

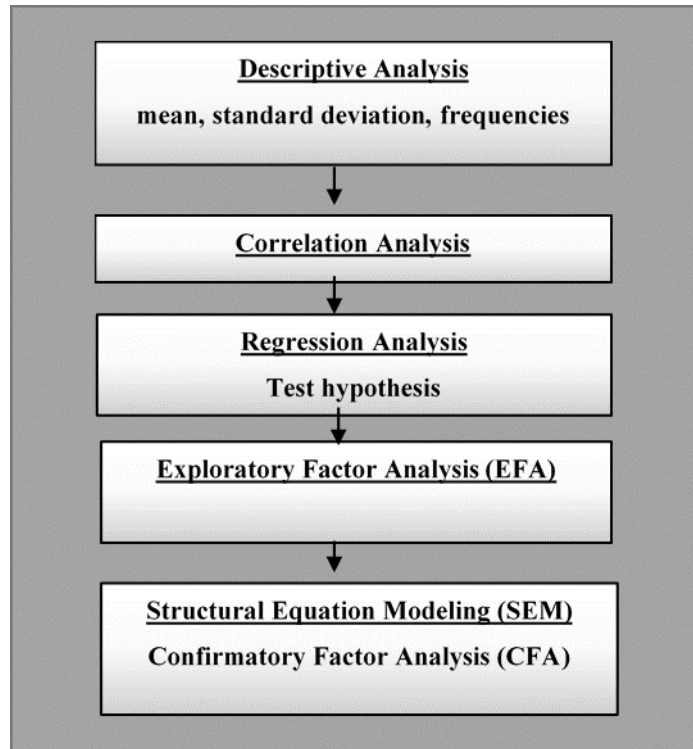
## CHAPTER 4

### RESULTS AND DISCUSSIONS

#### 4.1 Introduction

Chapter four represents the backbone of this research work. The chapter introduces the research methodology type of quantitative analysis / analysis towards the first batch of the primary data. These primary data are gathered among survey participants within the scope of review and its associated survey directed as well as executed at University Science Islamic Malaysia (USIM). The outcomes of the findings are derived and extracted from the process of the statistical investigation/analysis within the body of this chapter in which are utilized to accomplish the accompanying destinations:

1. Capability of meeting the research inquiries and its relevant questions.
2. Investigating the associations between the parameters pertaining research (namely: System Quality Intention to implement SIS, and User's Satisfaction).
3. Testing the hypotheses of the research, including single linear regressions.
4. Testing the hypothetical modality and assessing the degree of relationship between the parameters mode. This can be depicted in Figure 4.1.



**Figure 4.1:** The Steps of Analysis

The analysis in this chapter is divided into several sections as shown in Figure 4.1, In the each of section discusses the result so that to make the necessary conclusions and examines the relationships between the variables of the research as well as testing the hypothesis. As summary of each section is described as following:

1. Demographic analysis, which includes the analysis of biological populations of the research such as age, sex, experience, academic qualifications.
2. Reliability test and Descriptive test, the aim of this test is to verify the consistency of the questionnaire and detect any possible error in the design of the questionnaire or detecting items that cause ambiguity for the research sample. The test is conducted by measuring reliability coefficient Cronbach's Alpha. However, if the values of this coefficient are acceptable, then further analysis could be performed. Moreover, the researcher calculates the descriptive

statistics (mean, standard deviation, frequencies) to understand the level of agreement on each item as well as the overall mean value of each variable. The descriptive analysis is useful to find the items those scored the highest level of agreement by the participants in the survey.

3. Pearson Correlation Analysis, to know the degree and the direction of association between the variables of the research.
4. Structural Equation Modeling (SEM) provides two main advantages in testing a theoretical (model). Such analysis provides numerical estimates for each of relationships in the model to indicate the strength of the relationships and allows the researcher to diagnose which observed variables are good indicators of the latent variables (through Confirmatory Factor Analysis CFA).

## **4.2 The Demographic Analysis**

Demographic analysis includes the sets of methods and techniques that allow the researcher to measure the dimensions of research sample. These methods have primarily been developed to research human populations, but are extended to a variety of areas where researchers want to know how populations of social actors can change across time through processes of age, experience, marital status, academic qualifications, and job experience. In the context of human biological populations, demographic analysis uses administrative records to develop an independent estimate of the population (Siegal, 2002).

### **4.2.1 Gender**

The following table shows the distribution of gender between the participants after accomplishing the survey in USIM.

**Table 4.1:** Frequencies of Gender Demographic Factor

Frequency			Percent	Valid Percent	Cumulative Percent
Valid	Male	173	62.9	62.9	62.9
	Female	102	37.1	37.1	100.0
	Total	275	100.0	100.0	

Table 4.1 shows that the percentage of male (62.90%) is greater than the percentage of female (37.10%). This result shows that number of male who uses SIS is around double number of female.

#### 4.2.2 Academic Level

The following table shows the distribution of academic qualifications of participants in USIM. Only Master and Ph.D. students are included in the survey: by using purposes sampling method

**Table 4.2:** Frequencies of Academic Qualification Demographic Factor

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Master	131	47.6	47.6	47.6
	PhD	144	52.4	52.4	100.0
	Total	275	100.0	100.0	

Table (4.2) shows the frequencies and percentages of the academic qualifications of the participant. It is found that students of Ph.D. represent the highest percentage = 52.40%. While the percentage of students from the Master's degree = 47.60%. This result indicates that the level of usage of SIS by postgraduate students of Ph.D. is slightly more with comparing to Master's degree students.

### 4.2.3 SIS Usage

The Table 4.3 shows the distribution of level of SIS usage by postgraduate students (Ph.D. and Master) in USIM:

**Table 4.3:** Level of SIS Usage in USIM

		Frequency	Percent	Valid Percent	Cumulative Percent
<b>Valid</b>	<2	42	15.3	15.3	15.3
	2-5	92	33.5	33.5	48.7
	6-9	67	24.4	24.4	73.1
	>10	74	26.9	26.9	100.0
	Total	275	100.0	100.0	

Table 4.3 shows frequencies and percentages of SIS level of usage. It is found that the maximum percentage is scored those who use the system 2-5 times through the semester. In other words, the majority of users are using the system maximum 5 times per semester (33.50%), next are those who use SIS maximum 10 times per year (26.90), while the lowest percentage those who use SIS less than 2 times per semester (15.30%).

### 4.3 The Descriptive Analysis

Descriptive statistics are used to describe the basic features of the data in a research. They provide simple summaries about the sample and the factors. Together with simple graphics analysis, they form the basis of virtually every quantitative analysis of data. The bivariate analysis involves the examination across cases of one variable at a time. There are three major characteristics of a single variable that the research uses in the descriptive analysis:

Distribution, which is a summary of the frequency of individual values or ranges of values for a variable. Frequency tables are the main type to measure distribution.

Central tendency. The central tendency of a distribution is an estimate of the "center" of a distribution of values. There are three major types of estimates of central tendency. The main type of estimates of central tendency is (Mean).

Dispersion, which refers to the spread of the values around the central tendency. There are two common factors of dispersion, the range and the standard deviation. The Standard Deviation is a more accurate and detailed estimate of dispersion because an outlier can greatly exaggerate the range.

The following sections describe the descriptive statistics associated with each variable:

#### 4.3.1 System Quality

The descriptive results (mean, standard deviations) associated with the items of System Quality are shown in Table 4.4.

**Table 4.4:** Descriptive Results of System Quality

	Usability	Mean	Std. Deviation
1	The current SIS provide information with simple ways to get information	3.50	1.00
2	It is easy to get SIS to do what I need	3.57	0.91
3	I am satisfied with the usability of SIS application	3.49	0.98
4	It is easy to navigate through the current system	3.53	0.89
5	It is easy to practice system interface	3.52	0.92
6	The design of all parts of SIS enhance my intention to use it	3.44	0.89
	Overall mean	3.50	

**Table 4.4** continued

	<b>Functionality</b>		
1	The functionality of SIS is suitable to me	3.47	1.07
2	SIS is precise in providing information for me	3.33	1.08
3	The techniques provided by the current SIS is useful	3.45	1.01
4	The utilities of system help me to get the required information	3.59	1.11
5	I am satisfied with the functionality of SIS application	3.50	1.04
6	The performance of SIS enhances my desire to use it	2.70	1.25
	Overall mean	3.34	
	<b>Flexibility</b>		
1	The current SIS is flexible to me	3.70	1.08
2	The SIS is flexible in meeting various demands	3.75	1.09
3	I am satisfied with the flexibility of SIS	3.69	3.26
4	The system help me to navigate without obstacles	3.40	0.98
5	The system enable me to custom my profile	3.57	1.01
6	SIS is simple and not complicated thus I have intention to use it	3.65	1.09
	Overall mean	3.62	
	<b>Convenience</b>		
	The current SIS is suitable to me	3.75	0.92
1	I am satisfied with the current SIS application because it fits my needs	3.92	0.95
2	SIS is easy to learn	3.58	0.0
3	I find SIS is not complicated to me	3.87	0.97
4	I find SIS interesting to learn	2.90	1.31
5	The appropriate design of SIS enhances my intention to use it	3.85	0.92
	Overall mean	3.64	
	<b>Data quality</b>		
1	The current SIS provide useful information to me	3.59	1.08
2	Information I get from SIS is clear	3.59	0.88
3	The system provide rich information	3.45	0.98
4	I am pleased with usefulness of data I get from SIS	3.54	1.01
5	The information provided by SIS is helpful	3.55	1.01
6	The level of quality I found in the information provided by SIS enhance my intention to use it	2.71	1.37
	Overall mean	3.40	
	<b>Responsiveness</b>		
1	I find SIS is responsive to me requests	3.08	1.09
2	SIS provides me with sufficient information	3.23	1.24
3	The SIS responds quickly to my requests	3.43	1.08
4	I am happy with the fast feedback of SIS system	3.34	1.04
5	The system respond quickly to my request	3.35	1.06
6	The responsiveness of SIS enhance my intention to use it	3.37	1.01
	Overall mean	3.30	

**Table 4.4** continued

	<b>Accessibility</b>		
1	I find SIS is highly accessible	3.49	1.05
2	The accessibility of SIS saves my time in finding results and scores of student	3.39	0.97
3	I am satisfied with the easy ways to get information from SIS application	3.47	1.02
4	I found it easy to access all pages of SIS application	3.46	1.04
5	I don't have any difficulty to access for information using SIS application	3.47	1.05
6	The accessibility of SIS enhance my intention to use it	3.68	1.03
	Overall mean	3.49	
	<b>Timeliness</b>		
1	SIS provide information in time	3.55	0.99
2	SIS provides me with up-to-date information	3.64	0.91
3	The SIS carries out my requests in a timely manner	3.48	0.97
4	I am satisfied with the timeliness of SIS application	3.51	0.96
5	The system deliver information quickly	3.43	1.03
6	The timeliness of SIS enhance my intention to use it	3.51	0.97
	Overall mean	3.52	
<b>Overall mean for System Quality</b>		<b>3.48</b>	

Table 4.4 provides the mean and standard deviation of system quality dimensions that usability, functionality, flexibility, convenience, data quality, responsiveness, accessibility, and timeliness. Based on the result obtained, the overall mean of system quality found at 3.48, this result indicates that the respondents consider these dimensions represent the system quality provided by the student information system. The lower mean was found for the responsiveness dimension at 3.30, while the higher dimension mean was found for the convenience at 3.64. This result emphasizes on the crucial role of convenience in weighting the system quality acceptance by the users. In this regard, within the convenience dimension, the users believe that the easier and appropriate design of student information system enhances their intention to use it comes first. Then followed by other dimensions that scale the system quality, which

weighted by the users as flexibility at (m=3.62), timeliness at (m=3.52), usability at (m=3.50), accessibility at (m=3.49), data quality at (m=3.40), functionality at (m=3.34), and responsiveness at (m=3.30). As the users pay second concern about the system flexibility, which enable them to overcome future obstacles. Meanwhile, the timeliness of information provided by the system comes at the third rank, as this information timing has low importance, which is attributed to the aspect of low urgent need. The usability and accessibility of information generated from the student system comes at the fourth and fifth rank, as these two dimensions rely on ICT infrastructure availability by the users. However, the data quality, functionality, and responsiveness dimensions received less attention from the users, which specifically within the system developer responsibility. Hence, the deficits of these aspects will lead to the unsuitability of student information system at all.

The findings from the descriptive results associated with SIS quality variable could be summarized in the following table.

**Table 4.5:** Summarized of descriptive results associated with SIS quality

Variable	Mean	Maximum	Found on item #
Usability	3.50	3.57	2
Functionality	3.34	3.59	6
Flexibility	3.62	3.70	2
Convenience	3.64	3.92	2
Data quality	3.40	3.61	6
Responsiveness	3.30	3.43	3
Accessibility	3.49	3.68	6
Timeliness	3.52	3.64	2

### 4.3.2 Intention to Use SIS

The descriptive results (mean, standard deviations) associated with the items of Intention to use SIS are shown the Table 4.6.

**Table 4.6:** Descriptive Result of Intention to Use SIS

No	Phrase	Mean	Std. Deviation
	<b>Utility</b>		
1	The good performance of SIS increases my intention to use it the future	3.38	1.07
2	The ease of use of SIS increases my intention to use it	3.47	1.01
3	The good utilities of SIS affect my intention to use it positively	3.53	0.96
4	The simple way to get and reach information of SIS affect my intention to use it positively	3.61	0.90
5	The rich of data I get from SIS increases my intention to use it	3.46	0.99
	Overall mean	3.49	
	<b>Using Advantages</b>		
6	The fast response of SIS enhances my intention to use it	3.48	0.99
7	I find SIS is highly accessible then I use it more frequent in the future	3.49	1.02
8	The timing of information I get from SIS affects my intention to use in the future	3.50	0.99
9	I find SIS is convenience then I use it more frequent in the future	3.42	0.99
10	When SIS satisfy my needs then I have more intention to use it in the future	3.67	0.96
	Overall mean	3.51	
	<b>Islamic Features</b>		
11	The features of Islam urge me to use SIS	3.54	0.95
12	I am keen to use SIS that is not breaching Islamic features and Sharia	3.70	0.97
13	I use SIS because it includes many features that are identical with Islamic rules	3.69	0.92
14	I am interesting in using SIS because of its Islamic design	3.72	0.96
15	SIS provide honest information according to Islamic guidance	3.77	0.90
	Overall mean	3.68	
<b>Overall mean for Intention to use</b>		<b>3.56</b>	

**Table 4.7:** Summarized of descriptive results associated with of Intention to Use SIS

Variable	Mean	Maximum	Found on item #
Utility	3.49	3.6	4
Using Advantage	3.51	3.67	10
Islamic Factors	3.68	3.77	15

### 4.3.3 User's Satisfaction

The descriptive results (mean, standard deviations) associated with the items of User's Satisfaction are shown table 4.8

**Table 4.8:** Descriptive Result of User's Satisfaction

No	Phrase	Mean	Std. Deviation
1	SIS meets the information processing needs of my business	3.43	0.95
2	I am satisfied with SIS	3.57	0.96
3	SIS provides reports that seem to be just about exactly what I need	3.49	0.96
4	working with SIS is effort free	3.51	1.04
5	The SIS operation is reliable	3.60	0.90
6	The SIS operates properly	3.16	1.16
7	The SIS functions at all times	3.33	1.12
8	The SIS operates at all times	3.28	1.09
9	The SIS is failure free	3.16	1.17
10	The SIS is available to use at all times	3.31	1.11
11	The SIS is ready to be used	3.50	1.01
12	The SIS is prompt in carrying out my requests	3.36	0.99
13	The SIS is fast in performing my requests	3.43	1.13
<b>Overall mean</b>		<b>3.40</b>	

**Table 4.9:** Summarized of descriptive results associated with of User's Satisfaction

Variable	Mean	Maximum	Found on item #
Intention to use SIS	3.49	3.6	4

The findings from the descriptive result associated with Intention to use SIS variable shows that the maximum level of agreement among participant is found on item 5 (mean = 3.16), which understand that SIS operation is reliable to postgraduate students.

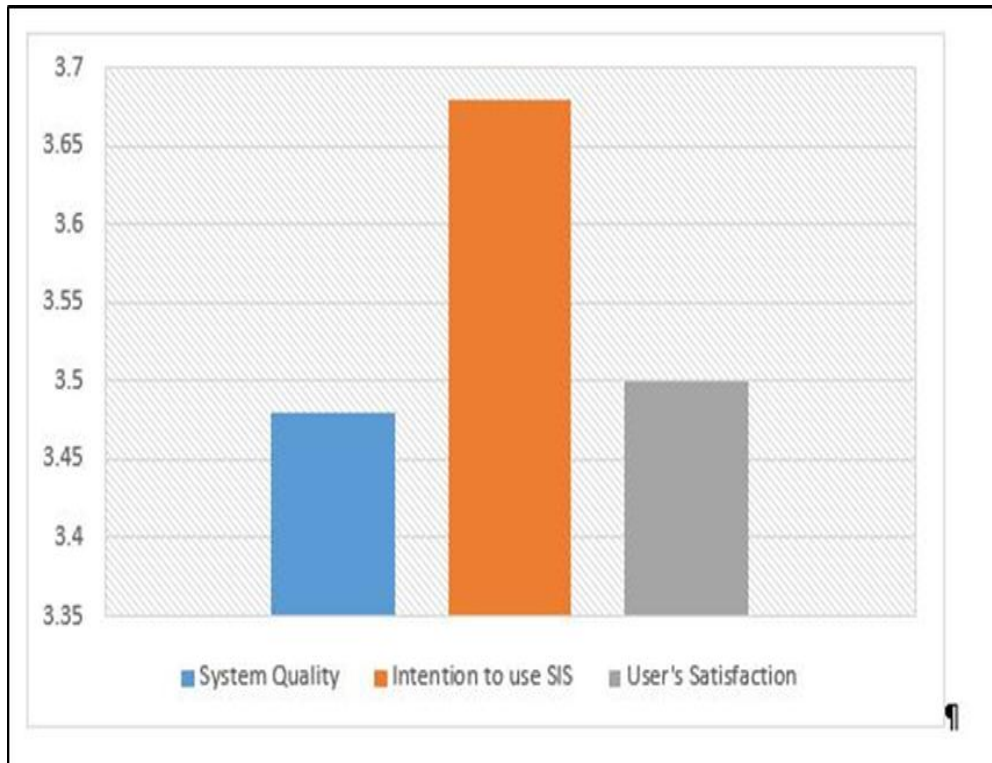
The accumulated mean of all items equal (3.40). This value is positive and indicates a moderate level of agreement by the participants on the influence of user's satisfaction on postgraduate students to use SIS.

The descriptive results show that SIS meets the information processing needs of students and they are satisfied with SIS to a "moderate" degree.

Moreover, SIS provides accurate reports and working with SIS is effort free. Participants confirmed that SIS is reliable, operates properly, provide good functions at all times, failure free, available to use at all times, help postgraduate students to carry out my requests, and SIS of USIM is fast in performing user requests. Despite all these features, the current level of agreement is moderate and below the expected level.

Therefore, the researcher recommends improving the current system in order to enhance user's satisfaction to a higher degree. The results of the research show a strong association between the items of each variable.

Figure 4.2 shows the summary descriptive results for all research variables. The mean is indicated on the vertical axis.



**Figure 4.2:** A Diagram Illustrating the Mean of Each Variable

#### 4.4 Pearson Correlation Analysis

As shown in the table 4.7, there is a moderate correlation between the three variables (User's Satisfaction, Intention to use SIS, SIS Quality). These correlations are non-directional. In other words, the directional and causal relationship are not possible to identify using Pearson correlation coefficient. Thus, conducting linear regression analysis is important to identify the casual relationships between these variables. The following section discusses the simple linear regression test.

The output of the correlation matrix table (see table 4.10) shows that all correlations between the independent variable (System Quality) and moderator (Intention to use) with the dependent variable (User's Satisfaction) are strong ( $r^{**} > 0.30, \rho < 0.05, \rho = 0.000$ ).

**Table 4.10:** Pearson Correlation Matrix between System Quality, User's Satisfaction, and Intention to Use SIS.

	SIS Quality	Intention to use SIS	Satisfaction
SIS Quality	1	.549**	.669**
Intention to use SIS	.	1	.635**
Satisfaction			1

All pair wise correlations are positive and highly statistically significant. The highest level of correlation is found between System Quality and User's Satisfaction, which shows the importance of the effect of system quality of SIS on the satisfaction of users.

The lowest level of correlation is found between System Quality and Intention to use SIS, a correlation that is still acceptable and shows a good degree of association between the intention of users to use SIS and their satisfaction about SIS.

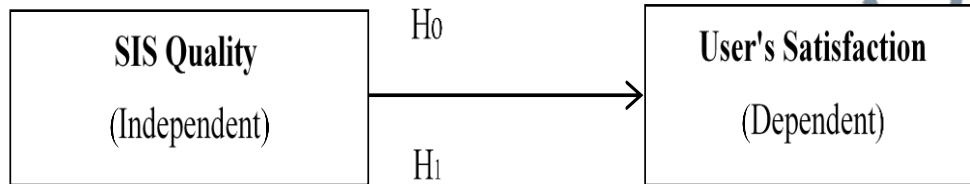
#### 4.5 Simple Linear Regression Analysis

In this section, the researcher tests each hypothesis defined in the conceptual framework. The test includes simple linear regression analysis between two individual variables, and finally testing the relationship between all variables of the model using multiple linear regression.

##### 4.5.1 Linear Regression for User's Satisfaction on SIS Quality.

A simple linear regression is used to test whether or not a linear relationship exists.

The regression model for User's Satisfaction on System Quality is shown in Figure 4.3. below.



**Figure 4.3:** The Regression Model for User's Satisfaction on System Quality

After running regression analysis in SPSS, the results are shown in the three outputs tables which are Models summary table, ANOVA table and Coefficients table.

The results in each table are discussed as follow:

**I. Model Summary of Simple Linear Regression.**

**Table 4.11:** Simple Linear Regression Output between SIS Quality and User's SAT

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.677 <sup>a</sup>	.459	.457	.48055
a. Predictors: (Constant), SIS_Quality				

Reading the values model summary enables the researcher to know how well the regression model predicts the observation on the variance and variability between the two variables according to Cohen (1988), acceptable value for R<sup>2</sup> is 0.2 and above. It is found that R (simple linear correlation) is to 0.677, this result indicates a good degree of association between System Quality and User's Satisfaction. The R<sup>2</sup> value of 0.459 indicates that 45.90% of the variation in User's Satisfaction can be explained by System Quality. This result also shows that a little more than 50% of the variation in User's Satisfaction is due to other reasons that future research has to look after.

## II. ANOVA Output

The table 4.9 is the regression outputs for ANOVA which reports how well the regression equation fits the data (i.e., predicts the dependent variable).

**Table 4.12:** ANOVA Output between SIS Quality and User's Satisfaction

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	53.461	1	53.461	231.507	.000 <sup>b</sup>
	Residual	63.043	273	.231		
	Total	116.505	274			
a. Dependent Variable: Satisfaction						
b. Predictors: (Constant), SIS Quality						

Reading the output in the ANOVA table shows that the overall regression model is statistically significant (p-value less than 0.05).

## III. The Regression Coefficients

The Coefficients the table 4.13 provides the necessary information to predict User's Satisfaction from System Quality. Table 4.13 also shows that the regression coefficient is significantly different from zero.

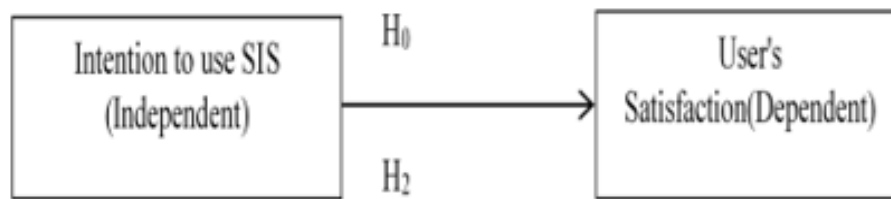
**Table 4.13:** Coefficients of Regression between SIS Quality and User's Satisfaction

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.439	.196		2.234	.026
	SIS_Quality	.851	.056	.677	15.215	.000
a. Dependent Variable: Satisfaction						

The regression equation of this model is as follows:

$$\text{User's Satisfaction} = 0.439 + 0.677 * \text{System Quality.}$$

#### 4.5.2 Linear Regression between Intention to Use SIS and User's Satisfaction



**Figure 4.4:** Regression model between Intention to use SIS and User's Satisfaction

**Table 4.14:** Simple Linear Regression Output between Intention to use SIS and User's Satisfaction

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.635 <sup>a</sup>	.403	.401	.50487
a. Predictors: (Constant), Intention				

Reading the value of R (simple linear correlation) is equal to 0.635, this result indicates a good degree of association between Intention to use SIS and User's Satisfaction.  $R^2 = .403$  indicates that 40.03% of the variance in the dependent variable which is User's Satisfaction in this case can be explained and interpreted by the variance in Intention to use SIS. In other words, any change (variability) in Intention to use SIS is 40.30% predicted by the Intention to use SIS. The remaining of variance in Intention to use SIS which is equal to 59.70% is presumed to be due to random variability not related to Intention to use SIS.

In this model, SPSS adjusted 40.10% of the variance between the two variables, where this value indicates a very small difference (0.1) between adjusted R-Squared and Predicted  $R^2$  obtained from the regression output which is statistically accepted. Thus, the level of fit of the regression model is not acceptable as well as the fit of the regression equation between the independent and dependent variable.

## I. ANOVA Output

The second table in regression outputs is ANOVA table which reports how well the regression equation fits the data (i.e., predicts the dependent variable).

**Table 4.15:** ANOVA Output between Intention to use SIS and User's Satisfaction

	Model	Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	46.920	1	46.920	184.080	.000 <sup>b</sup>
	Residual	69.585	273	.255		
	Total	116.505	274			
a. Dependent Variable: Satisfaction						
b. Predictors: (Constant), Intention						

Table 4.15 also shows that the regression coefficient is significantly different from zero.

Reading the data in ANOVA table shows the regression model predicts the dependent variable significantly well. In other words, the overall regression model statistically significantly predicts the outcome variable Intention to use SIS (i.e., the output of regression is a good fit for the data). In addition to that, the value of F (184.080) which is equal to the ratio of two mean square values of Intention to use SIS and User's Satisfaction is large. Thus, there is a causal relationship between Intention to use SIS and User's Satisfaction. According to that, the alternative hypothesis (H2) is true and accepts.

## II. The Regression Coefficients

The Coefficients table provides the necessary information to predict User's Satisfaction from Intention to use SIS, also it is helpful to determine whether Intention to use SIS contributes significantly to the regression model.

**Table 4.16:** Coefficients of Regression between Intention to use SIS and User's Satisfaction

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
1	(Constant)	.921	.185		4.982	.000
	Intention	.694	.051	.635	13.568	.000
a. Dependent Variable: Satisfaction						

The regression equation of this model as follow:

$$\text{User's Satisfaction} = 0.921 + 0.635 * \text{Intention to use}$$

Table 4.16 also shows that the regression coefficient is significantly different from zero.

### III. Summary of Hypothesis 2 Test

Table 4.17 shows the summary simple regression analysis using SPSS to get the necessary information about the strength and direction of association between Intention to use SIS and User's Satisfaction.

**Table 4.17:** Summary of Simple Regression Analysis of Intention to Use SIS and User's Satisfaction.

Output	Value	Output Table	Sig.	Description
Pearson Correlation R	0.635	Regression	.000	Positive, good, and Significant
R <sup>2</sup>	0.403 (40.30%)	Regression		Moderate degree of variance interpretation
F- Test	184.08	ANOVA	.000	Regression model fits the data well.
Regression Coefficient $\beta$	0.635	Coefficients	.000	Regression coefficient positive and statistically highly significant.

Based on the information indicated in the table above, the research rejects the null hypothesis (H0) and accepts the alternative hypothesis (H2). Therefore, it is concluded that Intention to use SIS is correlated with User's Satisfaction in a positive, strong, and causal relationship.

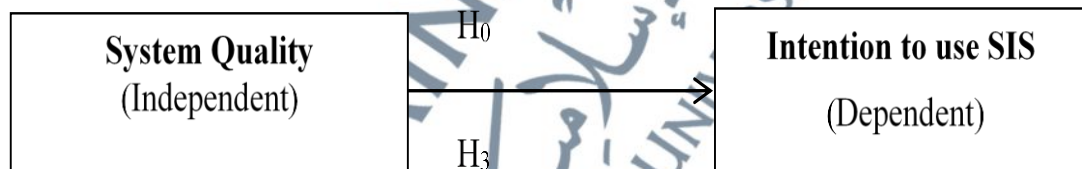
#### 4.5.3 Simple Linear Regression between System Quality and Intention to Use SIS

A simple linear regression is used to test the following the null and alternative hypotheses:

H3: There is a statistical relationship between system quality and Intention to use SIS.

H0: There is no statistical relationship between System Quality and Intention to use SIS.

The regression correlation between System Quality and Intention to use SIS is shown figure 4.5.



**Figure 4.5:** Regression Model between System Quality and Intention to Use SIS

After running regression analysis in SPSS, the results are shown in the three outputs tables which are Models summary table, ANOVA table and Coefficients table.

The results in each table are discussed as follow:

##### I. Model Summary of Simple Linear Regression

The model summary provides initial information about the regression strength between System Quality and Intention to use SIS. From the table 4.15 the research

identifies the simple correlation coefficient (R), the coefficient of determination (R<sup>2</sup>), and the adjusted R-Square.

**Table 4.18:** Simple Linear Regression Output Between System Quality and Intention to Use SIS.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.549 <sup>a</sup>	.301	.298	.49920
a. Predictors: (Constant), SIS_Quality				

Reading the values model summary shows that R (simple linear correlation) is equal to 0.549, this result indicates a moderate degree of association between System Quality and Intention to use SIS. R<sup>2</sup> = 0.301 indicates that 30.10% of the variance in the dependent variable which is Intention to use SIS in this case can be explained and interpreted by the variance in System Quality. In other words, any change (variability) in Intention to use SIS is 30.10% predicted by the System Quality. The remaining of variance in Intention to use SIS which is equal to 69.90% is presumed to be due to random variability not related to System Quality.

The adjusted R-squared = 29.80% of the variance between the two variables, where this value indicates a very small difference (0.003≈0) between adjusted R-Squared and Predicted R<sup>2</sup> obtained from the regression output which is statistically accepted. Therefore, the level of fit of the regression model is not acceptable as well as the fit of the regression equation between the independent and dependent variable.

## II. ANOVA Output

The second table in regression outputs is ANOVA table which reports how well the regression equation fits the data (i.e., predicts the dependent variable).

**Table 4.19:** ANOVA Output

Model	Sum of Squares	Df	Mean Square	F	Sig.
<b>Regression</b>	29.291	1	29.291	117.538	.000 <sup>b</sup>
<b>Residual</b>	68.033	273	.249		
<b>Total</b>	97.323	274			
a. Dependent Variable: Intention					
b. Predictors: (Constant), SIS_Quality					

Table 4.19 also shows that the regression coefficient is significantly different from zero.

### III. Regression Coefficients

**Table 4.20:** Coefficients of Regression

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.375	.204		6.737	.000
SIS_Quality	.630	.058	.549	10.841	.000
a. Dependent Variable: Intention					

The regression equation of this model as follow:

Intention to use SIS = 1.375+ 0.204\* System Quality.

Table 4.20 also shows that the regression coefficient is significantly different from zero.

### IV. Summary of Hypothesis 3 Test

Table 4.21 shows the summary simple regression analysis using SPSS to get the necessary information about the strength and direction of association between System Quality and Intention to use SIS.

**Table 4.21:** Summary of Simple Regression Analysis of Between System Quality and Intention to Use SIS

Output	Value	Output Table	Sig.	Description
Pearson Correlation R	0.549	Regression	.000	Positive, moderate, and Significant
R- Square R <sup>2</sup>	0.301 (30.10%)	Regression		Moderate degree of variance interpretation
F- Test	117.53	ANOVA	.000	Regression model fits the data well.
Regression Coefficient $\beta$	0.549	Coefficients	.000	Regression coefficient positive and statistically significant.

Based on the information indicated in the table 4.21, the research rejects the null hypothesis (H0) and accepts the alternative hypothesis (H3). Therefore, it is concluded that System Quality is correlated with Intention to use SIS in a positive, moderate, and causal relationship.

### V. Simple Regression Analysis for 3 Hypotheses

The test of hypothesis (see Table 4.22) shows there is a high correlation between the independent variables (System Quality, Intention to use SIS, and User's satisfaction) and the dependent variable (User's Satisfaction).

**Table 4.22:** The Summary of Hypothesis Test

Hypothesis	Test result	Independent variables	Dependent Variable	Regression Level
H1	Accepted	System Quality	User's Satisfaction	High
H2	Accepted	Intention to use SIS	User's Satisfaction	High
H3	Accepted	System Quality	Intention to use SIS	High

## 4.6 Exploratory Factor Analysis (EFA)

In this section, the research conducts a factor analysis to examine the loading of items with each factor and identify the final items that would be used in the SEM. The result from EFA is the final step to identify the most significant variables (items) that affect the related factors of each variable. The following subsections shows the results of EFA which include Communalities, KMO and Bartlett's Test, Total Variance Explained, and Rotated component matrix.

### 4.6.1 EFA of System Quality

The following analysis show the result of main factor analysis associated with System Quality:

#### I. Communalities

The communalities for the variable are computed by taking the sum of the squared loadings for that variable. The first check for any value that might be below 0.3. If many items below 0.3 then might be some issues with these items that need for improvement.

Table 4.23 shows the communalities of System Quality. The output in this table shows that most of the items having a good degree of communalities  $> 0.3$ . No item having an extraction below 0.30, which shows a good fit of data for factor analysis. The communalities after extraction is above 0.5 for most items which represent a good fit of data. The lowest communality extraction is found with item 1 which is equal to 0.439 but this item shall not be removed from further steps in factor analysis since it is greater than 0.30 and acceptable according to statistical standards.

**Table 4.23:** Communality of System Quality

	<b>Initial</b>	<b>Extraction</b>
Usability_1	1.000	.439
Usability_2	1.000	.617
Usability_3	1.000	.590
Usability_4	1.000	.679
Usability_5	1.000	.617
Usability_6	1.000	.551
Function_1	1.000	.859
Function_2	1.000	.844
Function_3	1.000	.952
Function_4	1.000	.904
Function_5	1.000	.906
Function_6	1.000	.610
Flexibility_1	1.000	.909
Flexibility_2	1.000	.886
Flexibility_3	1.000	.473
Flexibility_4	1.000	.536
Flexibility_5	1.000	.935
Flexibility_6	1.000	.939
Conven_1	1.000	.899
Conven_2	1.000	.833
Conven_3	1.000	.621
Conven_4	1.000	.819
Conven_5	1.000	.416
Conven_6	1.000	.912
Data_Qua_1	1.000	.845
Data_Qua_2	1.000	.468
Data_Qua_3	1.000	.939
Data_Qua_4	1.000	.877
Data_Qua_5	1.000	.879
Data_Qua_6	1.000	.636
Respons_1	1.000	.644
Respons_2	1.000	.502
Respons_3	1.000	.630
Respons_4	1.000	.821
Respons_5	1.000	.632
Respons_6	1.000	.574
Access_1	1.000	.933

**Table 4.23** continued

Access_2	1.000	.716
Access_3	1.000	.955
Access_4	1.000	.944
Access_5	1.000	.945
Access_6	1.000	.492
Timeliness_1	1.000	.708
Timeliness_2	1.000	.510
Timeliness_3	1.000	.529
Timeliness_4	1.000	.532
Timeliness_5	1.000	.837
Timeliness_6	1.000	.629

## II. KMO and Bartlett's Test

Bartlett's test is another indication of the strength of the relationship among variables. This tests the null hypothesis that the correlation matrix is an identity matrix. An identity matrix is matrix in which all of the diagonal factors are 1 (See table 4.24) and all off diagonal factors (term explained above) are close to 0. The research wants to reject this null hypothesis. A significance level below 0.05 is small enough to reject the null hypothesis. This means that correlation matrix is not an identity matrix.

**Table 4.24:** KMO Values

>0.9	Excellent
>0.8	Very good
>0.7	Good
>0.6	Fine
>0.5	Accepted but need for improvement

Source: Kaiser (1974)

KMO and Bartlett's test of sphericity produces the Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett's test. The value of KMO should be greater than 0.5 and should be significant if the sample is adequate (KMO values less than 0.5 require

remedial action). Where KMO values greater than 0.8 can be considered very good (see table below), i.e. an indication that component or factor analysis will be useful for these variables.

The result from KMO and Bartlett's Test table shows that the value KMO value equal 0.890, which is considered a very good fit for EFA. Thus, the data of system quality is highly fit for EFA. Also, the reading of Bartlett's Test of Sphericity shows it is significant ( $p=0.000$ ), which is  $\leq 0.05$ . i.e. it is concluded that the significance level is small enough to reject the null hypothesis. Therefore, the correlation matrix is not an identity matrix.

**Table 4.25: KMO and Bartlett's Test**

<b>Kaiser-Meyer-Olkin Measure of Sampling Adequacy.</b>		.890
<b>Bartlett's Test of Sphericity</b>	Approx. Chi-Square	11850.336
	Df	1128
	Sig.	.000

### III. Total Variance Explained

The total variance explained is a table that shows the percentage of variance explanation by all possible factors of the variable. In statistics, explained variation factors the proportion to which a mathematical model accounts for the variation (dispersion) of a given data set. Total column gives the eigenvalue, or amount of variance in the original variables accounted for by each component. The % of Variance column gives the ratio, expressed as a percentage, of the variance accounted for by each component to the total variance in all of the variables. The Cumulative % column gives the percentage of variance accounted for by the first n components. For example, the cumulative percentage for the second component is the sum of the percentage of variance for the first and second components (Achen, 1990).

Eigenvalue actually reflects the number of extracted factors whose sum should be equal to number of items which are subjected to factor analysis. The next item shows all the factors extractable from the analysis along with their eigenvalues.

The percentage of explanation of variance in System Quality by its variables (items) is shown Table 4.26 Reading the output data, it is evident that the eigenvalue reflects the total number of extracted factors (components) whose sum should be equal to number of all items which shall be analysed in EFA. The focus in interpretation the variance of System Quality is reading the values of Extraction Sums of Squared Loadings. The result from the output of total variance explained analysis shows that each factor (component) of System Quality captures a certain amount of the overall variance in the observed variables of System Quality. (See the column of % of Variance of Rotation Sums of Squared Loadings), and the factors (components) are always listed in order (sequentially) of how much variation they explain.

**Table 4.26:** Total Variance Explained

SIS quality Factors	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1. Accessibility	12.766	26.596	26.596	12.766	26.596	26.596
2. Functionality	4.485	9.344	35.940	4.485	9.344	35.940
3. Flexibility	3.635	7.573	43.513	3.635	7.573	43.513
4. Data quality	3.075	6.407	49.920	3.075	6.407	49.920
5. Convenience	2.320	4.833	54.753	2.320	4.833	54.753
6. Responsiveness	2.116	4.407	59.161	2.116	4.407	59.161
7. Timeliness	1.703	3.549	62.709	1.703	3.549	62.709
8. Usability	1.561	3.251	65.960	1.561	3.251	65.960

The output table 4.26 shows that the total number of extracted components with an eigenvalue greater than one equal 8 factors, thus they are considered in CFA analysis. The cumulative variance of explanation by 8 factors =65.96. Therefore, the 47 items associated with System Quality explain only 65.96% of its total variance.

The first factor (Accessibility) scored the highest eigenvalue (12.766). Thus, it is concluded that Accessibility of SIS explains 26.596% of the overall variance in System Quality (highest interpretation). The variables (items) loaded on Accessibility factor represent the most explanatory items to the variance in System Quality. The factors (1-8) are retained because their eigenvalue >1 and locating at the slop of curve in the scree plot (see Figure 4.6) which and explains more variance in System Quality comparing to other factors. These eight factors are (Usability, Functionality, Flexibility, Convenience, Data quality, Responsiveness, Accessibility, and Timeliness).

#### **IV. Scree Plot**

A Scree Plot is a simple line segment plot that shows the fraction of total variance in the data as explained or represented by each Principal Component. The components are ordered, and by definition are therefore assigned a number label, by decreasing order of contribution to total variance. The PC with the largest fraction contribution is labelled with the label name from the preferences file. Such a plot when read left-to-right across the abscissa can often show a clear separation in fraction of total variance where the 'most important' components cease and the 'least important' components begin. The point of separation is often called the 'elbow'. (In the PCA literature, the plot is called a 'Scree' Plot because it often looks like a 'scree' slope).

The scree plot of System quality is illustrated in the figure 4.6. It is shown that the slope of the curve is changing at component 8. Therefore, the factors from 1-8 are selected in the Confirmatory Factor Analysis CFA later in SEM.

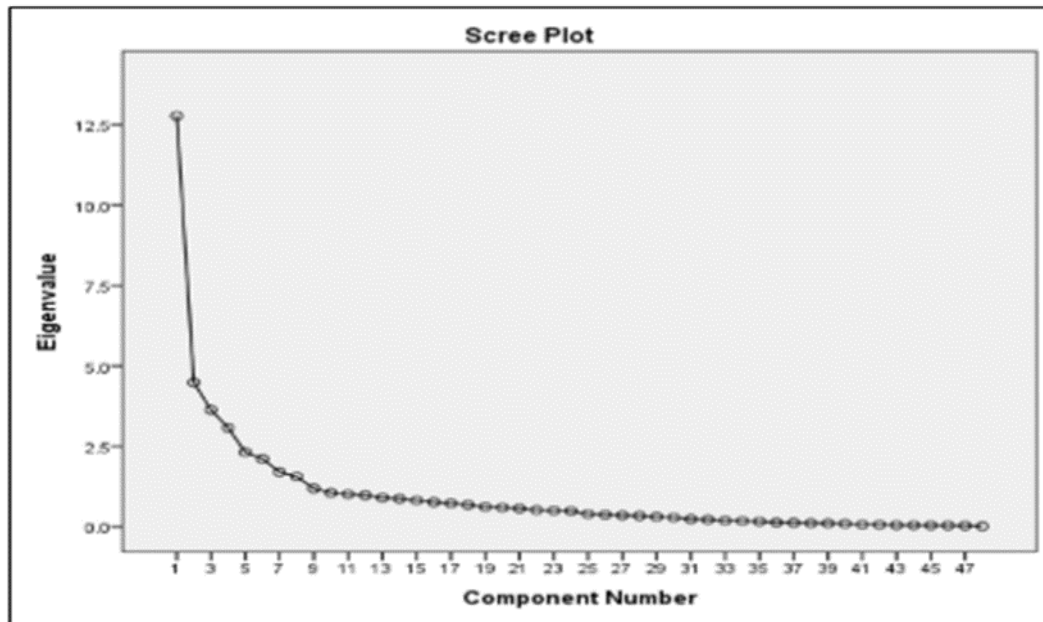


Figure 4.6: Scree Plot of System Quality Factors

#### V. Rotated component matrix

In this analysis, the research factors the loading of each variable (item) with the associated factor (component), the loading is a measure of (weight/strength/importance) of correlation of each variable with a particular factor. The aim of doing rotations on the variables of System Quality in order improve its extracted factors.

The rotation is made for all variables of System Quality so that to enhance the overall interpretation of the retained factors. The research used a type of rotation is based on an assumption that all (47) extracted factors of System Quality are uncorrelated in order to achieve strongest loading by variables on each factor. Also doing orthogonal rotation will enhance the loading of each variable on one particular

factor rather than distribute loading on other factors which make the measurement of extracted factors more difficult. The result of rotation is shown in the following table 4.27.

Through rotated matrix it is possible to identify the items with highest factor loading. There are eight factors specified: Accessibility, Functionality, Flexibility, Data quality, Convenience, Responsiveness, Timeliness, and Usability. The following table shows the loading of System Quality items on each factor.

**Table 4.27:** Matrix of System Quality Rotated Component

	Component (factors)										
	1	2	3	4	5	6	7	8	9	10	11
	Accessibility	Functionality	Flexibility	Data quality	Convenience	Responsiveness	Timeliness	Usability	Factor 9	Factor 10	Factor 11
Access_5	.930										
Access_3	.920										
Access_4	.919										
Access_1	.912										
Access_2	.785										
Function_3		.959									
Function_4		.942									
Function_5		.933									
Function_1		.910									
Function_2		.896									
Flexibility_6			.940								
Flexibility_5			.926								
Flexibility_2			.911								
Flexibility_1			.907								
Flexibility_4											
Data_Qua_3				.922							
Data_Qua_5				.915							
Data_Qua_4				.910							
Data_Qua_1				.866							
Data_Qua_2				.405							

**Table 4.27** continued

Conven_6					.888							
Conven_1					.874							
Conven_2					.853							
Conven_4					.835							
Conven_5												
Respons_4						.822						
Respons_1						.728						
Respons_5						.687						
Respons_3						.650						
Respons_6						.566						
Timeliness_5							.832					
Timeliness_1							.801					
Timeliness_6							.611					
Timeliness_2							.521					
Timeliness_4							.505					
Timeliness_3							.498					
Usability_4								.712				
Usability_5								.705				
Usability_2								.630				
Usability_3								.599				
Usability_6								.559				
Usability_1								.475				
Flexibility_3									.628			
Function_6										.703		
Respons_2												
Conven_3												
Data_Qua_6												.734
Access_6												

As shown in the table 4.27, the items Flexibility\_3, Function\_6, Respons\_2, Conven\_3, Data\_Qua\_6, Access\_6 are loaded individually on factors (9, 10, and 11) and not grouped with other items within one factor. Therefore, factors 9, 10, 11 are omitted together with their loaded items from CFA analysis.

#### 4.6.2 EFA of User's Satisfaction

The following analysis shows the result of EFA analysis associated with User's satisfaction:

##### I. Communalities

Table 4.28 shows the communalities of User's satisfaction. The output in this table shows that all items having a good degree of communalities  $> 0.3$  except item (6). The majority of items scored communalities around 0.5 for most items which represent a good fit of data for factor analysis. Despite item (6) scored a small value of communalities (0.287) but the researcher shall not remove this item and retain it since it is close to 0.30 but needs for careful monitoring in further analysis.

**Table 4.28:** Communality of User's Satisfaction

	Initial	Extraction
Satisfaction_1	1.000	.551
Satisfaction_2	1.000	.703
Satisfaction_3	1.000	.522
Satisfaction_4	1.000	.357
Satisfaction_5	1.000	.366
Satisfaction_6	1.000	.287
Satisfaction_7	1.000	.563
Satisfaction_8	1.000	.562
Satisfaction_9	1.000	.471
Satisfaction_10	1.000	.526
Satisfaction_11	1.000	.571
Satisfaction_12	1.000	.426
Satisfaction_13	1.000	.639

## II. KMO and Bartlett's Test

The result from KMO and Bartlett's Test table 4.27 shows that the value KMO value equal 0.882, which is considered a very good fit for EFA. Thus, the data of system quality is highly fit for EFA. Also, the reading of Bartlett's Test of Sphericity shows it is significant ( $p=0.000$ ), which is  $\leq 0.05$ . i.e. it is concluded that the significance level is small enough to reject the null hypothesis. Therefore, the correlation matrix is not an identity matrix.

**Table 4.29:** KMO and Bartlett's Test

<b>Kaiser-Meyer-Olkin Measure of Sampling Adequacy.</b>		.882
<b>Bartlett's Test of Sphericity</b>	Approx. Chi-Square	1236.537
	df	78
	Sig.	.000

## III. Total Variance Explained

The output table 4.30 shows that the total number of extracted components with an eigenvalue greater than one equal to two factors. The cumulative variance of explanation by all factors equal (50.33%). Therefore, the 13 items associated with User's satisfaction explain only (50.33%) of its total variance. This value is considered an acceptable degree of interpretation of variance in a latent variable. The remaining percentage of interpretation (49.67%) is due to random error or other factors which are not defined in this research.

The first factor scored the highest eigenvalue (5.11) and explains (39.34%) of the overall variance in User's satisfaction. The variables (items) loaded on the first factor represent the most explanatory items to the variance in User's satisfaction. Thus, factors (1-2) are retained because their eigenvalue  $>1$  and locating at the slop of curve

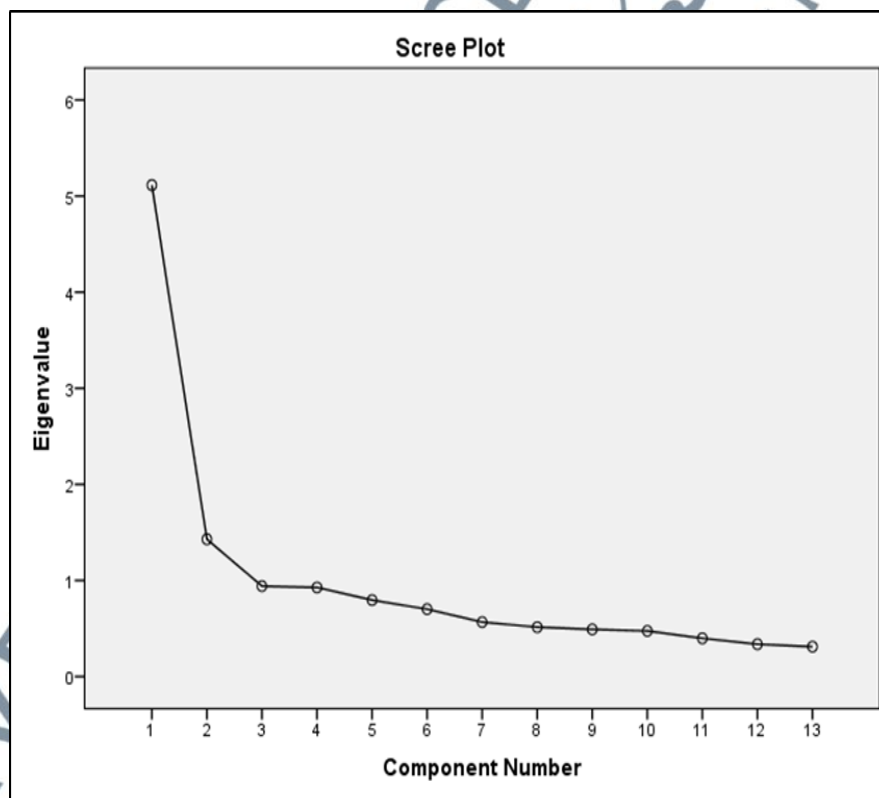
in the scree plot (see Figure 4.7) which and explains more variance in System Quality comparing to other factors.

**Table 4.30:** Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1-Acceptance	5.114	39.341	39.341	5.114	39.341	39.341
2- Approval	1.429	10.992	50.333	1.429	10.992	50.333

#### IV. Scree Plot

The scree plot of the above components is illustrated in the following Figure.



**Figure 4.7:** Scree Plot of User's Satisfaction Factors

## V. Rotated component matrix

The rotation is made for items associated with User's satisfaction so that to enhance the overall interpretation of the retained factors. The research used a type of rotation is based on an assumption that all (2) extracted factors of User's satisfaction are uncorrelated in order to achieve strongest loading by variables on each factor. As shown table 4.31 all items associated with User's satisfaction are retained for CFA and SEM analysis for building the measurement model and construction model.

**Table 4.31:** Matrix of User's Satisfaction Rotated Component

	Components (factors)	
	Acceptance	Approval
Satisfaction_13	.780	
Satisfaction_11	.739	
Satisfaction_8	.714	
Satisfaction_10	.707	
Satisfaction_7	.680	
Satisfaction_9	.651	
Satisfaction_12	.634	
Satisfaction_2		.824
Satisfaction_1		.721
Satisfaction_3		.701
Satisfaction_6		.524
Satisfaction_4		.505
Satisfaction_5		.458

### 4.6.3 EFA of Intention to Use SIS

The following analysis shows the result of EFA analysis associated with Intention to use SIS:

## I. Communalities

Table 4.32 shows the communalities of Intention to use SIS. The output in this table shows that all items having a good degree of communalities  $> 0.3$ . The majority of items scored communalities greater than 0.5 for most items which represent a good fit of data for factor analysis. Therefore, all items are retained for CFA and SEM analysis.

**Table 4.32:** Communality of Intention to Use SIS

	<b>Initial</b>	<b>Extraction</b>
Utility_1	1.000	.513
Utility_2	1.000	.617
Utility_3	1.000	.582
Utility_4	1.000	.437
Utility_5	1.000	.490
Advantage_1	1.000	.434
Advantage_2	1.000	.528
Advantage_3	1.000	.684
Advantage_4	1.000	.667
Advantage_5	1.000	.475
Islamic_1	1.000	.577
Islamic_2	1.000	.565
Islamic_3	1.000	.682
Islamic_4	1.000	.706
Islamic_5	1.000	.621

## II. KMO and Bartlett's Test

The result from KMO and Bartlett's Test table 4.33 shows that the value KMO value equal 0.880, which is considered a very good fit for EFA. Thus, the data of system quality is highly fit for EFA. Also, the reading of Bartlett's Test of Sphericity shows it is significant ( $p=0.000$ ), which is  $\leq 0.05$ . i.e. it is concluded that the significance level is small enough to reject the null hypothesis. Therefore, the correlation matrix is not an identity matrix.

**Table 4.33: KMO and Bartlett's Test**

<b>Kaiser-Meyer-Olkin Measure of Sampling Adequacy.</b>		.880
<b>Bartlett's Test of Sphericity</b>	Approx. Chi-Square	1236.537
	Df	78
	Sig.	.000

## III. Total Variance Explained

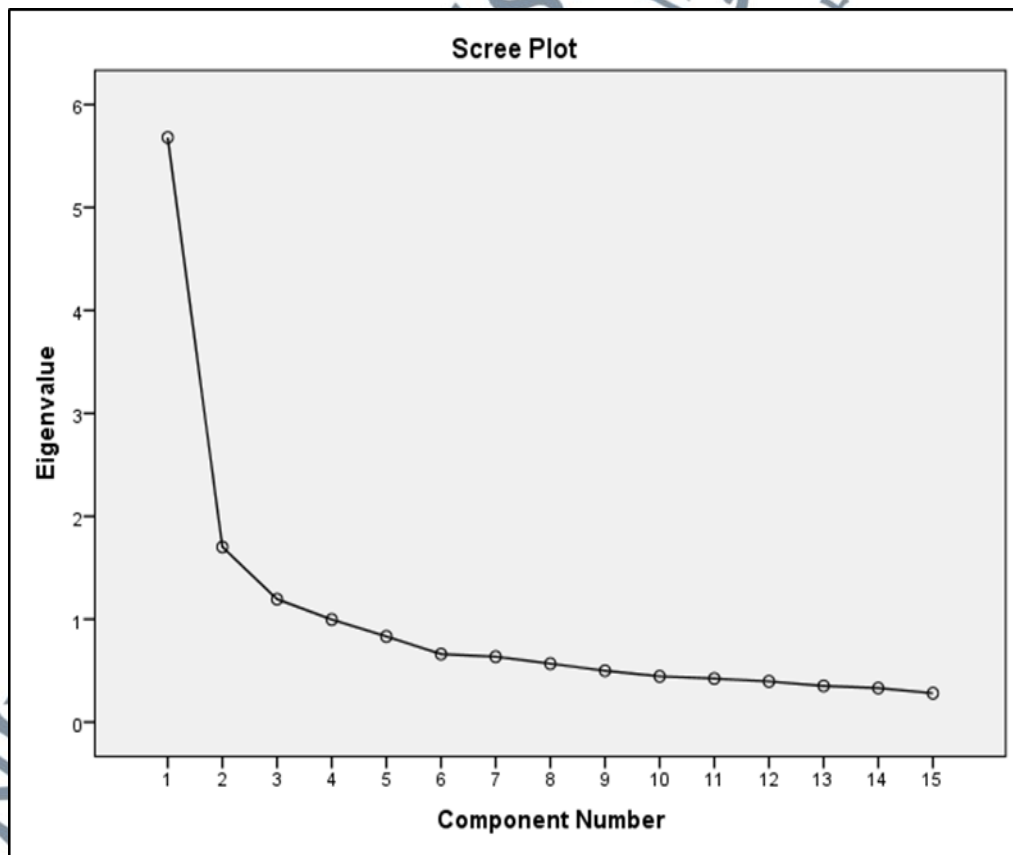
The output in table 4.34 shows that the total number of extracted factors with an eigenvalue greater than one equal to three factors. The cumulative variance of explanation by all factors equal (57.17%). Therefore, the 15 items associated with Intention to use SIS explain only (57.17%) of its total variance. This value is considered an acceptable degree of interpretation of variance in a latent variable. The remaining percentage of interpretation (42.83%) is due to random error or other factors which are not defined in this research. The factors (1-3) are retained because their eigenvalue  $> 1$  and locating at the slop of curve in the scree plot (see figure below) which and explains more variance in Intention to use SIS comparing to other factors. These three factors are (Utility, Advantage, Islamic features).

**Table 4.34:** Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1- Islamic Features	5.680	37.869	37.869	5.680	37.869	37.869
2- Utility	1.702	11.344	49.213	1.702	11.344	49.213
3- Advantages	1.195	7.964	57.178	1.195	7.964	57.178

#### IV. Scree Plot

The scree plot of the above components is illustrated in the following



**Figure 4.8:** Scree Plot of Intention to Use SIS Factors

## V. Rotated component matrix

The rotation is made for all items of Intention to use SIS so that to enhance the overall interpretation of the retained factors. The research used a type of rotation is based on an assumption that all (15) extracted factors of Intention to use SIS are uncorrelated in order to achieve strongest loading by variables on each factor. The result of rotation showed 3 extracted factors (Islamic Features, Utility, Advantages) after rotation as shown in the Table 4.35.

**Table 4.35:** Matrix Rotated Component

Rotated Component Matrix <sup>a</sup>			
	Component		
	1	2	3
	Islamic Features	Utility	Advantages
Islamic_4	.816		
Islamic_3	.790		
Islamic_2	.716		
Islamic_5	.709		
Islamic_1	.656		
Utility_2		.757	
Utility_3		.743	
Utility_1		.688	
Utility_4		.592	
Utility_5		.567	.407
Advantage_1		.456	.450
Advantage_3			.775
Advantage_4			.744
Advantage_5			.656
Advantage_2			.588

The outcome in table 4.35 indicates that some of the items are not retained for CFA and SEM analysis because they are having multiple loading. These items specifically are (Utility\_4, Utility\_5). Therefore, only 13 items are used in measure model and construction model in SEM.

#### **4.7 Structural Equation Modelling Analysis (SEM)**

The following sub-sections shows the results of CFA analysis of each variable in the research (Systems quality of SIS, Intention to use SIS, and User's satisfaction):

##### **4.7.1 CFA of System Quality**

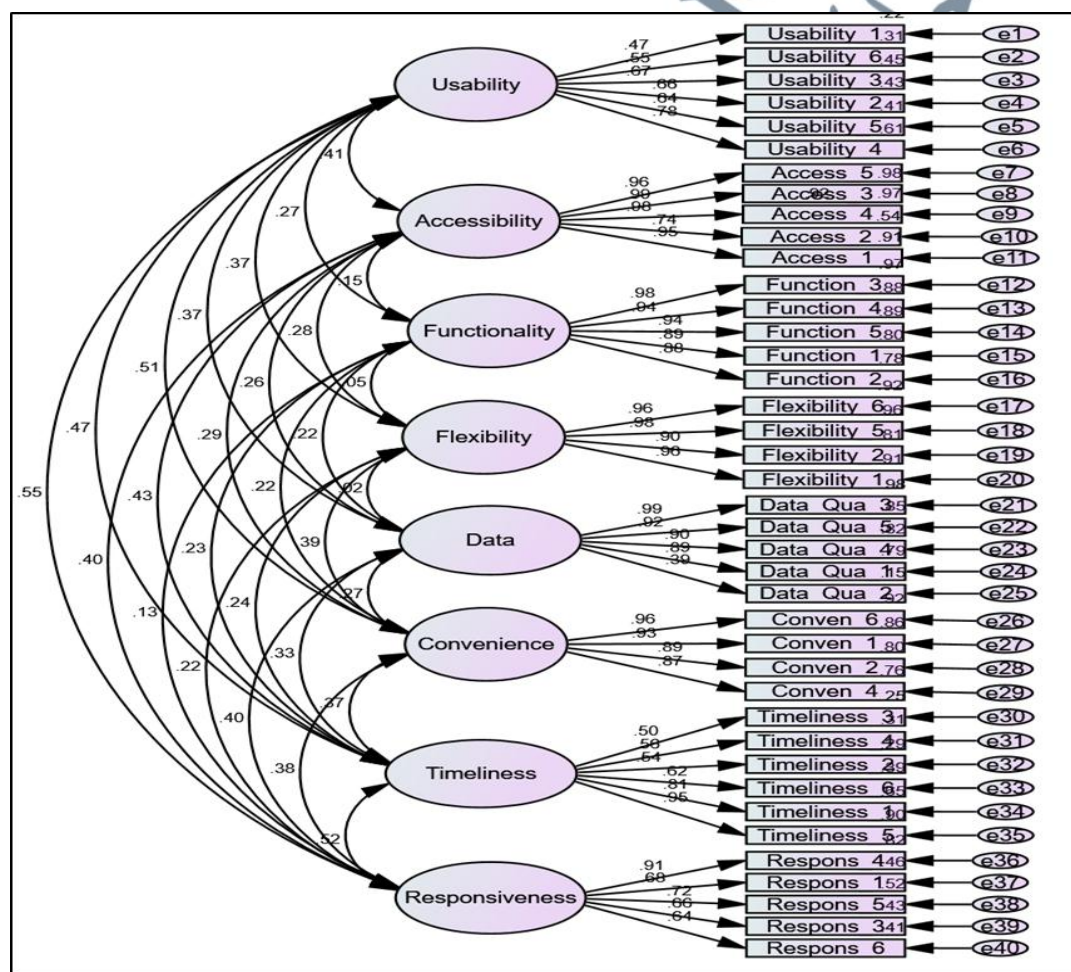
In this sub-section, the CFA analysis is mainly conducted to specify the number of factors, the non-directional correlations between factors, how the factors of system quality are inter correlated, how the various indicators of system quality are related to the latent factors, and the relationships among indicator errors. In CFA the latent variables are allowed to freely inter correlate in the CFA model (Timothy, 2006). There are no directional relationships between the factors within one variable, but there are non-directional correlations only.

##### **I. Initial Measurement Model of System Quality**

The researcher conducted CFA analysis for the latent variables (factors) of system quality which was defined in EFA. The initial measurement model shows that system quality is a latent variable of second-order. System quality consist of eight (8) first-order factors (Usability, Functionality, Flexibility, Convenience, Data quality, Responsiveness, Accessibility, and Timeliness).

After constructing the initial measurement variable and reading the fit indices, it is found that chi-square ( $\chi^2$ ) equal (1376.57), which requires a decrease to a lower

magnitude in order to increase the level of fitness of the measurement model with the data. This is the very first measure of fit proposed in the literature (Timothy, 2006) and it is an important measure of fit. The best model is defined as model with a  $\chi^2$  of zero and the worst model by the  $\chi^2$  of the null model. Chi square test functions as a statistical method for evaluating models, the fit indexes are more descriptive than statistical. Fit indexes describe and evaluate the residuals that result from fitting a model to the data. The structural part of initial 8-factors measurement model is illustrated in the figure 4.9:



**Figure 4.9:** Initial Measurement Model of System Quality

Furthermore, the degree of freedom = 712, and probability ( $p=0.000$ ), which is not recommended for a good degree of fitness between the estimated data by AMOS and the actual and observed data in the measurement model.

The value of chi-square is highly affected by sample size. Therefore, it is recommended to measure the Normed-ratio of chi-square, which is equal  $(\chi^2/df)$ . If Normed-ratio  $\leq 2$  then a good fitness with the observed data is achieved. The Normed-ratio of system quality measurement model = 1.933. This value is unacceptable and a modification to this ratio is required to improve the Goodness-Of-Fit indices of the measure model.

Moreover, the first reading to fit indices (CMIN/D RMR, GFI, AGFI, CFI, NF, PCFI) as well as factor loading of all items shows that the initial measurement model of system quality is not sufficiently fit with the data adequately and could be improved substantially (McDonald and Ho 2002; Teo et al. 2013). RMSEA also needs to be improved together with PCLOSE.

As described above, poor model fit indices, high degrees of freedom, and small or significant p-value indicates a lack of fit in the model with the observed data. Therefore, a further improvement to the initial measurement model is required to reduce the contradiction in the estimates of correlations by AMOS with actual data in the measurement model of system quality that is constructed based on observed data through the survey and collecting data from the sample of the study.

## **II. The Modification to the Initial Measurement Model of System Quality**

The researcher conducted several steps to improve the fit of the factors model of system quality. These steps include modification indices, deleting indicators with low factor loading or low interpretation percentage R<sup>2</sup> (Kline, 2005; Garson, 2007; Ali, 2016).

After achieving all necessary and possible steps to improve model fit, the values of Fit-Indices become statistically acceptable according to the standards of SEM after exceeding the defined thresholds as shown in the Table 4.36.

**Table 4.36:** Measurement Model of System Quality

Description	Fit-Indices	Initial indices	Final indices
Normed Ration	CMIN/DF	1.933	1.346
Model probability	$\rho$ -Value	0.000	0.000
Goodness of Fit Index	GFI	0.793	0.857
Adjusted Goodness of Fit Index	AGFI	0.761	0.833
Normed Fit Index	NFI	0.872	0.920
Relative Fit Index	RFI	0.872	0.911
Comparative Fit Index	CFI	0.940	0.978
Parsimonious Comparative Fit Index	PCFI	0.858	0.876
Root mean squared error of approximation	RMSEA	0.058	0.036
Statistic of Results	PCLOSE	0.002	1.000
Badness of fit	Chi-square	1376.57	940.872
Degree of Freedom	DF	712	699

The table 4.36 shows the differences between the fit indices before and after the improvement to the measurement model of system quality. It is evident the measurement model is improved to better fit with the observed data. Most fit indices show an acceptable degree of fitness and become now with higher magnitude after the steps of improvement on the measurement model. Chi-square is decreased = 940.872 as well as the degree of freedom = 699. Now the Normed ration is acceptable = 1.346 which is less the standard threshold value (2). In addition to that, CFI is improved = 0.978 which shows a good degree of fitness with the observed data, CMN/DF = 1.346 which is less than the standard threshold value (2). PCLOSE is turned non-significant ( $\rho \geq 0.000$ ,  $\rho = 1.000$ ), RMSEA has decreased more = 0.036 which is far less standard fit

threshold, as indicated in earlier section, any RMSEA value  $\leq 0.8$  indicates a good model fit (Wolff et al. 2006; Tong, 2007).

The summary of analysis to the measurement model of system quality shows that all fit indices are now above the standard thresholds (Lie and Wu, 2007). In addition to that, all factor loadings of indicators (items) are statistically accepted ( $\geq 0.3$ ) and all loadings are positive (Wolff et al. 2006). The figure 4.10 shows the final eight factors measurement model of system quality that is used in constructing the structural model of the study.

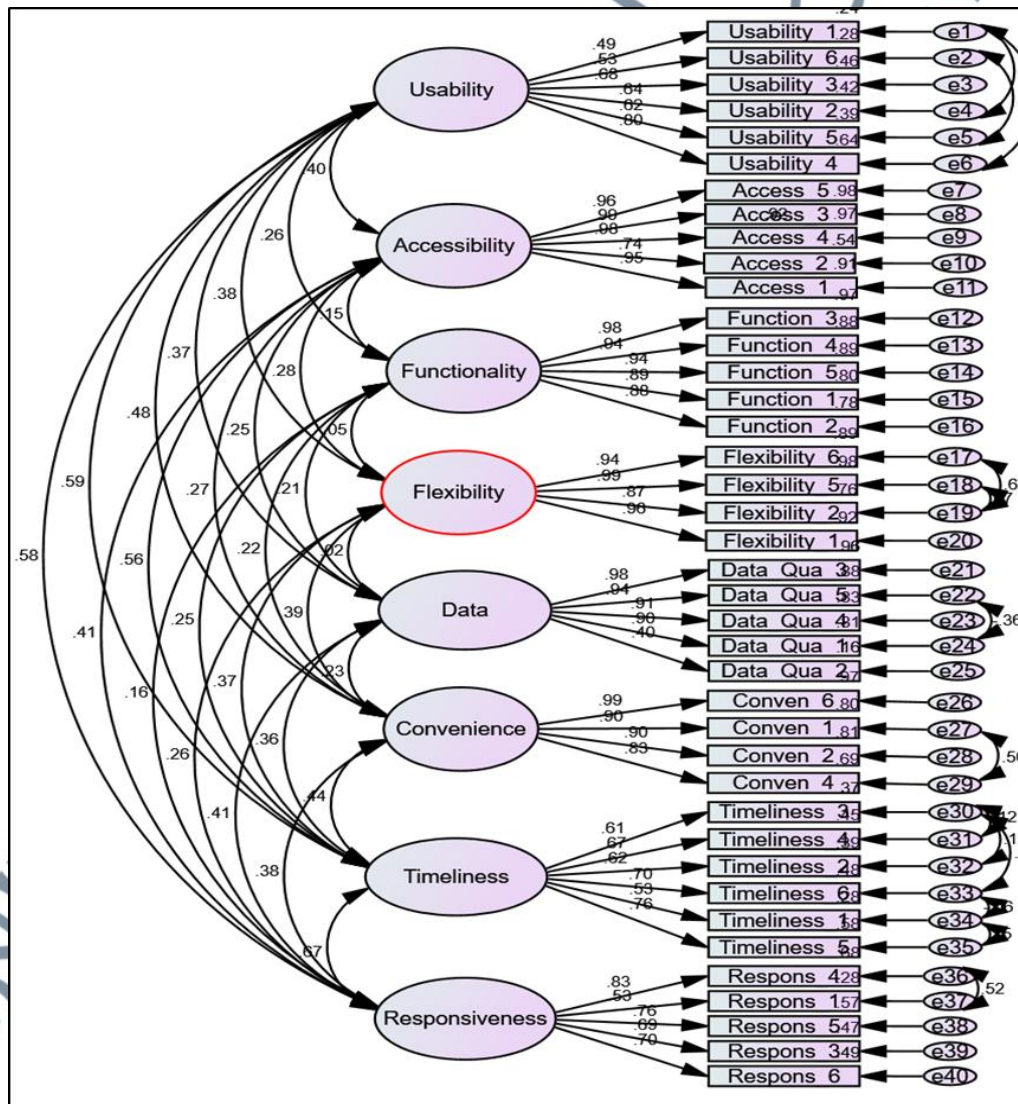


Figure 4.10: Final Measurement Model of System Quality

#### 4.7.2 CFA of Intention to Use SIS

This EFA analysis shows that Intention to use SIS is a 3-factors variable. The researcher conducted CFA analysis for the latent factors of Intention to use SIS.

##### I. Initial Measurement Model for Intention to Use Sis

Is a latent variable of second-order and consists of three first-order factors (Utility, Islamic view, Perceived advantage)?

After constructing the initial measurement variable and reading the fit indices it is found that chi-square ( $\chi^2$ ) = 237.602, which requires a decrease to a lower magnitude in order to increase the level of fitness of the measurement model with the data (Timothy, 2006, p.145). The fit indices were found not satisfactory which needs improvement to increase the degree of fit with the observed data. Furthermore, the degree of freedom = 87, and probability ( $p=0.000$ ), which is not recommended for a good degree of fitness between the estimated data by AMOS and the actual and observed data in the measurement model.

The value of chi-square is highly affected by sample size. Therefore, it is recommended to measure the Normed-ratio of chi-square, which is equal ( $\chi^2/df$ ). If Normed-ratio  $\leq 2$  then a good fitness with the observed data is achieved. The Normed-ratio of Intention to use SIS measurement model = 2.73. This value is greater than 2, according to that an improvement is required.

Moreover, the first reading to fit indices (CMIN/D RMR, GFI, AGFI, CFI, NF, PCFI) as well as factor loading of all items shows that the initial measurement model of Intention to use SIS is not sufficiently fit with the data adequately and could be

improved substantially (McDonald and Ho 2002; Teo et al. 2013). RMSEA also needs to be improved together with PCLOSE as well as Goodness-Of-Fit indices.

As described earlier, poor model fit indices, high degrees of freedom, and small or significant p-value indicates a lack of fit in the model with the observed data. Therefore, a further improvement to the initial measurement model is required to reduce the contradiction in the estimates of correlations by AMOS with actual data in the measurement model of Intention to use SIS that is constructed based on observed data through the survey and collecting data from the sample of the study. The structural part of initial 3-factors measurement model is illustrated below:

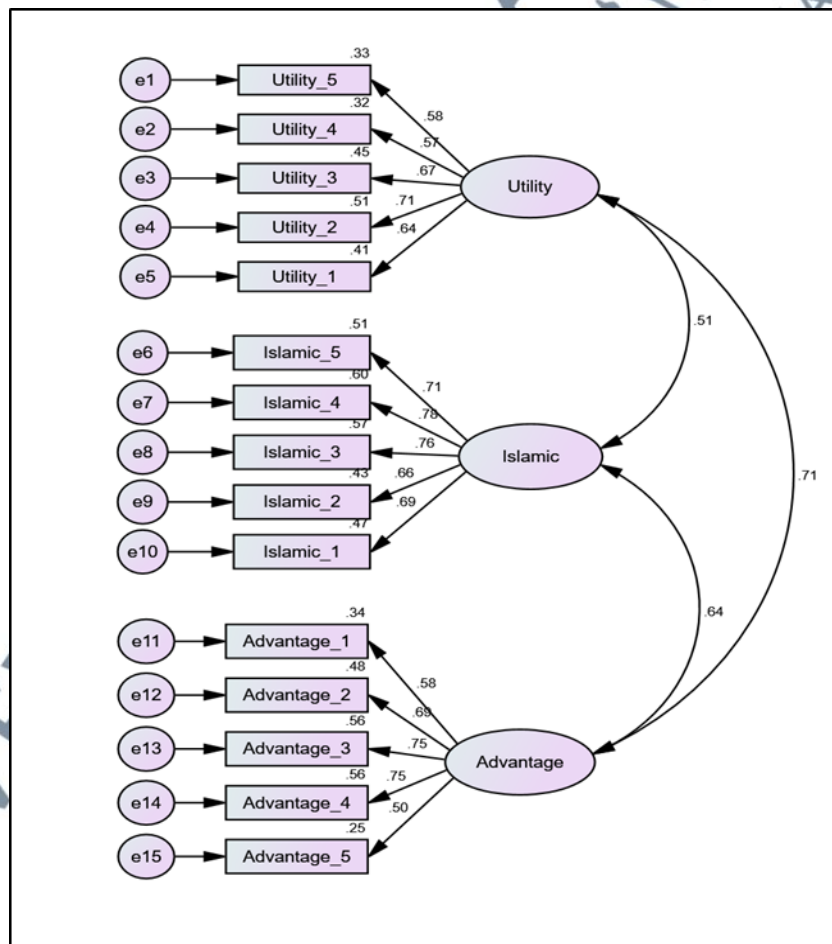


Figure 4.11: Initial Measurement Model of Intention to use SIS

## II. The Modification to The Initial Factors Model for Intention to Use SIS

Several steps have been achieved to improve the fit of the factors model. These steps include modification indices, deleting indicators with low factor loading or low interpretation percentage R<sup>2</sup> (Kline, 2005; Garson, 2007).

After making all necessary and possible steps to increase the magnitudes of fit indices so that they are statistically acceptable according to the standards of SEM and become above the standard thresholds as shown in the following Table 4.35 (McDonald and Ho 2002; Hair et al. 2003; Teo et al. 2013; Ali, 2016).

**Table 4.37:** Measurement Model of Intention to Use SIS

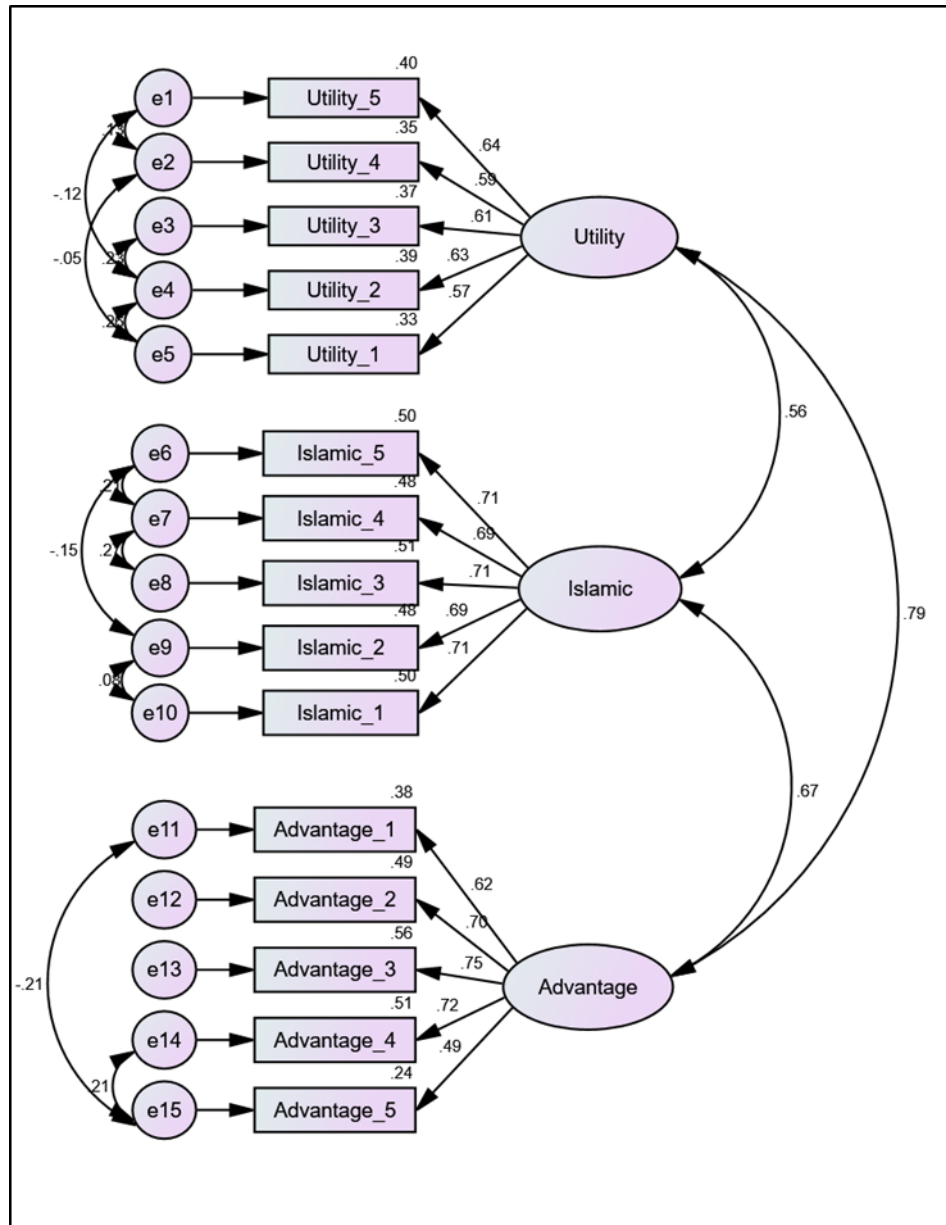
3. Description	4. Fit-Indices	5. Initial indices	6. Final indices
7. Normed Ration	8. CMIN/DF	9. 2.731	10. 1.964
11. Model probability	12. $\rho$ -Value	0.000	0.000
15. Goodness of Fit Index	16. GFI	0.894	0.935
19. Adjusted Goodness of Fit Index	20. AGFI	0.854	0.897
23. Normed Fit Index	24. NFI	0.853	0.907
27. Relative Fit Index	11. RFI	0.822	0.872
31. Comparative Fit Index	32. CFI	0.900	0.951
35. Parsimonious Comparative Fit Index	36. PCFI	0.746	0.689
39. Root mean squared error of approximation	40. RMSEA	0.079	0.059
43. Statistic of Results	PCLOSE	0.000	0.134
47. Badness of fit	Chi-square	237.60	149.247
51. Degree of Freedom	DF	87	76
55.	56.	57.	58.

### III. Summary of Model Fit

Reading the values of fit indices in the he above table shows the differences before and after the improvement to the measurement model of Intention to use SIS. Most fit indices show an acceptable degree of fitness now after taking the necessary steps of improvement on the measurement model. Chi-square is decreased = 149.247 as well as the degree of freedom = 76. Now the Normed ration is acceptable = 1.964 which is less the standard threshold value (2). In addition to that, CFI is improved = 0.951 and GFI is a good value now = 0.935 which shows a good degree of fit with the observed data, as mentioned above. PCLOSE is turned non-significant ( $p \geq 0.000$ ,  $p = 0.134$ ). RMSEA has decreased more = 0.059 which is far less the standard fit threshold, as indicated in earlier section, any RMSEA value  $\leq 0.8$  indicates a good model fit (Wolff et al. 2006; Tong, 2007).

The summary of analysis to the measurement model of Intention to use SIS shows that all fit indices are now above the standard thresholds (Lie and Wu, 2007). In addition to that, all factor loadings of indicators (items) are statistically accepted ( $\geq 0.3$ ) and all loadings are positive (Tabachnick and Fidell 1996; McDonald and Ho 2002; Teo et al. 2013). No items have been deleted from the measurement model, all factor loading is acceptable.

The following Figure 4.12 shows the final three factors measurement model of Intention to use SIS that is used in constructing the structural model of the study.



**Figure 4.12:** Final Measurement Model of Intention to use SIS

#### 4.7.3 CFA of User's Satisfaction

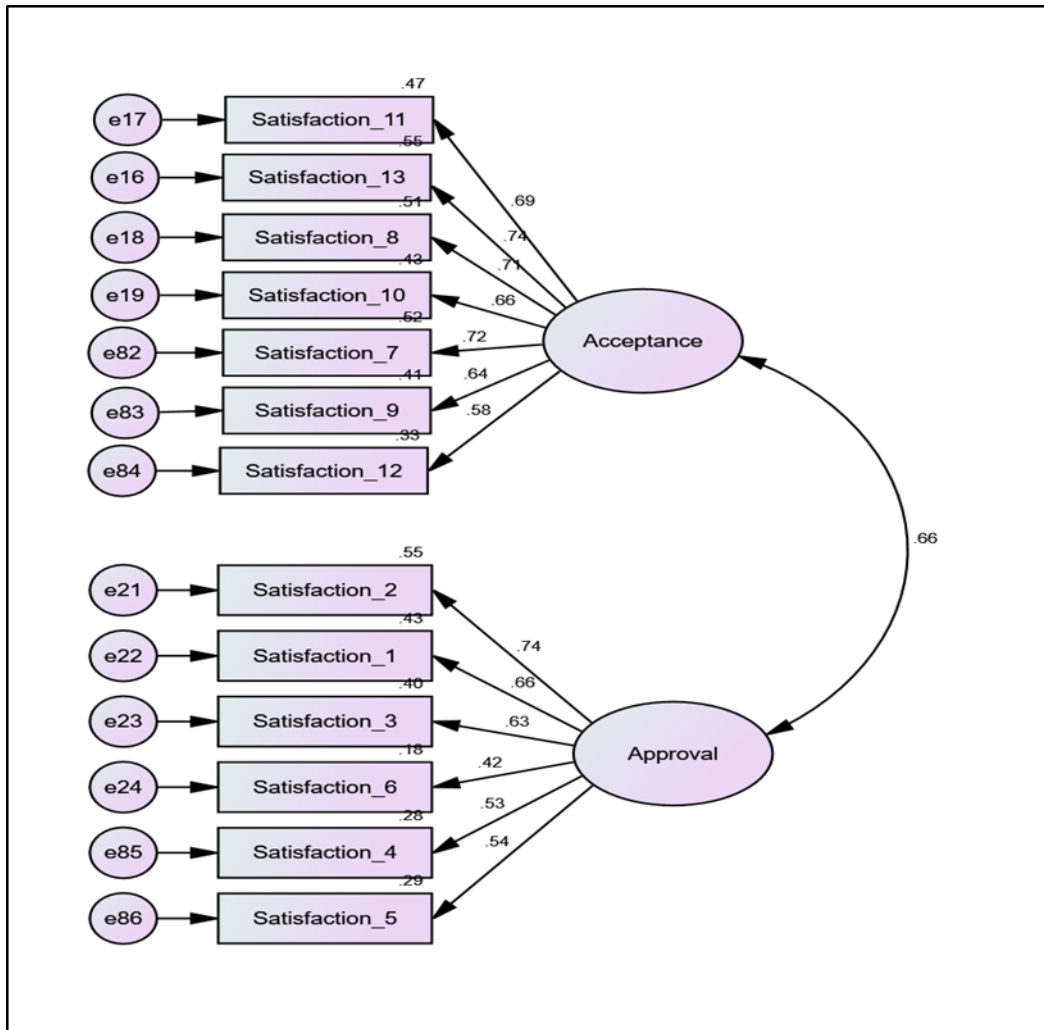
This EFA analysis shows that User's Satisfaction consist of two factors. The researcher conducted CFA analysis for the latent factors of User's Satisfaction. The initial measurement model shows that User's Satisfaction is a latent variable of second-order and consists of two first-order factors (Acceptance, Approval of SIS).

Reviewing the construct of the initial measurement model of User's Satisfaction and checking the fit indices of this model shows that  $\chi^2 = 172.492$ , with 64 degree of freedom. Therefore, these two indices need to reach a lower magnitude in order to increase the level of fitness of the measurement model with the data (Teo et al. 2013). Furthermore, the probability (p-value =0.000) is not significant, and hence is not recommended for a 2-factors variable.

The normed-ratio which is equal to  $\chi^2 / \text{d.f.}$  is an important indicator of model fit with the observed data? A good fit with the observed data is attained if the normed-ratio is less than or equal to 2. In our case, the normed-ratio of User's Satisfaction measurement model is 2.69. Accordingly, an improvement is required.

The magnitudes to fit indices (CMIN/D RMR, GFI, AGFI, CFI, NF, PCFI) show that the initial measurement model of User's Satisfaction is not a satisfactorily fit with the observed data and needs substantial improvement (see, e.g., McDonald & Ho, 2002; Teo et al. 2013.). It was also found that RMSEA = 0.79 and PCLOSE = 0.001 (non-significant). Thus, both the current magnitudes of RMSEA and PCLOSE should be enhanced.

Accordingly, a good model fit is a necessity, thus a high degree of freedom and a significant PCLOSE indicates the measurement model of User's Satisfaction is not reaching the desired fit with the observed data. Based on the current magnitudes of fit indices, a further improvement to the initial measurement model is required to reduce the contradiction in the estimated data and correlations by AMOS with actual data in the measurement model. The structural part of initial 2-factors measurement model of User's Satisfaction is illustrated below:



**Figure 4.13:** Initial Measurement Model of User's Satisfaction

### I. The Modification to the Initial Measurement Model

The researcher has conducted several steps in order to improve the degree of fit with the observed data and enhance all fit indices. These steps included and were not limited to modification indices, deleting weak factor loading indicators if detected (Kenny, 1999; Kline, 2005; Garson, 2007). Doing all necessary steps has led to increase the magnitudes of all fit indices so that the measurement model now becomes statistically acceptable and satisfactory according to the standards of SEM as found in the following table 4.36, (McDonald and Ho 2002; Teo et al. 2013; Hair et al. 2010).

**Table 4.38:** Measurement Model of User's Satisfaction

59. Description	60. Fit-Indices	61. Initial Indices	62. Final Indices
63. Normed Ration	64. CMIN/DF	65. 2.695	66. 1.026
67. Model probability	68. $\rho$ -Value	69. 0.000	70. 0.421
71. Goodness of Fit Index	72. GFI	73. 0.907	74. 0.971
75. Adjusted Goodness of Fit Index	76. AGFI	77. 0.868	78. 0.950
79. Normed Fit Index	80. NFI	81. 0.863	82. 0.957
83. Relative Fit Index	84. RFI	85. 0.833	86. 0.936
87. Comparative Fit Index	88. CFI	89. 0.908	90. 0.999
91. Parsimonious Comparative Fit Index	92. PCFI	93. 0.745	94. 0.679
95. Root mean squared error of approximation	96. RMSEA	97. 0.079	98. 0.010
99. Statistic of Results	100. PCLOSE	101. 0.001	102. 0.994
103. Badness of fit	104. Chi-square	105. 172.492	106. 54.392
107. Degree of Freedom	108. DF	109. 64	110. 53

## II. Summary of Model Fit

Reading the values of fit indices in the he above table shows the differences before and after the improvement to the measurement model of User's Satisfaction. Most fit indices show an acceptable degree of fitness now after taking the necessary steps of improvement on the measurement model. In particular, Chi-square is decreased = 54.392 as well as the degree of freedom = 53. Now the Normed ration is acceptable = 1.026 which is less the standard threshold value (2). In addition to that, CFI is improved = 0.999 which shows an excellent degree of fitness with the observed data. PCLOSE is turned non-significant ( $\rho \geq 0.000$ ,  $\rho = 0.994$ ) an excellent value, RMSEA has decreased more = 0.010 which is far less standard fit threshold, as indicated in earlier section, any RMSEA value  $\leq 0.8$  indicates a good model fit (Teo et al. 2013; Tong, 2007). Currently, the measurement model of User's Satisfaction shows an excellent fit index (Lie and Wu 2007). In addition to that, all factor loadings of indicators (items) are statistically accepted ( $\geq 0.3$ ) and all loadings are positive (Teo et

al. 2013). The following figure shows the final 2-factors measurement model of User's Satisfaction that is used in constructing the structural model of the study.

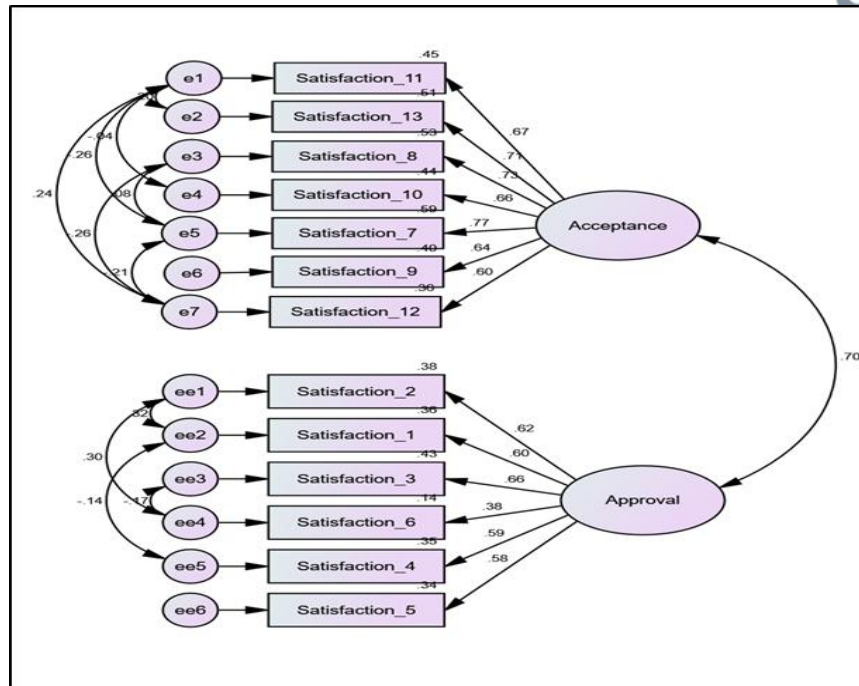


Figure 4.14: Final Measurement Model of User's Satisfaction

#### 4.8 The Structural Model

In this section, the research specifies how the various latent variables (system quality, intention to use SIS, user's satisfaction) are related to one another (e.g., direct or indirect effects, no relationship, and spurious relationship). The exact nature of the relationships is specified in the structural model.

Technically the Chi-Square could not be non-significant in structural model testing due to the usually large sample required for it. So, if it is in fact significant, therefore, the non-significant structural mode is accepted as long as the RMSEA, CFI, and other indicators of fit are good. The outcome of EFA is reported as a completely standardized solution. In applied CFA research, completely standardized solutions are most commonly reported.

After modelling the measurement models and measuring the data in the measurement model of each of the three variables (System Quality, Intention to Use, and User's Satisfaction). The steps of constructing the measurement models of three variables into a structural model include several steps to increase the model fit. The initial structural model is shown Figure 4.15.

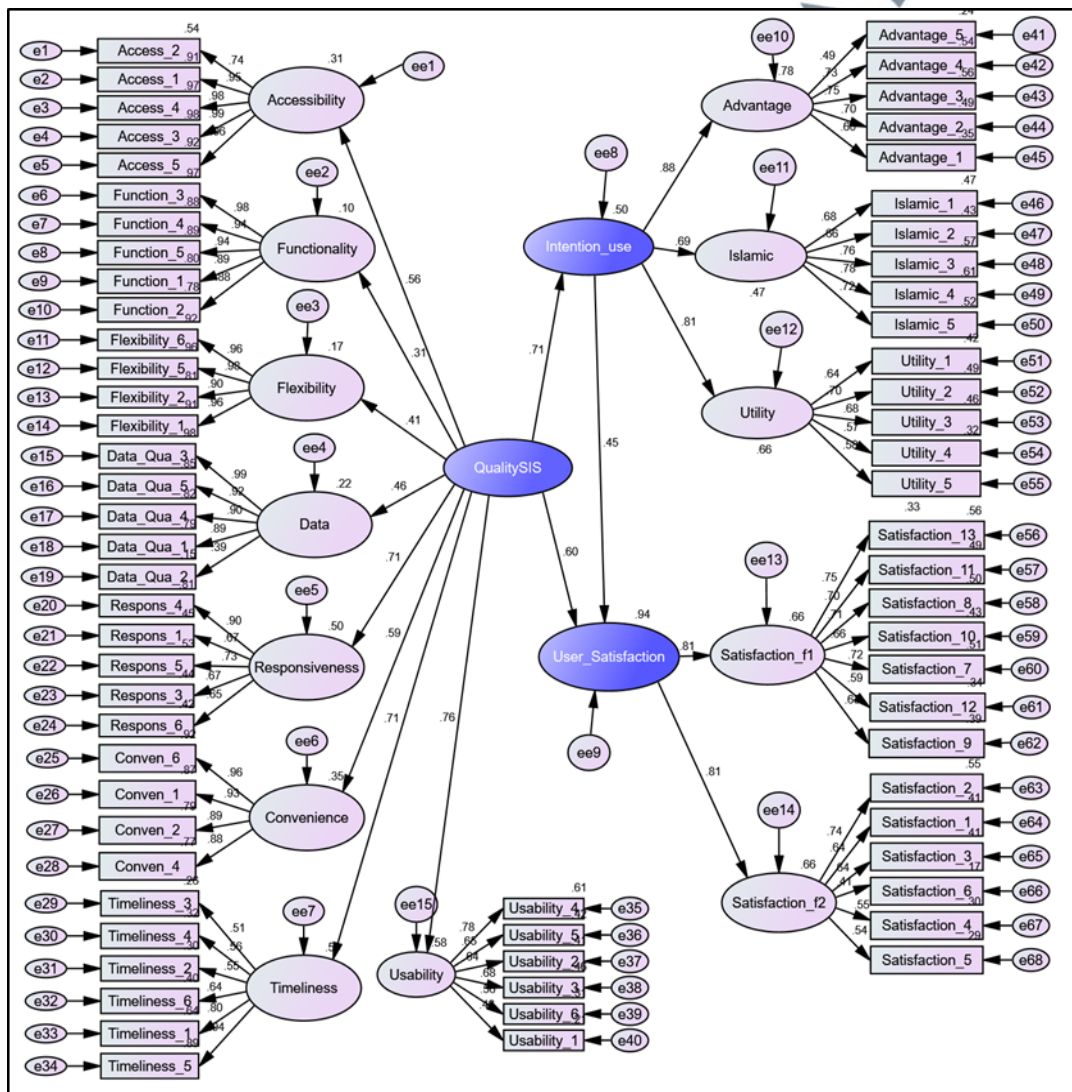


Figure 4.15: The Initial Structural Model

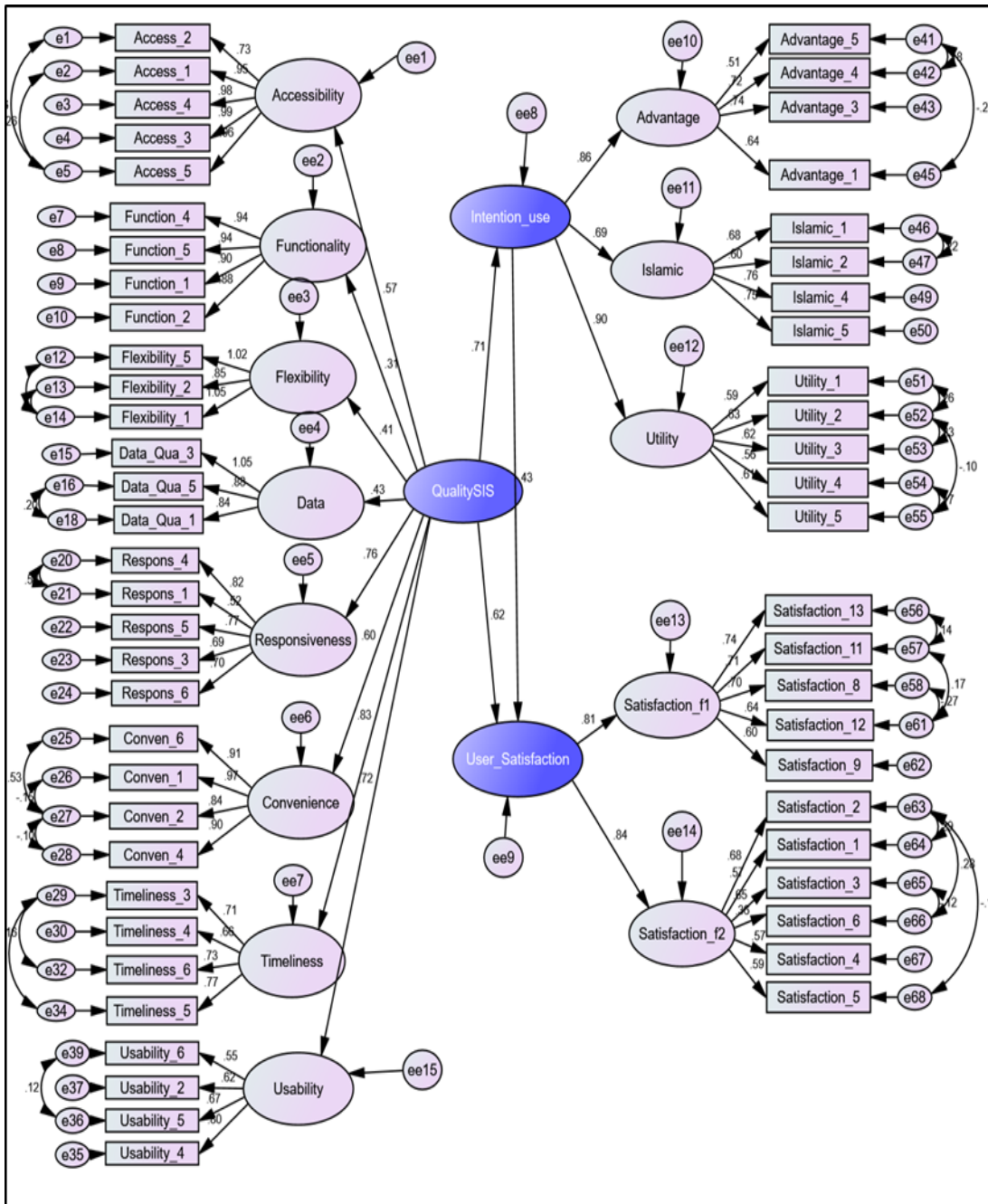
Reviewing the output data from AMOS after running SEM analysis shows that fit indices was not satisfactory. Therefore, the researcher has achieved several steps in order to improve the model fit of the structural model. These steps include and not

limited to modification indices, deleting weak factor loading indicators if detected (Kline, 2005; Garson, 2007). Accomplishing all necessary steps has led to increase the magnitudes of all fit indices so that the measurement model now becomes statistically acceptable and satisfactory according to the standards of SEM as found in the following Table 4.37 (McDonald and Ho 2002; Teo et al. 2013; Hair et al. 2010).

**Table 4.39:** Fit Indices Before and After Fit Modification on the Structural Model

111. Description	112. Fit-Indices	113. Initial indices	114. Final indices
115. Normed Ration	116. CMIN/DF	117. 1.514	118. 1.362
119. Model probability	120. $\rho$ -Value	121. 0.000	122. 0.000
123. Goodness of Fit Index	124. GFI	125. 0.782	126. 0.806
127. Adjusted Goodness of Fit Index	128. AGFI	129. 0.762	130. 0.785
131. Normed Fit Index	132. NFI	133. 0.804	134. 0.845
135. Relative Fit Index	136. RFI	137. 0.794	138. 0.834
139. Comparative Fit Index	140. CFI	141. 0.923	142. 0.953
143. Parsimonious Comparative Fit Index	144. PCFI	145. 0.879	146. 0.892
147. Root mean squared error of approximation	148. RMSEA	149. 0.043	150. 0.036
151. Statistic of Results	152. PCLOSE	153. 0.999	154. 1.000
155. Badness of fit	156. Chi-square	157. 2221.274	158. 1963.535
159. Degree of Freedom	160. DF	161. 1467	162. 1442

The steps of model fit lead to higher magnitudes for all fit indices. The following results are achieved in the final structural model:



**Figure 4.16: The Final Structural Model**

Results are achieved in the final structural model:

#### 4.8.1 Standard Regression Coefficients (Path Estimates)

The results showed a strong association between the three variables (System Quality, Intention to Use, and User's Satisfaction). All correlation is greater than ( $<0.3$ ),

a standard threshold for considering a significant effect between these variables, where all correlations are statistically significant ( $p \leq 0.000$ ) as shown in the final structural model. Moreover, the degree of interpretation ( $R^2$ ) has been increased for most indicators as well as the latent variables System Quality, Intention to Use, and User's Satisfaction) and their factors. The Table 4.40 shows the magnitudes of standard regression between these three variables:

**Table 4.40:** The Magnitudes of Standard Regression between These Three Variables

163. Relationship	164. Standard regression ( $\beta$ )	165. Probability
166. System Quality of SIS > User's Satisfaction	167. 0.62	168. ***, $p \leq 0.000$
169. System Quality of SIS > Intention to use SIS	170. 0.71	171. ***, $p \leq 0.000$
172. Intention to use SIS > User's Satisfaction	173. 0.43	174. ***, $p \leq 0.000$

Reading the magnitude of path estimate between System Quality and Intention to Use = 0.71 (strong), System Quality and User's Satisfaction = 0.62 (moderate), Intention to Use and User's Satisfaction = 0.43 (moderate). These correlations confirm a good degree of associations between the variables.

The following main findings is found in the table 4.38.

When Intention to use goes up by 1, User Satisfaction goes up by 0.43.

When SIS quality goes up by 1, Intention to use goes up by 0.71.

When SIS quality goes up by 1, User Satisfaction goes up by 0.62.

The p-values of all standardized regressions weights are significant and support the goodness of the model mentioned above.

#### 4.8.2 Significance of Correlations

The table of estimates shows the regression weights (see Table 4.41). It is found that all regression estimates and correlations between indicators and factors, between factors and variables, and between three variables (System Quality, Intention to Use, and User's Satisfaction) are significant ( $p \leq 0.000$ , marked \*\*\*). The following table shows the regression weight between the variables of the research, p-level the probability of getting a critical ratio as large as C.R in absolute value is less than 0.001 (\*\*\*). In other words, the regression weight for each variable in the prediction of other variable is significantly different from zero at the 0.001 level (two-tailed), and these statements are approximately correct for large samples under suitable assumptions, and finally C.R (Dividing the regression weight estimate by the estimate of its standard error).

**Table 4.41:** The Regression Weight Estimate by The Estimate of Its Standard Error

175. Relationship	176. C.R.	177. Probability ( $p \leq 0.000$ )
178. System Quality of SIS > User's Satisfaction	179. 4.469	180. ***
181. System Quality of SIS > Intention to use SIS	182. 5.241	183. ***
184. Intention to use SIS > User's Satisfaction	185. 3.826	186. ***

#### I. Normed Ration CMIN/DF

CMIN/DF is the minimum discrepancy of the structural model. Several scientists in statistic have suggested the use of this ratio as a measure of fit. For every estimation criterion, the ratio should be close to one for correct models. Wheaton et al. (1977) suggest that the researcher also compute a relative chi-square ( $\chi^2/df$ ). They suggest a ratio of approximately five or less 'as beginning to be reasonable.' In our

experience, however, ( $\chi^2$ ) to degrees of freedom ratios in the range of 2 to 1 or 3 to 1 are indicative of an acceptable fit between the hypothetical model and the sample data." (Carmines and McIver 1981, p.80). Reading the value of CMIN/DF shows that the discrepancy between the theoretical (estimated) model and the actual model (based on observed data from the survey) is statistically acceptable and satisfactory. Different researchers have recommended using ratios as low as 2 or as high as 5 to indicate a reasonable fit." (Marsh and Hocevar 1985). A CMIN/DF ratio  $> 2.00$  represents an inadequate fit." (Byrne, 1989, p.55). The model fit summary shows a value of CMIN/DF = 1.362 of the structural model which indicates a good degree of fit with the observed data (Hair et al., 2006).

## II. RMSEA

As described in earlier sections, RMSEA stands as Root mean squared error of approximation. RMSEA incorporates no penalty for model complexity and will tend to favour models with many parameters. In comparing two nested models, RMSEA will never favour the simpler model. Steiger and Lind (1980) suggested compensating for the effect of model complexity by dividing by the number of degrees of freedom for testing the model. Taking the square root of the resulting ratio gives the population "root mean square error of approximation", called RMS by Steiger and Lind, & RMSEA by Browne and Cudeck (1993).

RMSEA of about 0.08 or less would indicate a close fit of the model in relation to the degrees of freedom. This figure is based on subjective judgment. It cannot be regarded as infallible or correct, but it is more reasonable than the requirement of exact fit with the RMSEA = 0.0. Thus, a value of about 0.08 or less for the RMSEA would

indicate a reasonable error of approximation and would not want to employ a model with a RMSEA greater than 0.1." (Browne and Cudeck 1993).

Reading the data from the model fit summary,  $RMSEA = 0.036 \leq 0.08$ . Therefore, the structural model of the research indicates a very close fit of the model in relation to the degrees of freedom.

#### **4.9 Findings on Hypotheses**

To test the hypotheses of the research, structural equation modelling (SEM) is used. In SEM, the independent variable (System Quality of SIS) is referred to as endogenous variable while the dependent and mediator variables (Users Satisfaction and Intention to Use SIS) are referred to as exogenous variables (Jackson, 2003).

Critical Ratio (C.R) is used to validate each hypothesis, which is formed by dividing an estimate by its standard error. With large samples, the critical ratio can be referred to the standard normal distribution. Thus, a value for the C.R. of 1.96 or higher (and  $-1.96$  and lower), indicates two-sided significance at the customary 5% level. In other words, the hypothesis is true. In CFA analysis, the critical ratio tests indicate that all loadings are significant. In random sample variables with standard normal distributions, estimates with critical ratios more than 1.96 are significant at the 0.05 level (Garson, 2005). Thus, a C.R value of  $> 1.96$  is used to indicate a statistically significant correlation between the endogenous and exogenous variables as in the following:

##### **I. Hypothesis 1**

H<sub>0</sub> (Null-Hypothesis): There is no statistical relationship between system quality and user's satisfaction of SIS.

H1 (Alternative Hypothesis): There is a statistical relationship between system quality and User's satisfaction of SIS.

Hypothesis 1 predicted a positive correlation between System Quality and User's satisfaction of SIS. To derive the overall influence of System Quality association on user's satisfaction, the researcher analysed the critical ratio (C.R) value of  $> 1.96$  and is used to indicate a statistically significant correlation between user's satisfaction and System Quality. It is found that user's satisfaction correlates significantly with System Quality because C.R value =  $4.469 \geq 1.96$ . Furthermore, C.R positive value is statistically significant ( $p \leq 0.000$ , \*\*\*), this result suggests a positive correlation and association between Intention to use SIS and System Quality. Thus, the alternative hypothesis H1 is true and the null-hypothesis H0 is not true (rejected and not supported).

- **Test of Sub-hypothesis**

**Hypothesis Ha:**

H0a (Null-Hypothesis): There is no statistical relationship between usability and system quality of SIS.

H1a (Alternative Hypothesis): There is a statistical relationship between usability and system quality of SIS.

Hypothesis 1a predicted a positive correlation between Usability and System Quality of SIS. To derive the overall influence of Usability association on System Quality, the researcher analysed the critical ratio (C.R) value of  $> 1.96$  and is used to indicate a statistically significant correlation between Usability and System Quality of SIS. It is found that Usability correlate significantly with System Quality of SIS because C.R value =  $5.288 \geq 1.96$ . Furthermore, C.R positive value is statistically insignificant

( $p \leq 0.000$ , \*\*\*), this result suggests a positive correlation and association between Usability and System Quality of SIS. Thus, the alternative hypothesis H1a is true and the null-hypothesis H0b is not true (rejected and not supported).

**Hypothesis 1b:**

H0b (Null-Hypothesis): There is no statistical relationship between functionality and system quality of SIS.

H1b (Alternative Hypothesis): There is a statistical relationship between functionality and system quality of SIS.

Hypothesis 1b predicted a positive correlation between Functionality and System Quality of SIS. To derive the overall influence of Functionality association on System Quality, the researcher analysed the critical ratio (C.R) value of  $> 1.96$  and is used to indicate a statistically significant correlation between Functionality and System Quality of SIS. It is found that Functionality correlate significantly with System Quality of SIS because C.R value  $= 3.922 \geq 1.96$ . Furthermore, C.R positive value is statistically insignificant ( $p \leq 0.000$ , \*\*\*), this result suggests a positive correlation and association between Functionality and System Quality of SIS. Thus, the alternative hypothesis Hb is true and the null-hypothesis H0b is not true (rejected and not supported)

**Hypothesis 1c:**

H0c (Null-Hypothesis): There is no statistical relationship between flexibility and system quality of SIS.

H1c (Alternative Hypothesis): There is a statistical relationship between flexibility and system quality of SIS.

Hypothesis 1c predicted a positive correlation between Flexibility and System Quality of SIS. To derive the overall influence of Flexibility association on System Quality, the researcher analysed the critical ratio (C.R) value of  $> 1.96$  and is used to indicate a statistically significant correlation between Flexibility and System Quality of SIS. This regression weight was fixed at 1.000, not estimated by AMOS. Therefore, the association between Flexibility and System Quality of SIS is estimated by AMOS to be perfectly fit and significant. Thus, the alternative hypothesis H1c is true and the null-hypothesis H0c is not true (rejected and not supported).

**Hypothesis 1d:**

H0d (Null-Hypothesis): There is no statistical relationship between convenience and system quality of SIS.

H1d (Alternative Hypothesis): There is a statistical relationship between convenience and system quality of SIS.

Hypothesis 1d predicted a positive correlation between convenience and System Quality of SIS. To derive the overall influence of convenience association on System Quality, the researcher analysed the critical ratio (C.R) value of  $> 1.96$  and is used to indicate a statistically significant correlation between convenience and System Quality of SIS. It is found that convenience correlate significantly with System Quality of SIS because C.R value =  $5.960 \geq 1.96$ . Furthermore, C.R positive value is statistically insignificant ( $\rho \leq 0.000$ , \*\*\*), this result suggests a positive correlation and association between convenience and System Quality of SIS. Thus, the alternative hypothesis H1d is true and the null-hypothesis H0d is not true (rejected and not supported).

**Hypothesis 1e:**

H0e (Null-Hypothesis): There is no statistical relationship between data quality and system quality of SIS.

H1e (Alternative Hypothesis): There is a statistical relationship between data quality and system quality of SIS.

Hypothesis 1e predicted a positive correlation between Data quality and System Quality of SIS. To derive the overall influence of Data quality association on System Quality, the researcher analysed the critical ratio (C.R) value of  $> 1.96$  and is used to indicate a statistically significant correlation between Data quality and System Quality of SIS. It is found that Data quality correlate significantly with System Quality of SIS because C.R value =  $4.780 \geq 1.96$ . Furthermore, C.R positive value is statistically insignificant ( $\rho \leq 0.000$ , \*\*\*), this result suggests a positive correlation and association between Data quality and System Quality of SIS. Thus, the alternative hypothesis H1e is true and the null-hypothesis H0e is not true (rejected and not supported).

**Hypothesis 1f:**

H0f (Null-Hypothesis): There is no statistical relationship between responsiveness and system quality of SIS.

H1f (Alternative Hypothesis): There is a statistical relationship between responsiveness and system quality of SIS.

Hypothesis 1f predicted a positive correlation between Responsiveness and System Quality of SIS. To derive the overall influence of Responsiveness association on System Quality, the researcher analysed the critical ratio (C.R) value of  $> 1.96$  and is used to indicate a statistically significant correlation between Responsiveness and System Quality of SIS. It is found that Responsiveness correlate significantly with

System Quality of SIS because C.R value =  $5.94 \geq 1.96$ . Furthermore, C.R positive value is statistically insignificant ( $\rho \leq 0.000$ , \*\*\*), this result suggest a positive correlation and association between Responsiveness and System Quality of SIS. Thus, the alternative hypothesis H1f is true and the null-hypothesis H0f is not true (rejected and not supported)

**Hypothesis 1g:**

H0g (Null-Hypothesis): There is no statistical relationship between timeliness and system quality of SIS.

H1g (Alternative Hypothesis): There is a statistical relationship between timeliness and system quality of SIS.

Hypothesis 1g predicted a positive correlation between timeliness and System Quality of SIS. To derive the overall influence of timeliness association on System Quality, the researcher analysed the critical ratio (C.R) value of  $> 1.96$  and is used to indicate a statistically significant correlation between timeliness and System Quality of SIS. It is found that timeliness correlate significantly with System Quality of SIS because C.R value =  $6.311 \geq 1.96$ . Furthermore, C.R positive value is statistically insignificant ( $\rho \leq 0.000$ , \*\*\*), this result suggests a positive correlation and association between timeliness and System Quality of SIS. Thus, the alternative hypothesis H1g is true and the null-hypothesis H0g is not true (rejected and not supported).

**Hypothesis 1h:**

H0h (Null-Hypothesis): There is no statistical relationship between accessibility and system quality of SIS.

H1h (Alternative Hypothesis): There is a statistical relationship between accessibility and system quality of SIS.

Hypothesis 8 predicted a positive correlation between accessibility and System Quality of SIS. To derive the overall influence of accessibility association on System Quality, the researcher analysed the critical ratio (C.R) value of  $> 1.96$  and is used to indicate a statistically significant correlation between accessibility and System Quality of SIS. It is found that accessibility correlate significantly with System Quality of SIS because C.R value =  $5.936 \geq 1.96$ . Furthermore, C.R positive value is statistically insignificant ( $\rho \leq 0.000$ , \*\*\*), this result suggests a positive correlation and association between accessibility and System Quality of SIS. Thus, the alternative hypothesis H1h is true and the null-hypothesis H0h is not true (rejected and not supported).

## II. Hypothesis 2

H0 (Null-Hypothesis): There is no statistical relationship between system quality of SIS and Intention to use SIS.

H2 (Alternative Hypothesis): There is a statistical relationship between system quality of SIS and intention to use SIS.

Hypothesis 2 predicted a positive correlation between system quality of SIS and intention to use SIS. To derive the overall influence of system quality association on intention to use, the researcher analysis the critical ratio (C.R) value of  $> 1.96$  and is used to indicate a statistically significant correlation between system quality of SIS and intention to use SIS. It is found that intention to use SIS correlate significantly with system quality because C.R value =  $5.241 \geq 1.96$ . Furthermore, C.R positive value is statistically significant ( $\rho \leq 0.000$ , \*\*\*), this result suggests a positive correlation and association between system quality of SIS and intention to use SIS. Thus, the hypothesis H2 is true and the null-hypothesis H0 is not true (rejected and not supported).

### III. Hypothesis 3

H0 (Null-Hypothesis): There is no statistical relationship between intention to use SIS and user's satisfaction.

H3 (Alternative Hypothesis): There is a statistical relationship between intention to use SIS and user's satisfaction.

Hypothesis 3 predicted a positive correlation between intention to use SIS and user's satisfaction. To derive the overall influence of intention to use SIS association on user's satisfaction, the researcher analysed the critical ratio (C.R) value of  $> 1.96$  and is used to indicate a statistically significant correlation between intention to use SIS and user's satisfaction. It is found that intention to use SIS correlate significantly with user's satisfaction because C.R value =  $3.826 \geq 1.96$ . Furthermore, C.R positive value is statistically significant ( $p \leq 0.000$ , \*\*\*), this result suggests a positive correlation and association between intention to use SIS and user's satisfaction. Thus, the hypothesis H3 is true and the null-hypothesis H0 is not true (rejected and not supported).

### IV. Hypothesis 4

Mediation analyses are employed to understand a known relationship by exploring the underlying mechanism or process by which one variable influences another variable through a mediator variable. In particular, mediation analysis can contribute to better understanding the relationship between an independent variable and a dependent variable when these variables do not have an obvious direct connection.

Baron and Kenny (1986).

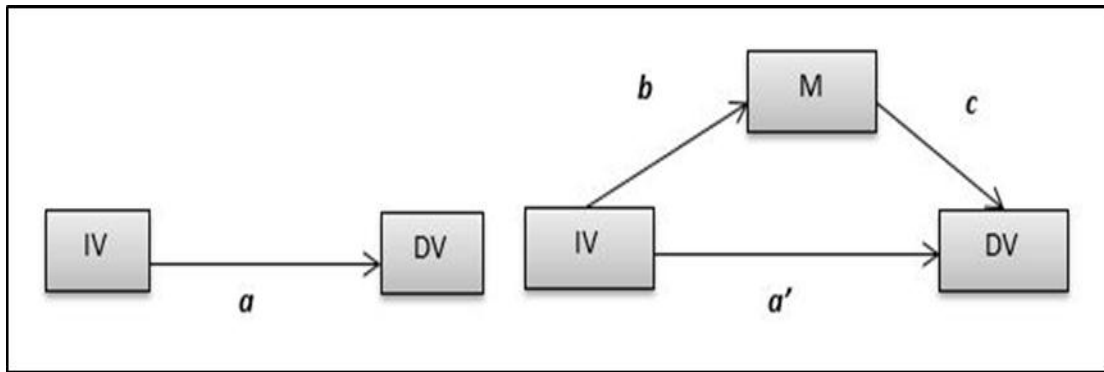
The research hypothesized that Intention to Use SIS mediates the relationship between System Quality and User's Satisfaction. To test this hypothesis, the research

has conducted a mediation analysis in this section based on Baron and Kenny's (1986) framework for mediation analysis which has become a standard part of the consumer researcher's toolkit: an independent variable IV affects some mediator M that in turn affects some dependent variable DV (IV: independent variable, M: Mediator, DV: Dependent variable).

Baron and Kenny proposed a series of three regressions, showing: IV affects M; IV affects DV; and when IV and M are included in the same regression, there is a significant partial effect of M and the partial (direct) effect of IV on DV that is less than the effect of IV on DV without controlling for M.

Baron and Kenny argue that the strongest evidence for mediation is when this partial effect of IV on DV is reduced to non-significance. Statistical literature has disputed these points, but this literature has not affected practice in consumer research, where Baron and Kenny's (1986) paper has been cited by 11,480 journal articles as of April 2009, according to Social Sciences Citation Index. The basic concept of mediation and the Baron and Kenney procedure are now so well-known that they are used by authors and requested by reviewers almost reflexively – even when other experimental rather than statistical approaches to theory testing might be more appropriate (Iacobucci and Deng 2007; Lynch, 2007; Spencer, Hayes, 2017).

In the basic setup, an independent variable IV is thought to “cause” a distal dependent variable DV through the mechanism of a mediating construct M, as shown in the following figure.



**Figure 4.17:** A Three-Variable Non-Recursive Causal Model

The causal effect of chain implies that there should be no partial effect of IV on DV once one controls for the mediator M. If one allows for the possibility that IV could affect DV “directly” (path a) as well as indirectly (path b and path c), then mediation is commonly understood to imply that the relationship between IV and DV when one controls for M should be weaker than the relationship between IV and DV when one does not control for M.

Baron and Kenny's (1986) most cited lines refer to three tests: “A variable function as a mediator when it meets the following conditions: (a) variations in levels of the independent variable significantly account for variations in the presumed mediator (i.e., Path b). (b) variations in the mediator significantly account for variations in the dependent variable (i.e., Path c), and (c) when Paths b and c are controlled, a previously significant relation between the independent IV and dependent variables DV is no longer significant, with the strongest demonstration of mediation occurring when Path a' is zero.” (p.1176)

Note that Condition (c) requires a significance test for the “direct” Path a. Paths c, b, and a' are tested and estimated by three regressions, Equations 1, 2, and 3 below;

$$M = i1 + bIV + e1 \quad \text{Equation 4.1}$$

$$DV = i2 + a IV + e2 \quad \text{Equation 4.2}$$

$$DV = i3 + aIV + cM + e3 \quad \text{Equation 4.3}$$

To test mediation, one should estimate the three following regression equations: first, regressing the mediator on the independent variable; second, regressing the dependent variable on the independent variable; and third, regressing the dependent variable on both the independent variable and on the mediator.

To establish mediation, the following conditions must hold: First, the independent variable must affect the mediator in the first equation; second, the independent variable must be shown to affect the dependent variable in the second equation and third, the mediator must affect the dependent variable in the third equation.” (p.1177).

**Table 4.42:** Output of Mediation Test System Quality and User’s Satisfaction

187. DV	188. N	189. DV	190. a	191. a'	192. b	193. c
194. System Quality	195. Intention to Use SIS	196. User's Satisfaction	197. 0.94	198. 0.611	199. 0.897	200. 0.343
201.	202.	203.	204. $\rho=0.000$	206. $\rho=0.000$	208. $\rho=0.000$	210. $\rho=0.000$
211.	212.	213.	205. Sig.	207. Sig.	209. Sig.	217. Sig.

Baron and Kenny advise that the strongest evidence of mediation exists when IV is significant in Equation 4.2) but reduced to non-significance in Equation 4.3) – that is, when there is evidence of “full mediation.” It is found that when there is a significant “direct” effect of IV on DV in Equation 3, this can inform theorizing about added mediators of the IV > DV relationship. Second, there need not be a significant “effect to be mediated” in Equation 4.2).

Baron and Kenny (1986) asserted that the strongest evidence for mediation is when there is no partial effect of the independent variable IV when DV is predicted by both IV and the mediator when there is a significant indirect path by the Sobel test but the coefficient *c* in Equation 4.3) is significant, this is “partial mediation.” Though “full” mediation is considered the gold standard, Iacobucci (2008, p. 12) notes that “When all tests are properly conducted and reported, the majority of articles conclude with ‘partial mediation’ as the result.” Descriptively, then, evidence of mediation is usually accompanied by evidence of a significant “direct” effect.

Reading the data in table 4.42 shows that the relationship between the independent variable (System Quality) and the dependent variable (User’s Satisfaction) before and after the mediator affect the direct relationship between System quality and User’s Satisfaction ( $p \leq 0.05$ , Sig.). In addition to that, the direct and causal effect (regression) of System Quality on User’s Satisfaction is decreased from 0.94 to 0.611 due to the partial mediation effect of Intention to Use SIS. Moreover, both the indirect effects (relationships) between System quality and Intention to Use SIS ( $b = 0.897$ ,  $p \leq 0.05$ , Sig.) as well as the relationship between Intention to Use SIS and User’s Satisfaction are significant ( $c = 0.343$ ,  $p \leq 0.05$ , Sig.). Thus, a partial mediation relationship is occurred due to the indirect effect of Intention to Use SIS (mediator).

Full mediation is when the entire relationship between the independent & dependent variables is through the mediator variable. If you take away the mediator, the relationship disappears. Since the real world is a complicated place with many interactions, this is less common than partial mediation.

In statistics a mediation model seeks to identify and explain the mechanism or process that underlies an observed relationship between an independent variable the inclusion of a third hypothetical variable, known as a mediator variable (also a mediating variable, intermediary variable, or intervening variable). Rather than a direct causal relationship between the independent variable and the dependent variable, a mediation model proposes that the independent variable influences the (non-observable) mediator variable, which in turn influences the dependent variable. Thus, the mediator variable serves to clarify the nature of the relationship between the independent and dependent variables Agler, and De Boeck (2017).

#### **4.10 Validation of the Proposed Model**

To validate the proposed model, a set of validation form has been constructed by researcher. The validation form consists of four items questions which are applicability, usability, satisfaction, and Overall satisfaction... the items are important to show the level of experts' views on the constructed model, that consisting of four questions the validation.

This validation process involved seven experts. Four are technical experts and three academic, table 4.43 shows the description of the experts.

**Table 4.43:** List of Experts Validations

Specialties	Number of Participants.	Description
Academician	3	1- Teaching Responsibilities: Information Systems Analysis and Design, Human Computer Interaction (HCI) Information Engineering, Web Engineering, Real-Time Systems, Web Technologies.UG and PG Projects Programmer Leader for Franchise courses at MDIS (Singapore) and INTI (Malaysia) 2005-20014 Research Interests.
		2- Research Assistant. Department of Computer Science and Software Engineering, Faculty of Engineering and computer Science, Concordia University, Sir, George Williams Campus. 3- Management Information Systems, Toowoomba, Australia Information Technology, and Services, Current, Lecturer at University of Southern Queensland, Education University of Southern Queensland
Technical	4	1- Dean Centre for Graduate Studies of USIM. 2- Staff of IT Department 3- Staff of IT Department 4- Staff of IT Department
Total	7	

The main validation proposes is to validate the proposed model and its applicability in the context of Malaysia educational environment the first step in the validation process, the testing session researcher gave some explanation on how the factors have been identified and put on the variable and use the AMOS and SEM uses to measure the proposed model then researcher gave the validation form of questionnaire to get some experts to respond as the validation process towards the proposed model the testing session researcher gave some explanation how the factors have been identified and put on the variable and use the AMOS and SEM uses to measure the proposed model.

The testing session researcher gave some explanation of how the factors have been identified and put on the variable and use the AMOS and SEM uses to measure

the proposed model then researcher gave the validation form to get some response as the validation process towards the proposed model.

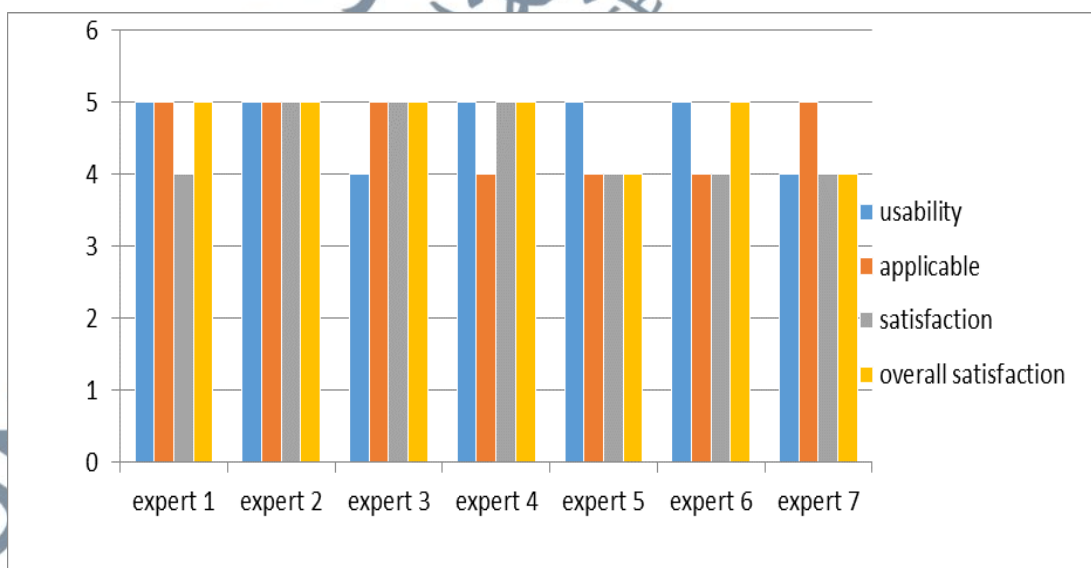
The experts provide the answer to the questions by using a 5-type scale (1 - strongly disagree, 2 - disagree, 3 - neutral, 4 - agree, and 5 - strongly agree). A five-point Likert format was used in this research because it reduces the frustration level of the respondents, thereby increasing the response rate and quality of the responses (Babakus and Mangold 1992).

The validation form consists of 4 questions; the questions mainly focused on applicability, usability, satisfaction, and Overall satisfaction as shown in table 4.44

**Table 4.44:** Items Expert Validation

No	Items
1	Usability
2	Applicability
3	Satisfaction
4	Overall satisfaction

The following bar chart summarizes the responses.



**Figure 4.18:** Analysis of Experts responded

The key expert responses gathered through the survey included expert usability, and applicability, satisfaction, and overall satisfaction. The figure 4.18 displays that 4.71 as the overall of the usability, and 4.57 as the overall of the applicability. About 4.42 as the satisfaction, where 4.71 as the overall satisfaction. Based on the finding that presented in figure 4.18 the research conceptual model is valid and reliable according to the measurement of usability, applicability, satisfaction, and overall satisfaction.

#### **4.11 Conclusion**

The analysis and discussion in this chapter is based on various analysis methods including descriptive, correlations, factor analysis and regression. SEM analysis is used to validate the theoretical model which is an emerging statistical tool that is gaining popularity in the social sciences.

In this chapter, the research examined the relationships between System quality of SIS, Intention to use SIS, and User's Satisfaction. This chapter highlighted the use of SEM in analysing correlations among independent (System quality of SIS) and dependent (User's Satisfaction) variables and the four hypotheses of the research. An overview of creating an SEM using SPSS and AMOS was explored.

Statistically significant correlations between the endogenous and exogenous variables were demonstrated through analyses of critical ratio (CR) values. In addition to correlation analysis, the goodness of fit for the model was also scrutinized. Elimination of non-significant endogenous variables resulted in an overall strengthening of the SEM. Because of the relative ease and clear depiction of proposed correlations indicated in the use of SEM, perhaps future research into SIS can develop even greater applications for this emerging and highly applicable statistical technique.