on the importance for such studies to be carried out from time to time as technology and the way user and computer interacts keep evolving. This chapter will provide details on existing previous studies to strengthen the preliminary knowledge in carrying out the research.

1. UX and LMS

User eXperience (UX) is given a plethora of definition by designers and researchers. In a context that is made general and accepted by many practitioners, UX is defined as the result of the interaction of the user, the system and the context (Lallemand, Gronier, Geonig, 2015). It is no doubt that every product must achieve an acceptable level of UX to be well received. A good UX promotes high quality interactions between the user and the system (Santoso et. al, 2016). According to some other research, the concept of user experience combines well-known aspects such as efficiency and effectiveness with additional aesthetic or joy-of-use, attractiveness (Maria Rauschenberger et al., 2013).

LMS is a software tool that supports distance learning that combines computer and communication with the content of educational materials being managed through online in a web-based learning environment (Britain and Liber, 1999). the activities performed were limited to uploading and downloading teaching and learning materials with the accessibility to the LMS content wherever the users were, home or work. In the context of Malaysia, in the early 2000, most universities were encouraged to embed online learning into their organizational strategical ICT mission and vision (Norsaniah md Noh et al., 2012). Evaluating and measuring LMS using UX as a benchmark is done by UX questionnaires provides comprehensive user

perception and relative quality level of the LMS (Dadang Sharif et. al, 2016). User experience can be generally grouped into 2 categories Pragmatic and Hedonic. Pragmatic is a characteristic that represents the elements which are sensible and realistic and on the other hand, Hedonic, refers to the pleasantness of the element. UX has become universally identified as the factors in gauging product and service quality.

III. METHODOLOGY

Quantitative research method is implemented while completing this research as it provides the best mechanism in collecting data that is revealing subjective materials that can be formed in a highly structured questionnaire to avoid human bias. A standard questionnaire implementing 7 points Likert scale approach adopting the UEQ framework is used to collect relevant quantitative data. The responses from the identified 50 users that are selected based on non-probability convenience sampling. Data for this study is to be collected through questionnaires that are distributed to the School of Information Technology SEGi College Damansara students through an invitation that is sent to their email or WhatsApp using Google Form, the web-based survey administration platform. The responses which are stored in the cloud can be retrieved to local drive if necessary. The responses are analyzed using IBM SPSS Statistics to generate the statistical model to measure the UX of the LMS. The quantitative result of the research will help the LMS developers and institutions of higher learning to form a better idea about the need in enhancing and improving the UX of the LMS products to better suit the current and future LMS users' need and expectations.

1. UEQ Structure

An efficient and inexpensive method to do UX measurement is through rigorously constructed and validated questionnaires (Maria Rauschenberger, et al., 2013). In another literature, the researchers emphasized that questionnaires are direct and useful tool commonly used to access the usability and quality of LMS product (Syarif SS, Santoso, Ferdiana, 2016).

In the UEQ framework, *Attractiveness* of a system is divided into two main areas with its subdivisions: The detailed explanations on the attributes of UEQ are provided in Figure 1.

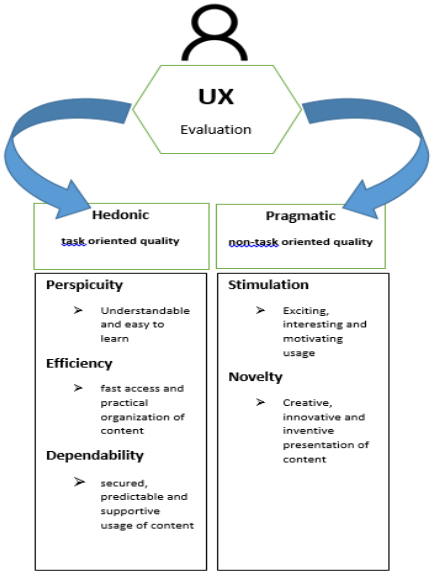

Figure 1: UEQ Assumed Scale Structure

There are many approaches such as Usability Test, User Experts Evaluation, Cognitive Walkthrough Techniques and UX Questionnaires has been presented in many researchesfor UX (Martin Schrepp, Thomaschewski, 2019).

In this study the identified attributes of attractiveness will be constructed as the 6 variables that will be presented in 22 items which are relevant to the study.

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree Nor Disagree	Somewhat Agree	Agree	Strongly Agree
	1	2	3	4	5	6	7
How **USEFUL** do you find the LMS is in terms of its usage?	○	○	○	○	○	○	◉
How **PLEASANT** do you find the LMS is in terms of its usage?	○	○	○	○	○	○	○

Figure 2: Likert Scale Questionnaire snapshot

2. Instrument Development

Based on the various literature reviews explored during the study, questionnaire adopting the UEQ framework is applied as the instrument for the data collection for this UX measurement project.

The questionnaire implements 7-point Likert scale which is a psychometric scale that comprises of questions to collect the users' ordinal responses on their agreement or disagreement on the pragmatic and hedonic features of the LMS. Figure 2 is a snapshot of the questionnaire that is used.

The variables are categorized and the questions in the questionnaire are construed to fit the categories. The independent and independent variables of the study are derived as shown in Figure 3.

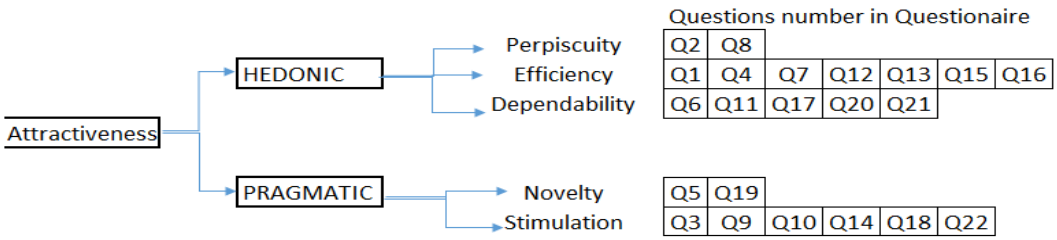

Figure 3: Questions Associated to the Variables

3. Data Collection

The questionnaires are created and responses to the questionnaires are collected using Google Forms platform which is a web application developed by Google. Responses collected in the cloud are to be retrieved and archived in a local drive that will be accessible for future references. The responses collected are then tabulated into IBM SPSS Analysis to generate necessary Quantitative analysis to sum up the result of the study. The illustration on the Methodology to detail the data collection and data analysis method used is given in Figure 4.

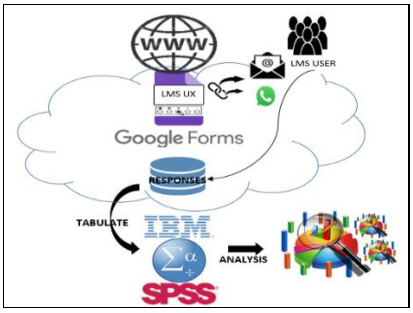

Figure 4: Methodology

Data collected through the questionnaire that is kept in the cloud repository, is inserted into IBM SPSS 28 for further data analysis. Dataset was created to systematically insert the data according to the answers given by the respondents. In this section the data insertion is explained in detail starting from the aspect on the creation of the variables, the data types decided, and values allowed to be stored within the variables.

3.1 Independent and Dependent Variables

The UEQ framework in Figure 3 suggests 6 variables that are used to achieve the measurement of the UX of a system. The property ATTRACTIVENESS is divided into:

i) Pragmatic: {Perspicuity, Efficiency, Dependability} and

ii) Hedonic: {Stimulation, Novelty}

The structure that is implemented in the framework gives a clear guideline to identify the

variables involved in this study, both the dependent and the independent variables.

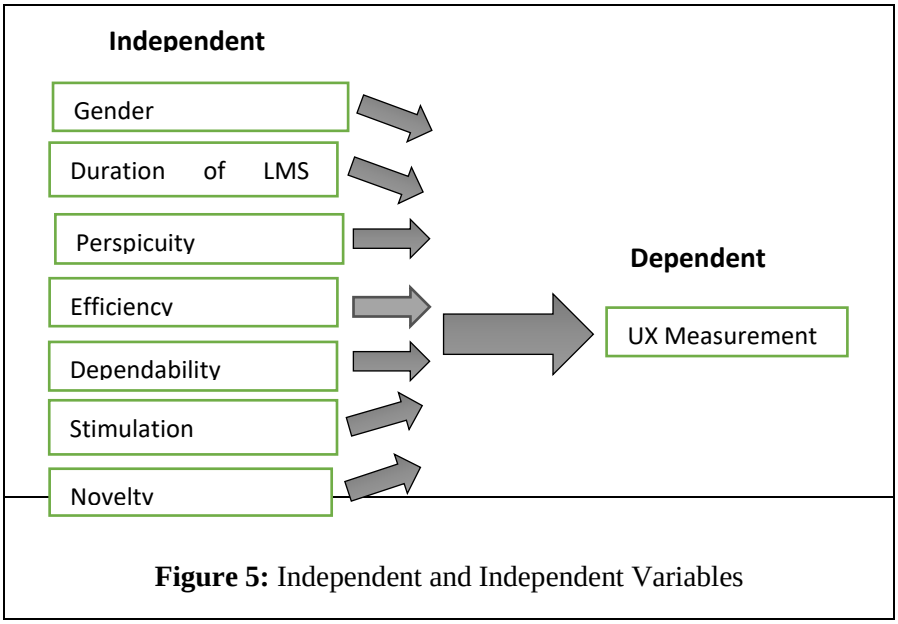

Figure 5: Independent and Independent Variables

The measurement of the UX is given a measurable value of an ordinal scale to rate the degree they agree on a statement that is given in the questionnaire with a 7-point Likert Scale (Sullivan, Anthony, 2013). The demographic data the Independent Variables and Dependent Variables for this study is as illustrated in Figure 5.

IV DATA ANALYSIS

Before proceeding with the data analysis, a Reliability Analysis is conducted to examine the reliability of the questionnaire based on how related the items are as a group in the Likert-based questionnaire that is used to collect the data for this study. The Cronbach's Alpha is defined in the Reliability Analysis conducted and in Figure 6 we can identify that the Cronbach's Alpha achieved is 0.955 which is higher than 0.9. Referring to Figure 7, we can see that the achieved Cronbach Alpha is indicating an excellent internal consistency in all the items measured.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.955	.964	6

Figure 6: Reliability Statistic

Cronbach Alpha	Internal Consistency
α >= 0.9	Excellent
0.9 > α >= 0.8	Good
0.8 > α >= 0.7	Acceptable
0.7 > α >= 0.6	Questionable

0.6 > α >= 0.5	Poor
0.5 > α	Unacceptable

Figure 7: Cronbach Alpha's Scale

Along the way in completing this report, a few other analyses relevant to the study are generated and the relevant hypotheses are discussed in the following sections.

1. Descriptive Analysis

A Descriptive Analysis is used to describe the characteristics of the given set of data representing the population in terms of its basic features. It also provides of the summary and measurement such as the mean, median, mode, max, min and others. It is very useful in providing Central Tendency and Measures of Variability in conceptualizing the overall formation of the data

1.1 Frequency Analysis

In the Figure 8 presented below, data on the frequency of the gender that participated as the respondents in the study is analyzed. It is noted that more female students participated as respondents which is 56% and the balance of 44% are male respondents.

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	22	44.0	44.0	44.0
	Female	28	56.0	56.0	100.0
	Total	50	100.0	100.0	

Figure 8: Population by Gender

Further demographic data collected in the questionnaire as depicted in Figure 10, provided the information on the duration the respondents have been using the LMS. From the total of 50 respondents 20% students have been using the LMS for under 1 year, 22% have been using the LMS for under 2 years, 26% have been using the LMS for under 3 years and the remaining 20% have been using the LMS for under 4 years.

2 Correlation

Correlation is a measurement of the relationship between two variables to determine whether the variables are positively, negatively or are not related to each other. The variables are related if a change in one variable affects the other variable.

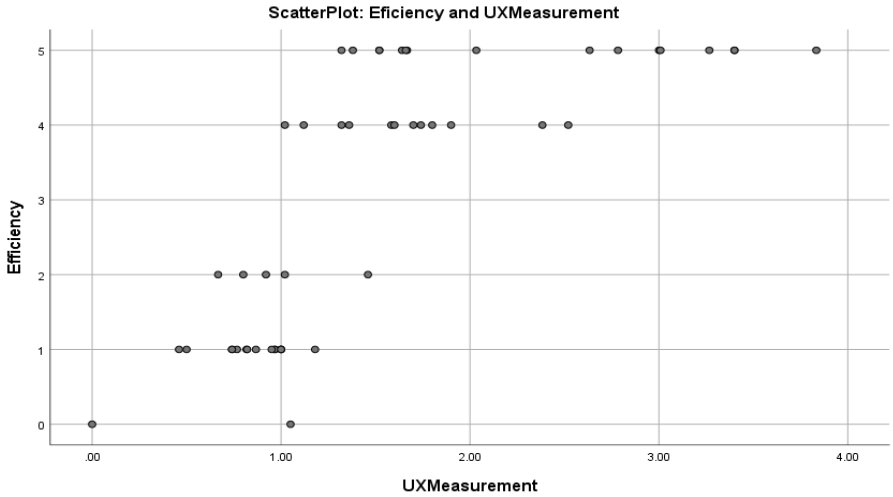

Figure 1: Scatter Plot Efficiency and UXMeasurement

The scatter plot shown in Figure 9 is of the variable Efficiency and UXMeasurement is indicating a positive correlation between the two variables as there is an uphill pattern from left to right between the X-axis and the Y-axis. Further analysis on correlation with the Pearson Correlation is conducted in the following section.

2.1 Pearson Correlation

Pearson Correlation Coefficient is used for jointly normally distributed data (Schober et. Al, 2018). Correlation efficient (r) can be indicating negative correlation (-r) or positive correlation (+r), simply put -1=< r <=1. The p-value (significance level) that is generated in the analysis of the population will be compared to the α-value which is a standard 0.05 (decision ruler) and the hypothesis accepted or rejected based on the following rules:

If p =< α: there is a significant relationship between the variable which means the null hypothesis is accepted.

If p > α: there is no significant relationship between the variable which means the null hypothesis is rejected.

The null hypothesis that is derived is that there is a relationship between the dependent variable Efficiency and the independent variable UXMeasurement:

Null Hypothesis

H0: There is a significant relationship between Efficiency and UXMeasurement.

Alternative Hypothesis

H1: There is no significant relationship between Efficiency and UXMeasurement.

Correlations

		Efficiency	UXMeasurement
Efficiency	Pearson Correlation	1	1.000**
	Sig. (2-tailed)		.000
	N	50	50
UXMeasurement	Pearson Correlation	1.000**	1
	Sig. (2-tailed)	.000	
	N	50	50

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 10: Pearson Correlation

In the Pearson Correlation analysis in Figure 10, it indicates that the P-value obtained is 0.000 which is significantly smaller than the chosen α value which is 0.05. This shows that the relationship between the variables are highly significant in the population as well as in the sample. The Pearson Correlation is at **1.000** which proves that there is a **strong positive correlation** between the relationship. This enable us to **accept** the **H0** which is to agree that there is a significant positive relationship between Efficiency and UXMeasurement.

3 T-Test

T-test is conducted to compare means. The T-score obtained from the analysis is the ratio between the two groups and the difference within the two groups. A p-value (probability) is also generated, which is to indicate the probability that the result has happened by chance. A low p-value (low probability) is an indication that the result did not happen by chance. In most cases when the p-value is lesser than 0.05, meaning the probability is less than 5%, the result of the test is said to be valid or in another word the hypothesis of the test is accepted. The T-Test, which is One Sample T-Test is performed in the following section.

3.1 One Sample T-Test

One Sample T-Test is used to examine if the mean of the population is statistically different from the known mean or hypothesized value. Before observing the analysis, the null and alternative hypothesis is stated as below:

Null Hypothesis

The null hypothesis is that the underlying population (based on Duration) mean is equal to 3.
H0: The respondents are students who have used the LMS for 3 years. (H0: $\mu = 3$)
Alternative Hypothesis
The alternative hypothesis is that the underlying population (based on Duration) mean is not equal to 3.
H1: The respondents are students who have not used the LMS for 3 years. (H1: $\mu \neq 3$)
In the One-Sample T-Test analysis, we have to observe the p-value against the α-value which is decided to be at 0.05 giving the room of 5% of error and 95% of Confidence Interval.

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Duration	50	2.82	1.304	.184

Figure 2: One-Sample Statistics

As indicated in Figure 11, the mean value for the Duration is 2.82 which is close enough to the test value for the hypothesis which is 3.

One-Sample Test

	Test Value = 3						
			Significance			95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Mean Difference	Lower	Upper
Duration	-.976	49	.167	.334	-.180	-.55	.19

Figure 3: Pearson Correlation

In Figure 12 we can observe that the p-value generated for the Compare Means One Sample T-Test is 0.167 which is greater than the standard α-value 0.05. This allows the acceptance of H_0 at 95% Confidence Interval of Difference which emphasize that the confidence interval will contain the hypothesized mean. Thus, statistically it is correct to conclude by accepting the null hypothesis which says that "The respondents are students who have used the LMS for 3 years".

3.2 Two-Way Anova

A Two-Way Anova is decided to be used to determine the effect of 2 independent variables on a dependent variable. In this section we will determine if the Independent Variables, Gender and Duration have any significant effect on the Dependent variable UXMeasurement either separately or jointly.
The hypotheses tested in this section are:

1) Null Hypothesis (Gender)

The null hypothesis is that the Gender will have no significant effect on the UXMeasurement.
H0: Gender have NO significant effect on the UXMeasurement.
Alternative Hypothesis
The alternative hypothesis is that the Gender will have no significant effect on the UXMeasurement.
H1: Gender have significant effect on the UXMeasurement.

2) Null Hypothesis (Duration)

The null hypothesis is that the Duration will have no significant effect on the UXMeasurement.
H0: Duration have NO significant effect on the UXMeasurement.
Alternative Hypothesis
The alternative hypothesis is that the Duration will have no significant effect on the UXMeasurement.

H1: Duration have significant effect on the UXMeasurement.

3) Null Hypothesis (Gender and Duration)

The null hypothesis is that the Gender and Duration will have no significant effect on the UXMeasurement.

H0: Gender and Duration have NO significant effect on the UXMeasurement.

Alternative Hypothesis

The alternative hypothesis is that the Gender and Duration will have no significant effect on the UXMeasurement.

H1: Gender and Duration have significant effect on the UXMeasurement.

Tests of Between-Subjects Effects

Dependent Variable: UXMeasurement

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	6.775[a]	9	.753	.989	.464
Intercept	82.469	1	82.469	108.321	<.001
Gender	.507	1	.507	.666	.419
Duration	6.584	4	1.646	2.162	.091
Gender * Duration	.112	4	.028	.037	.997
Error	30.454	40	.761		
Total	155.198	50			
Corrected Total	37.228	49			

a. R Squared = .182 (Adjusted R Squared = -.002)

Figure 15 : Two-Way Anova

The p-value generated for Gender, Duration and Gender*Duration is compared with the α-value 0.05 to either accept or reject the hypothesis. If the p-value is greater than the α-value, the null hypothesis is accepted and if the p-value is smaller the hypothesis will be rejected. Thus, below results are observed from the analysis generated as depicted in Figure 15:

The p-value for Gender is 0.419 which is greater than 0.05 thus the Gender H0 is accepted, meaning that:

Gender will have NO significant effect on the UXMeasurement.

The p-value for Duration is 0.091 which is greater than 0.05 thus the Duration H0 is accepted meaning that

Duration will have NO significant effect on the UXMeasurement.

The p-value for Gender*Duration is 0.997 which is greater than 0.05 thus the Gender*Duration H0 is accepted meaning that:

Gender and Duration will have NO significant effect on the UXMeasurement.

V CONCLUSION AND DISCUSSION

This study focuses on the quantitative approach in analyzing data collected for research on the title Measurement of Students User Experience (UX) of Learning Management System in School of IT, SEGI University Kota Damansara using convenient sampling of the population on the stated school. The Descriptive Analysis was used to perform the central tendency and measurement of variability and the Frequency Analysis was used to generate the frequency on the gender that participated in the study. It was identified that most of the respondents were female, which is at 56% and the remaining 44% were male.

The Reliability Statistics was performed to inspect the Cronbach Alpha value to establish the internal consistency of the items measured, and an excellent Cronbach Alpha value was established to prove that the items used in the study were highly related.

The scatterplot that was generated in the Correlation of the chosen variables was indicating a positive relationship between the variable Efficiency and UXMeasurement. Further analysis for T-Test was conducted using One-Sample T-test statistically proven that the

respondents participated in the study were students who have used the LMS for 3 years. The Two-Way Anova analysis was used to prove several hypotheses and the findings are that the gender of the respondents do not have any significant effect of measurement of the User Experience of the LMS, the duration the respondents been using the LMS do not have any effect on the measurement of the User Experience of the LMS and gender of the respondents do not have any effect on the User Experience Measurements of the LMS.

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