Spreadsheet Usability Testing in Nielsen's Model among Users of ITSMEs to Improve Company Performance

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Abstract. The use of a spreadsheet application is one of the applications that must be used by SMEs in conducting financial and stock calculations. The level of usage is getting higher, along with the development of the use of the application. Usability testing is done to determine the level of use of spreadsheet users so that it is known how much the level of Learnability, Efficiency, Memorability, Errors, and Satisfaction. The index value obtained will give an idea of how much ability the user has in using the spreadsheet application. This research is a quantitative study involving a range of 119 respondents from interested parties in the use of spreadsheets at the MSME. Data was analyzed using the PLS-SEM method using SmartPLS 3.0 software. The results obtained show that there are four hypotheses that were rejected and one hypothesis that was accepted.

Key words: usability, SME's, spreadsheet, PLS, SEM.

Introduction

Information and Telecommunications Technology (ICT) is found in almost all-human life. ICTs are driving the movement of patterns of human life toward more modern and practical ones. The applications that appear are the result of the development of ICT, which is now a tool that is used in almost all human activities in the world, including in Indonesia. One of them is the internet is used by humans for various purposes, starting from communication, study work to shopping (Berisha-Shaqiri, 2015: 73-79).

In data processing, the use of the internet is assisted with many applications related to windows, one of which is Microsoft Excel, which is very popular and excellent data processing software today. This data processing application has lasted a long time, along with the emergence of other applications, which are application balancer data from Microsoft Excel. In its use, Microsoft Excel can be integrated with word processing applications such as Microsoft Word so that users can easily create financial reports together with data processing, to produce reliable reports. The ease of operation makes Microsoft Excel the most popular data processing application so that every company that uses the Windows operating system is sure to process data using Microsoft Excel for financial statements (Jusoh and Ahmad, 2019: 23-25).

This research was conducted to measure the level of usability of Microsoft Excel on users by Nielsen's method (Nielsen, 1996; Nielsen and Mack, 1994). Usability is a quality attribute that will assess the ease of user interface usage. Usability also refers to methods to facilitate use during the design process (Nielsen and Mack, 1994). In usability, there are five main elements, namely: (1) Usability, (2) Efficiency, (3) Effectiveness, (4) Satisfaction, (5) Acceleration (Rubin and Chisnell, 2008). Usability is also defined as a measure by which users can access the functionality of a system effectively, efficiently, and satisfactorily in achieving its goals.

A product can be called usable if, in use, there is no sense of distress or frustration from the user. Users can do what they want to do without obstacles, without difficulties or doubts or questions (J. Rubin and Chisnell, 2008). There are several parameters to measure usability, namely: (1) Success Rate, is measuring the level of user success in completing work using the application. (2) The Time a Task Requires is measuring the time needed by the user in completing a task. (3) Error Rate is the level of an error made by the user. (4) User's Subjective Satisfaction is the level of user satisfaction in completing the overall work.

In conducting usability testing, several criteria are used as a basis, namely: (1) Learnability, the level of relevance to how easily an application is used. Ease is measured by using the functions and features available. (2) Efficiency, the level of connection with the speed in doing something in the application. (3) Memorability, the level of relevance to the user's ability to maintain their knowledge after a certain period of time. (4) Errors, the level of association with errors made or made by users during interaction with the application. (5) Satisfaction, the level of association with user satisfaction after using the application (Rusu et al., 2015: 1-12; Vallejo et al., 2016: 333-339).

Material and Methods

The study was conducted by conducting a preliminary study (1.1), which is conducting a review of the literature relating to the field of research, where this is the beginning of a draft model that will be developed. The study will refer to Nielsen's usability model (Nielsen, 2001; Nielsen, 2003; Nielsen and Mack, 1994; Nielsen and Molic, 1998). The draft model obtained will then be developed into a reference model (1.2), which will later be calculated as the factors that influence it.

The next stage is to make a model indicator, which is developing questions that will later be used as a reference in making questionnaires (1.3). This method is more often used by quantitative researchers (Creswell, 2013; Hong et al., 2018: 459-467; Östlund et al., 2011: 369-383; Subiyakto et al., 2015: 1-14) to get perceptions about the use of an application or things related to human-computer interaction (Ajzen, 1991: 179-211; Steffensen, 2013: 195-221). The questionnaire will be distributed in various types of SMEs, ranging from the retail sector and the producer sector, so that it can obtain an overview of the use of Microsoft Excel in all layers of the SMEs industry. The distribution of questionnaires is done by filling out directly on the form or sent via email or WhatsApp application. The coverage area covers the five regions in Jakarta, and the technique used is a purposive sampling (Barglowski, 2018: 151-168; Etikan et al., 2016: 1-4). The calculation uses SEM-PLS to produce an outer model analysis that is validity analysis and reliability analysis (Sani et al., 2019: 49-56).

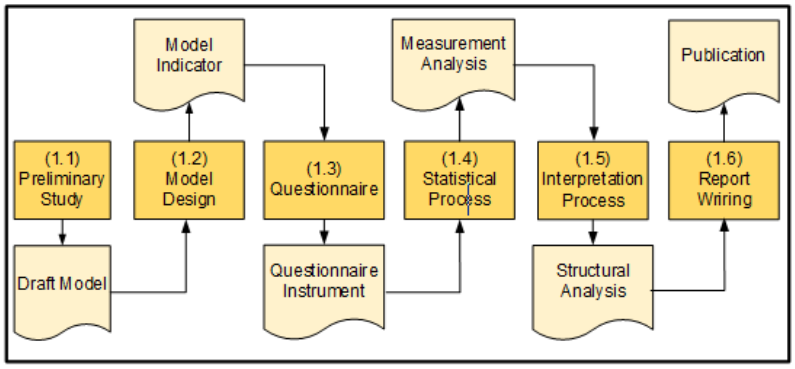

Fig. 1. Research Method

Based on the consideration of key informant aspects (Creswell, 2013), the determination of the study population is all stakeholders of SMEs, especially users of spreadsheet applications. A total of 119 respondents consisting of employees and owners, were included in the respondents who were required to fill out a questionnaire.

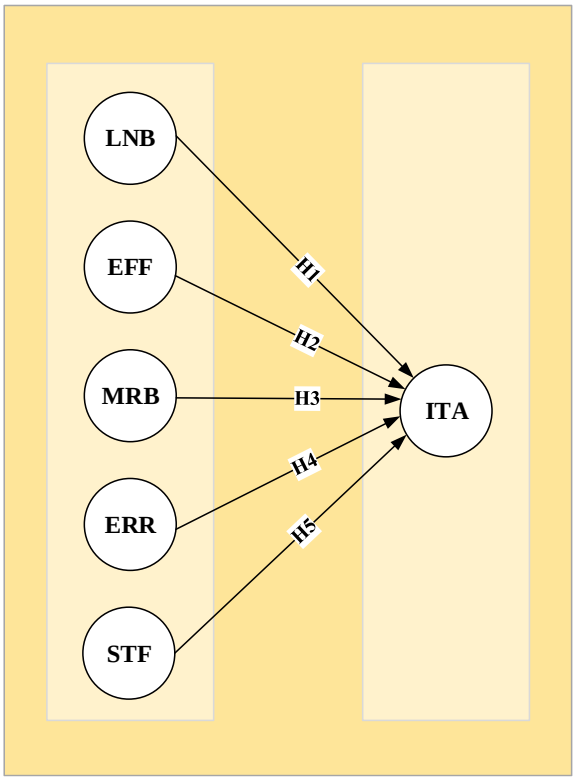

Fig. 2. Model Proposed

The questionnaire uses a Likert scale (Kaptein, Nass, and Markopoulos, 2010) and to ensure validity and reliability, and this study adopted several indicator items from previous studies (Nielsen, 2001; Nielsen, 2003). Besides, this study also adopts several theories relating to information system processes and logic models of input-process-output (Asrul et al., 2019).

Table 1.List of model and theory

Model and Theory	Definision	Source
Information Process Model	This model uses assumptions about information processing in modeling in information systems. The information process is carried out in a structured manner so that the stages that occur are in accordance with the process.	(Davis and Yen, 1998; Sani et al., 2018; Subiyakto and Ahlan, 2014: 5603-5612)
Nielsen's Model	Nielsen's model is used to get usability problems. Measurements were made using five criteria that will	(Etikan et al., 2016; Nielsen, 2001; Nielsen, 2003; Nielsen and Mack, 1994; Yuniarto, Suryadi, et al., 2018)

	provide information on usability issues	
IPO Logic Model	The IPO logic model describes the whole process starting from the input side to the impact of the process so that differences can be arranged between the results.	(Sani and Wiliani, 2019: 49-56; Subiyakto and Ahlan, 2014)

Result and Discussion

Measurement Model Analyses

The analyses was performed using MS Excel for demographic data and SmartPLS for inferential statistical analysis. The use of PLS_SEM was considered because of its simultaneous ability in data analysis without the use of initial assumptions, in addition to that because the data collected was small (n = 119) as described (Hair et al., 2011: 139-152; Hair et al., 2012: 414-433; Wong, 2013: 1-32).

Based on table 2, the majority of respondents had an undergraduate degree (64.71%), while other respondents were divided into High School (25.21%) and diplomas (10.08%). While the level of use of spreadsheets shows that the level is good (63.87%), sufficient (21.85%), very good (12.61%), and less (1.68%). Table 2 also illustrates the uneven distribution of questionnaires because MSMEs are still dominated by the Jakarta area (38.66%) and Tangerang (37.82%). While the Bogor, Bekasi, and Depok areas are below 10%. The lack of respondents obtained most likely will affect the results of the characteristics of respondents produced.

From table 3, there are four indicators that are rejected, namely LNB2, EFF2, STF1, and ITA4. The discriminant validity and convergent validity test results give good results, namely the value of AVE> 0.5 and Cronbachs Alpha value above the average of 0.5. (Hair et al., 2011: 139-152; Hair et al., 2012: 414-433; Henseler et al., 2009: 277-319; Subiyakto et al., 2016: 229-247; Wong, 2013: 1-32). So that the model can be accepted for the measurement of its structural model. The possibility of the validity test above can give a good value is due to the selection of respondents and the right questions to this study. This is also because it is related to the trust and correctness of the right data sources**.**

Structural Model Analyses

The analyses was carried out with two stages of analysis, namely bootstrapping and blindfolding. Bootstrapping analysis procedures are related to path coefficient (f^2) and T statistic (T-stat) analysis. As for the blindfolding analysis related to the analysis of effect size (f^2).

Analysis of the path coefficient (β) is tested by looking at the threshold value above 0.1 to state that the path has a significant path to the model. Of the five paths tested in the model, there is one path that is not significant, the ERR→ITA pathway as shown in table 4.Effect size (f^2) or predictive effect analysis is performed to predict the effect of certain variables on other variables in the model structure with a threshold value of about 0.02 for small influences, 0.15 for moderate influences, and 0.35 for large influences. Of the five pathways tested, ERR → ITA and MRB → ITA have little effect. Pathway EFF → ITA, LNB → ITA, and STF → ITA have a moderate influence on the model.

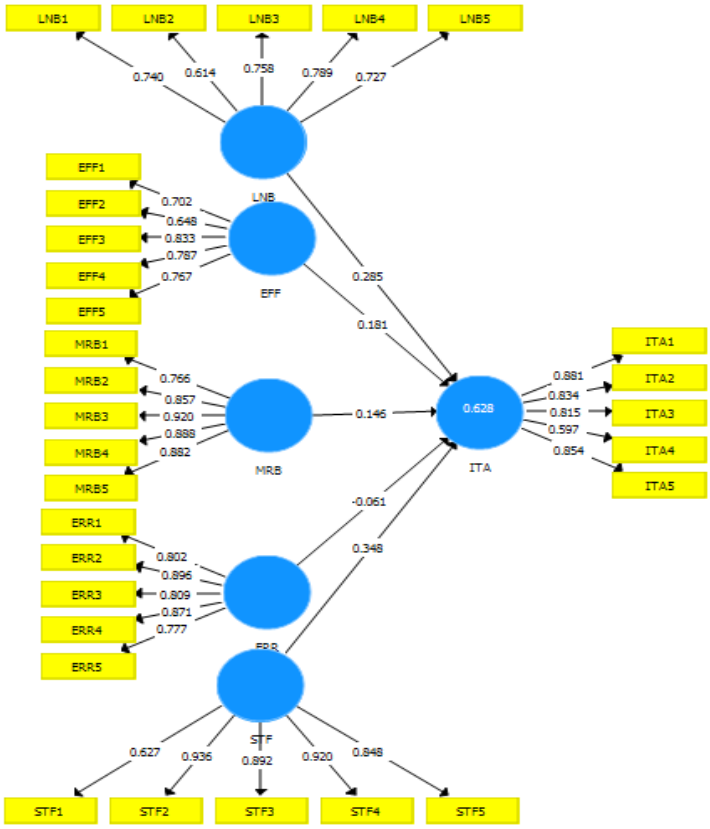

Fig. 3. Path Diagram

Tabel 2. Characterictic of respondent

Characteristic	Respondent	Count and Proportion	
		Count	Proportion (%)
Gender	Male	54	45,38
	Female	65	54.62
Education	High School	30	25.21
	Diploma	12	10.08
	University	77	64.71
Using Spreadsheet	Less	2	1.68
	Enough	26	21.85
	Well	76	63.87
	Very Good	15	12.61
Regional	Jakarta	46	38,66
	Bogor	10	8,40
	Tangerang	45	37.82
	Bekasi	8	6.72
	Depok	10	8.40

Hypothesis analysis (T-stat) or hypothesis testing to find out whether the hypothesis is rejected/accepted. Hypotheses will be accepted if the T-stat value is above 1.96. In table 4, it can be seen that only one hypothesis is accepted, namely STF → ITA, while the other pathways are rejected.

Tabel 3. Results of exploratory factor analysis

Var	Ind	CL						CA	CR	AVE
		LNB	EFF	MRB	ERR	STF	ITA			
LNB	LNB1	0.74	0.29	0.42	0.37	0.40	0.40	0.78	0.85	0.53
	LNB2	Reject								
	LNB3	0.76	0.49	0.55	0.47	0.60	0.60			
	LNB4	0.79	0.50	0.54	0.43	0.41	0.60			
	LNB5	0.73	0.35	0.47	0.41	0.55	0.46			
EFF	EFF1	0.39	0.70	0.55	0.60	0.58	0.56	0.80	0.86	0.56
	EFF2	Reject								
	EFF3	0.47	0.83	0.73	0.66	0.43	0.46			
	EFF4	0.58	0.78	0.64	0.62	0.49	0.48			
	EFF5	0.45	0.76	0.61	0.61	0.51	0.51			
MRB	MRB1	0.45	0.61	0.77	0.69	0.60	0.48	0.91	0.93	0.75
	MRB2	0.58	0.74	0.86	0.78	0.67	0.55			
	MRB3	0.60	0.74	0.92	0.74	0.71	0.67			
	MRB4	0.63	0.67	0.89	0.62	0.76	0.70			
	MRB5	0.69	0.69	0.88	0.72	0.75	0.66			
ERR	ERR1	0.40	0.66	0.64	0.80	0.51	0.45	0.88	0.92	0.69
	ERR2	0.49	0.75	0.76	0.89	0.64	0.56			
	ERR3	0.34	0.68	0.57	0.81	0.50	0.48			
	ERR4	0.51	0.62	0.67	0.87	0.66	0.53			
	ERR5	0.63	0.62	0.75	0.77	0.76	0.57			
STF	STF1	Reject						0.90	0.93	0.72
	STF2	0.68	0.54	0.72	0.64	0.94	0.66			
	STF3	0.63	0.45	0.68	0.60	0.89	0.64			
	STF4	0.58	0.53	0.70	0.62	0.92	0.67			
	STF5	0.45	0.59	0.73	0.61	0.85	0.61			
ITA	ITA1	0.64	0.49	0.64	0.51	0.67	0.88	0.86	0.90	0.64
	ITA2	0.54	0.53	0.52	0.44	0.55	0.83			
	ITA3	0.58	0.58	0.64	0.60	0.63	0.81			
	ITA4	Reject								
	ITA5	0.63	0.46	0.60	0.47	0.62	0.85			

Table 3. Latent Variable Correlations

Variable	EFF	ERR	ITA	LNB	MRB	STF
EFF	0,750					
ERR	0,803	0,832				
ITA	0,636	0,629	0,803			
LNB	0,595	0,580	0,687	0,728		
MRB	0,797	0,821	0,719	0,690	0,864	
STF	0,628	0,747	0,722	0,660	0,814	0,852

Tabel 4. Path Analysis

Jalur	β	f^2	T Stat	Analysis		
				β	f^2	T Stat
EFF → ITA	0.181	0.025	1.319	Significant	Moderate	Rejected

Jalur	β	f^2	T Stat	Analysis		
				β	f^2	T Stat
ERR → ITA	-0.061	0.002	0.395	Insignificant	Small	Rejected
LNB → ITA	0.285	0.106	1.846	Significant	Moderate	Rejected
MRB → ITA	0.146	0.010	0.788	Significant	Small	Rejected
STF → ITA	0.348	0.093	2.659	Significant	Moderate	Accepted

Conclusion

This conclusion reflects the final results of research that indirectly refer to problem-solving, objectives, research objectives, and simultaneously answer research questions and hypotheses. The number of rejected hypotheses illustrates that efficiency, errors, learnability, and memorability give unfavorable results, even though the path coefficient provides a significant result. Only the level of satisfaction gives a good hypothesis with a moderate level of predictive influence.

In addition to the results of the analysis of measurement models that have been presented statistically psychometric characteristics, other results that need to be considered are the instruments used in this study can be used again for testing other models related to usability level. This research can also be a consideration for interested parties, thereby adding an academic reference for researchers of information systems models.

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