

# Extending the End-user Computing Satisfaction with Security Measures

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**Abstract**—Security issues have been undeniably increasingly becoming a consideration for end users since the early era of internet technology. Despite the issues have indicated practically its influences towards the end-user computing satisfaction (EUCS), but scholars who adopted clearly the construct in the EUCS research model is still rare to be found in the IS research field. This study aims to determine the EUCS status towards the sampled IS implementation and examine the factors that affect the satisfaction. The survey study was done by involving approximately 230 respondents who are selected based on the stratified purposive sampling. The partial least square-structural equation model (PLS-SEM) method the SmartPLS version 3.0 was then employed in the analysis stage. The study revealed that besides EUCS level of the sampled system is currently at a fairly satisfied level, three of the eleven influential paths are rejected. Besides the practical consideration for stakeholders of the sampled IS, the study findings may also become the theoretical considerations for the future studies.

**Keywords**—EUCS; security variable; information system; PLS-SEM.

## I. INTRODUCTION

The EUCS constructs have been interesting the IS researchers and practitioners since the early era of the IS implementation in business in the 1960s [1-5]. Igbaria and Nachman [6] etymologically defined the construct within two words, i.e., the end-user computing and their satisfaction itself. Both scholars elucidated the idea related to the behavior features and personal beliefs, the system features, and the demographic features. On the other side, security issues are undeniably becoming an essential consideration for end-users in this digital era.

Despite the fact that the above-mentioned issues have indicated practically its influences towards the EUCS construct, but scholars who adopted clearly the construct in the EUCS research model is still rare to be found in the IS research field. Thus, it is an interesting phenomenon how to adopt the security variable into the EUCS studies. The motivation of the adoption is in order to confirm what is influences of the variable in terms of the EUCS construct.

This study was aimed to know the EUCS status of the sampled IS implementation case and to examine the influential factors that affected the EUCS status. Specifically, the assessments using the end-user perspectives were objectives of the study. In order to guide the research implementation, the two research questions

then were proposed by the researchers refer to the background points, problem statements, purposes, and the objectives of the research.

- RQ1: How to know the EUCS status of the sampled IS?
- RQ2: What are the influential variables of the EUCS model?

In this study, the researchers used the results of the previous model development study [7]. The model was developed by adopting the Doll and Torkzadeh's EUCS model [8], inserting the security variable [9, 10], and adapting the variables, in terms of the IS satisfaction phenomenon in the sampled institution. The extension was conducted by the scholars referring to the Belout and Gauvreau's [10] description that most research models were developed using earlier models and theories [11, 12]. The model development assumptions were the input-process-output (IPO) logic of the information processing theory [13] and the processional and causal model of the previous model development concepts [14-17], as the assumptions were also implemented by previous model studies [18-23]. The used model consisted of its seven variables and 11 hypotheses (Fig. 1), i.e., Content (CON), Accuracy (ACC), Format (FOR), Easy of Use (EUS), Timeliness (TIM), Security (SEC), and User Satisfaction (EUS).

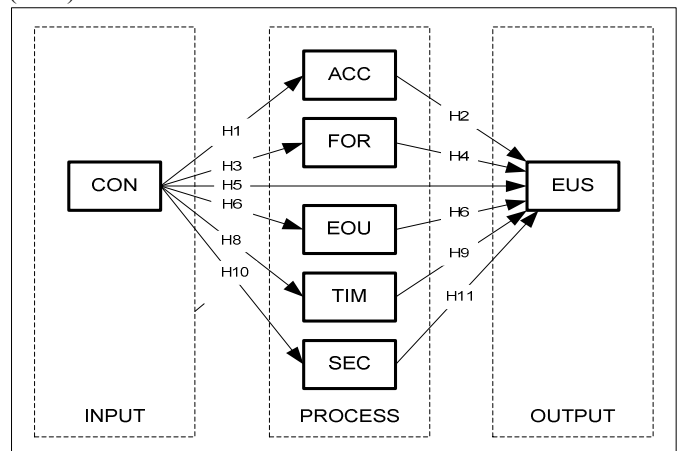


Fig. 1. The used EUCS Model [7]

The paper is structured in the four parts. The following

parts describe sequentially the three parts, i.e., the research methods, results and discussion, and the conclusion parts.

## II. RESEARCH METHOD

This quantitative study was through eight stages (Fig. 2) from the preliminary study to the report writing. The population was around 24.366 of the active students and employees at the sampled institution. Based on the stratified purposive sampling [24], 300 samples were then determined referring to their key informant characteristics [25-27]. Approximately 230 ( $\pm 77\%$  response rate) valid data were then obtained from the blended survey as long as approximately one month. The questionnaire consisted of two parts. The first part was the introduction letter of the filling request and the second one described the research questions using the five Likert's scale points [28, 29].

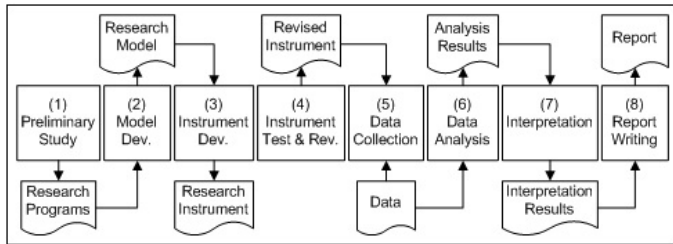


Fig. 2. The research procedure

Furthermore, the data analysis was done in two stages. MS. Excel 2007 and IBM SPSS 20 were used to analyze descriptively the demographic information of the respondents (Table 1). The second stage was done with the PLS-SEM method using SmartPLS 3.0 to examine the measurement and structural models. The model measurement analysis was performed to test the reliability and validity of the outer model through the indicator reliability, internal consistency reliability, convergent validity, and the discriminant validity examinations [30-34]. Furthermore, the structural model assessment was performed to assess the inner model through several testing phases, i.e., the coefficient, coefficient of determination, t-test, effect size, predictive relevance, and the relative impact assessments [30-34]. Moreover, the interpretation stage was focused on the statistical analysis results, especially the hypothetical analysis.

## III. RESULTS AND DISCUSSION

### A. The Descriptive Analysis Results

This part displays the demographic information regarding respondent characteristics, system roles, and system user satisfaction status. The results showed that most of the samples were respondents with female gender (70%) and student status (97.4%). Furthermore, most respondents came from the Faculty of Science and Technology (25.2%) and the Faculty of Tarbiyah and Teachers Training (12.2%). These results also show that as many as 88.7% of the respondents

felt helped by the system and also about 75.7% of respondents were satisfied when using the system (Table 1).

TABLE I  
 THE RESPONDENT PROFILES

Category	Item	%
Gender	Female	70.0
	Male	30.0
Status	Student	97.4
	Employee	2.6
Work Unit	Faculty of Dirasat Islamiyah	0.4
	Faculty of Tarbiyah and Teachers Training	12.2
	Faculty of Syariah and Law	7.4
	Faculty of Adab and Humanities	6.5
	Faculty of Social and Political Sciences	8.3
	Faculty of Medicine and Health Sciences	10.0
	Faculty of Ushuluddin	3.9
	Faculty of Da'wah and Communication Sciences	7.0
	Faculty of Economics and Business	9.1
	Faculty of Science and Technology	25.2
	Faculty of Psychology	7.4
	Rectorat	2.6
System Role	Very Helpful	21.3
	Helpful	36.1
	Quite Helpful	31.3
	Less Helpful	10.9
	Not Helpful	0.4
User Satisfaction Status	Very Satisfied	3.5
	Satisfied	33.5
	Quite Satisfied	38.7
	Less Satisfied	21.7
	Not Satisfied	2.6

### B. The Measurement Model Analysis Results

The measurement model analysis (outer model) was done through four assessment stages, i.e, the individual goods reliability test, internal consistency, extracted average variance, and the discriminant validity assessment. Graphically, the results can be seen in Table II and Table III. The explanation of the model analysis results are:

- Table II shows that all of the 30 indicators in this study already have their factor loading values above 0.7. In addition, the results of this test also show the deletion of eight other indicators (ACC5, EOU4, EOU7, FOR3, FOR4, FOR5, SEC5, TIM4) because the factor loadings of the indicators are under the threshold value.
- The results of internal consistency test show that to all variables in this model already have Composite Reliability (CR) value above the threshold value (0.7).
- The results of the average variance extracted test show that to all variables have their Average Variance Extracted (AVE) scores above 0.5.
- The Discriminant validity test was done through two stages of examination, that is the cross loading inspection between indicator (Table II) and the Fornell-Locker's cross-loading (Table III). Meanwhile, on the Fornell-Locker's cross-loading examination requires conditions where the AVE root values should be higher than the correlation between constructs with other constructs.

TABLE II  
 THE MEASUREMENT MODEL ASSESSMENT RESULTS

	CL							AVE	CR
	ACC	CON	EOU	EUS	FOR	SEC	TIM		
ACC1	0.843	0.541	0.455	0.486	0.487	0.294	0.461	0.640	0.877
ACC2	0.763	0.444	0.377	0.403	0.388	0.258	0.409		
ACC3	0.784	0.396	0.399	0.404	0.410	0.419	0.374		
ACC4	0.809	0.529	0.540	0.500	0.502	0.398	0.448		
ACC5	<i>Rejected</i>								
CON1	0.510	0.795	0.519	0.525	0.572	0.241	0.448	0.530	0.849
CON2	0.372	0.740	0.455	0.444	0.504	0.262	0.398		
CON3	0.463	0.654	0.439	0.455	0.340	0.229	0.318		
CON4	0.401	0.715	0.432	0.470	0.514	0.291	0.361		
CON5	0.449	0.730	0.433	0.476	0.547	0.296	0.326		
EOU1	0.393	0.482	0.774	0.518	0.641	0.245	0.352	0.546	0.856
EOU2	0.422	0.495	0.817	0.504	0.611	0.356	0.378		
EOU3	0.411	0.436	0.784	0.473	0.524	0.266	0.329		
EOU4	<i>Rejected</i>								
EOU5	0.419	0.472	0.703	0.474	0.499	0.287	0.422		
EOU6	0.420	0.419	0.594	0.430	0.352	0.411	0.431		
EOU7	<i>Rejected</i>								
EUS1	0.418	0.522	0.458	0.785	0.388	0.333	0.528	0.724	0.913
EUS2	0.453	0.535	0.541	0.891	0.493	0.372	0.525		
EUS3	0.518	0.558	0.630	0.884	0.602	0.312	0.499		
EUS4	0.523	0.598	0.579	0.839	0.538	0.403	0.565		
FOR1	0.408	0.561	0.573	0.447	0.772	0.228	0.396	0.636	0.875
FOR2	0.469	0.616	0.612	0.521	0.850	0.307	0.456		
FOR3	<i>Rejected</i>								
FOR4	<i>Rejected</i>								
FOR5	<i>Rejected</i>								
FOR6	0.442	0.469	0.573	0.424	0.798	0.311	0.336		
FOR7	0.477	0.526	0.537	0.506	0.769	0.397	0.428		
SEC1	0.350	0.335	0.347	0.406	0.333	0.882	0.379	0.756	0.925
SEC2	0.361	0.319	0.342	0.303	0.321	0.900	0.340		
SEC3	0.438	0.326	0.358	0.317	0.357	0.907	0.375		
SEC4	0.332	0.274	0.411	0.410	0.338	0.783	0.401		
SEC5	<i>Rejected</i>								
TIM1	0.459	0.418	0.429	0.506	0.436	0.338	0.840	0.701	0.904
TIM2	0.452	0.380	0.405	0.487	0.426	0.363	0.873		
TIM3	0.448	0.459	0.413	0.517	0.344	0.409	0.818		
TIM4	<i>Rejected</i>								
TIM5	0.422	0.444	0.475	0.565	0.498	0.336	0.817		

TABLE III  
 THE FORNELL-LACEKRS CROSS LOADING RESULTS

	ACC	CON	EOU	EUS	FOR	SEC	TIM
ACC	0.800						
CON	0.604	0.728					
EOU	0.559	0.627	0.739				
EUS	0.565	0.652	0.652	0.851			
FOR	0.563	0.686	0.720	0.598	0.798		
SEC	0.426	0.361	0.421	0.418	0.389	0.869	
TIM	0.532	0.511	0.517	0.623	0.510	0.433	0.837

C. Structural Model Analysis Results

The structural model (inner model) analysis was done through six examination stages, i.e., the path coefficient ( $\beta$ ), coefficient determination ( $R^2$ ),  $t$ -test, effect size ( $f^2$ ), predictive relevance ( $Q^2$ ) and relative impact ( $q^2$ ). Graphically, the results can be seen in Table IV.

TABLE IV  
 THE STRUCTURAL MODEL ASSESSMENT RESULTS

	$\beta$	t-test	$R^2$	$f^2$	$Q^2$	$q^2$	Analyses					
							$\beta$	t-test	$R^2$	$f^2$	$Q^2$	$q^2$
H1	0,604	13,286	0,364	0,572	0,213	0,271	Sign	A	M	L	P	M
H2	0,075	0,952	0,595	0,007	0,393	0,002	Insig	R	M	S	P	S
H3	0,686	17,156	0,470	0,887	0,276	0,381	Sign	A	M	L	P	L
H4	0,023	0,297	0,595	-	0,393	- 0,005	Insig	R	M	S	P	S
H5	0,267	3,685	0,595	0,077	0,393	0,033	Sign	A	M	S	P	S
H6	0,627	13,226	0,393	0,647	0,198	0,247	Sign	A	M	L	P	M
H7	0,262	3,317	0,595	0,069	0,393	0,030	Sign	A	M	S	P	S
H8	0,511	9,286	0,261	0,353	0,169	0,203	Sign	A	L	L	P	M
H9	0,277	3,854	0,595	0,111	0,393	0,044	Sign	A	M	S	P	S
H10	0,361	4,984	0,131	0,151	0,092	0,101	Sign	A	L	M	P	S
H11	0,050	0,937	0,595	0,005	0,393	- 0,002	Insig	R	M	S	P	S

Notes: 1) Sign: Significant  
 2) Insig: Insignificant  
 3) A: Accepted  
 4) R: Rejected  
 5) L: Large  
 6) M: Medium  
 7) S: Small  
 8) P: Predictive

- The path coefficient assessment results state that three of the 11 paths have an insignificant influence (ACC→EUS, FOR→EUS, SEC→EUS).
- The above-mentioned results are also significant with the  $t$ -test results that mention the three paths are rejected.
- From the coefficient of determination can be seen that  $R^2$  from SEC variable is the weakest with the value equal to 0,131. It can be interpreted that CON explains weakly (13,1%) from SEC variant.
- The  $f^2$  examination results indicate that there are four of 11 paths having a large effect (CON→ACC, CON→FOR, CON→EOU, CON→TIM), one path has a medium effect (CON→SEC), and the rest ones have the small effect.
- Based on  $Q^2$  testing, the relevance of the overall path on the model is predictive.
- The test result  $q^2$  mentions that the 11 paths indicate with one large impact (CON→FOR), three medium impacts (CON→ACC, CON→EOU, and CON→TIM), and the rest ones with small impacts.

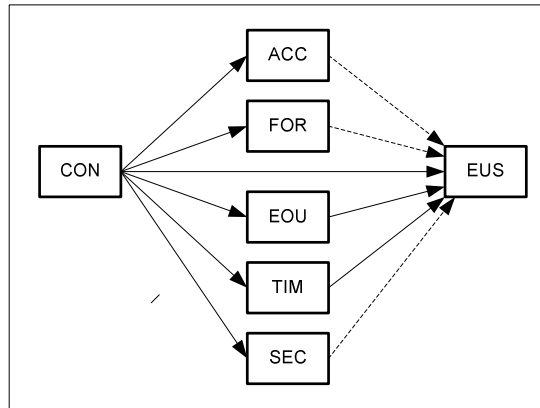


Fig. 3. The Hypothetical Assessment Results

The demographic information shows that the sampled IS is helpful for the end-users, as it is presented by the majority (88.7%) of the respondents. It is consistent with the satisfaction indication of the system. Most respondents (75.7%) expressed their satisfaction feelings. In short, it can be seen that the system can be classified at the satisfactory level.

Furthermore, despite the fact that the measurement model assessments show eight indicators deletions, but the overall results present that the outer model of the used model present statistically a good characteristic. Moreover, the inner model assessments indicate that the influential factors on the proposed EUCS model are Content, Easy of Use, and Timeliness (Fig. 3).

#### IV. CONCLUSION

This study demonstrates that majority users of the IS in the sampled institution satisfied within the system implementation. In addition, the findings of the study also present that the satisfaction level is affected by three factors, i.e., the content, easy of use, and the timeliness variables of the IS. Despite the fact that the accuracy, format, and the security variables may undeniably become the significant variables in the other user satisfaction studies, but the satisfactions of the sampled IS in the sampled institution is unaffected by the above-mentioned variables. The findings may helpful for the stakeholders of the sampled IS in the institution, in terms of the practical consideration points.

It may relate to the used data, techniques, and tools in the study. The findings can not be generalized with the findings of the other studies because of the differences. Thus, it is recommended that the utilizations of the data, techniques, and tools in the study can be a reference point for the future works.

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