Assessing the Reliability and Validity of Online Tax System Determinants: Using A Confirmatory Factor Analysis

Bojuwon MUSTAPHA[1]
[1]Department of Accounting College of Management and Social Science Fountain University Oshogbo Nigeria

Abstract

This paper examined the determinants of an online tax system model using a confirmatory factor analysis onto the income taxpayers' in Nigeria. The data were collected through a questionnaire distributed to the income taxpayers in Nigeria. This questionnaire is constructed based on five variables which are the intention to adopt, information security, government support, compatibility, and complexity. The data were distributed to 600 income taxpayers with 400 returned. Out of which 55 were deleted as a result of missing data. In all, 345 completed questionnaires were used for the analysis. The data were analyzed using Analysis of Moment of Structural (AMOS) Version 21.0 through model specification, model evaluation, model modification, model verification and model estimation to improve the reliability and validity of the online tax system determinant. The result signifies that the variables are statistically significant and practically important as a determinant of the online tax system in Nigeria. The paper is accomplished by discussing the implication, limitation and suggestion for future study.

Keywords: ***information security, information security, government support, complexity, compatibility and relative advantage.***

1. Introduction

This paper laid emphasis to the reliability and validity of the variables that serves as the determinants of an online tax system. The constructs were analyzed by using confirmatory factor analysis (CFA) with five measures of model specification, model evaluation, model modification, model verification and model estimation. Thus, the five listed measure play a significant role in the goodness-of-fit indices of an underlying construct. The importance of measurement model is it is more reliable and valid in the alleviation of multicollinearity issues in a data. The adoption of more than one variable in a model appears as a way of modeling variable that are related to one another which means that, the issues of multicollinearity in an interrelated variable may exist (Dijkstra & Henseler, 2015). It is explained that confirmatory factor analysis can also be referred to as a measurement model (Hair, Tatham, Anderson, & Black, 2006). In the use of Analysis of Moment of Structural (AMOS) software two main types of modeling are applied, which is the confirmatory factor analysis (measurement model) and the structural model (Path Analysis) called structural equation modeling (SEM). The use of confirmatory factor analysis by researchers is now frequent in validating the instrument before proceeding for the structural model. In the case of this study, the confirmatory factor analysis is used for validating the instrument before proceeding for any other form of analysis. The application of measurement model was used to identify if there are any items of unidimensional to remove an item that loaded below the minimum threshold of (≥ 0.50). The presentation of a unidimensionality procedure is achieved when a researcher is able to measure items with an acceptable factor loading ≥ 0.50 for each item in a particular construct (Chapman & Feit, 2015). This study adopts the variable and the items were adapted from existing studies of the REF. Therefore, an item that is newly developed is measured with the minimum threshold ≥ 0.50 while an established scale is measured with a minimum threshold of ≥ 0.60. Hence, the study applies ≥ 0.60 as a threshold for the analysis.

Compatiblity

Compatibility is the process by which an invention is perceived as reliable with the present structure, experience and values within the system (Rogers et al., 2004). It refers to the compatibility of the innovation with the prevailing system which includes the software and hardware. The lack of compatibility with the application of any innovation by an organization can affect its implementation (Atif, Richards, & Bigin, 2012; Sahin & Rogers, 2006). The compatibility of a new system depends on how fast the integration of the new system to the existing practice (Tornatkzy & Klein, 1982). There are limited studies on the determinants of an online tax

system: survey evidence onto self-employed taxpayers are limited in the context of Nigeria. This study examines the innovation factor as a determinant of online tax system with survey evidence from self-employed taxpayers. This study uses compatibility and relative advantage as underlying variables to measure the determinant of an online tax system.

Considerable segments of self-employed taxpayers in Nigeria have no access to the Internet (Yesegat, 2009). At present, most self-employed taxpayers do not keep an adequate record of their businesses as a result of lack of support from the government (Soos, 1990). Furthermore, the government which is meant to be a motivator for the self-employed and make the environment conducive does not fully support them in terms of policies and regulations (McQuaid, 2002).

Hansen, Rand and Tarp (2009) examined government assistance during the start–up the rate that influences the long run of adoption of innovation. In addition, Fernández, Junquera and Vazquez (1996) identify managerial and sectorial characteristics which determine the range of government support received by innovation users in Spain. The finding shows that sectorial differences were minimal with regard to the importance of government support and it shows a significant correlation with government support. In this study, government support and online security as an underlying variable to measure the external factor in finding the relationship on the determinant of the self-employed taxpayers' usage of an online tax system in Nigeria.

(b) Security

Perceived security is one of the critical external factor that impact on the effectiveness of any technology adoption. Zhu and Kreamer (2005) have previously suggested the evaluation of the concept of security in the use of the online tax system. The study reveals that business operations in an environment with inadequate policy will have low levels of innovation adoption. Increasingly complex and security policy will slow down the usage of a new innovation like online tax system (Johnson & Lundvall, 2000). In a study conducted by Awogbade (2012) the inadequate existence of security framework in the electronic system in Nigeria is an issue to be addressed.

In the context of an online tax system which is related to e-tax transaction and e-tax payment, the government's inability to monitor all online tax systems adequately may arise. In this respect, the Internet service providers as well as tax officers and other trading partners have the chance to leak private tax information sent online by self-employed taxpayers to unauthorized users. More so, the environmental uncertainty that exists because of the inherent and the unpredictable nature of the Internet may be beyond the control of the service provider or the tax administrators. Hong and Cha (2013) found that two forms of security are specifically present in an online transaction; that is either behavioural or environmental uncertainty as a result of security.

In developing an online tax system and the application, the developer as well as the service provider can take measures to enhance the security of the tax transaction by way of encryption and firewall. There is still the possibility of third party users manipulating the transaction process. Another key factor in using an online filing system software online is the fact that there is security involved and outsiders can easily access these files from a secure browser. This means that encryption is about 256 bits and would take some time to get through it.

Lai, Normala and Meera (2004) observed that the effect in the use of security will stall the effective use of online tax system due to the uncertainty in the security system. Finding shows that online security has an effect on the use of information technology. Hence, this study examines the implication of the variables government support and perceived security as measures of external factor.

2. Methodology

2.1. Target Population

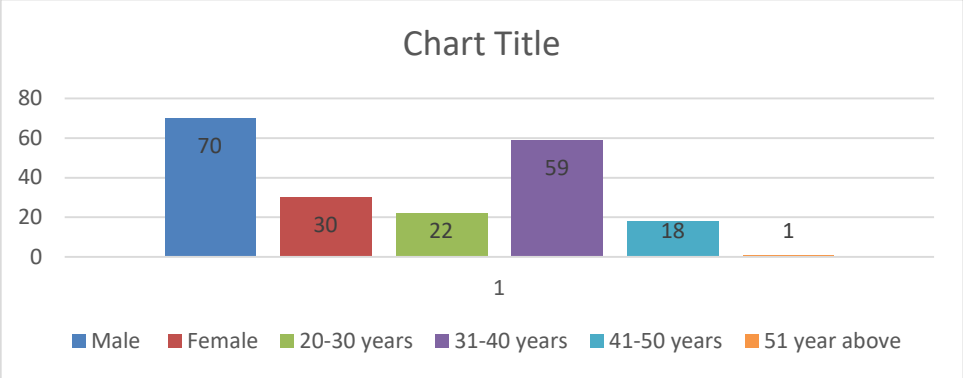
This paper applied a quantitative method of analysis with the means of distributing a survey questionnaire to the sampled population of income taxpayers in Nigeria. The questionnaire comprises of 19 items related to the five underlying variables used for this paper. The items adapted and modified on a five-point Likert Scale ranging from

1= strongly disagree, 2= disagree, 3= neutral, 4= agree and 5= strongly agree. A total number of 300 questionnaires were distributed, and 129 were returned out of which only 100 usable. The reaming 29 were discarded as a result of missing data and respondent ticking to scale in a particular item.

Respondent's profile

The preliminary analysis starts by understanding the respondent's demographic information which shows that the majority of the respondents are Male with a total number of 70 (70%), while the Female were with a total number of 0 (30%). On the respondent age, Majority of them were between the age of 31 and 40 years with total number of 59 (59%). The next were respondents aged between 20 and 30 years with total number of 22 (22%), age between 41 and 50 years were with a total number of 18 (18%). Finally, respondents age above 51 years were with a total number of 1 (1%) respectively. The third demographic variable is the respondent educational qualification. Table 1 exhibit the detail

Figure 1



2.2. The Measuring Instruments in the Study

The measurement of adapted and modified items emerged from the review of an existing literature to measure the level of involvement of the determinant of online tax system among the income taxpayers. The variable online tax system is referred to as the transmission of tax information directly to the tax administration through the use of internet (Edwards-dowe, 2008). This study looked at how variables such as compatibility, relative advantage information security, government support and complexity interact with each other. Thus, the items were encompassed on six sections. Since the paper is developed from the view of the income taxpayers in Nigeria, this paper would be used to customize the adapted and modified items accordingly in an order to suit the income taxpayers in the tax administration sector.

3. The Process Of Data Analysis

3.1. Unidimensionality

Unidimensionality refers to the degree by which the items single-handedly load on their respective construct without a parallel inter-correlation pattern with others (Segars, 1997). According to Gefen (2003) the unidimensionality of items cannot be passed using exploratory factor analysis with the Cronbach Alpha. In finding a unidimensionality in a construct, it means that there is no significantly shared variance among the variable they reflect.

In addition, the confirmatory factor analysis and the structural equation modeling provide for covariance of factor analysis with the ability to compare revised or re-specified measurement model through the statically significance of the data with the model (Bojuwon & Normala, 2015; Segars, 1997). The unidimensionality procedure is said to be classified as the model specification to specify which items to be retained in the construct as a measure based on the factor loading values. On these notes, when the confirmatory factor analysis has passed through the unidimensionality process, the discriminant and convergent validity is then followed. Finally, the goodness-of-fit indices are conducted in the confirmatory factor analysis model after the items have

successfully met the requirement of the unidimensionality procedure. The goodness-of-fit indices to measure the finding of this paper are in three groups, parsimonious fit: the Chi-square (x^2) and the chi-square divided by the degree of freedom (CMIN/DF); absolute find index: root mean square error of approximation (RMSEA); incremental fit: Tucker-Lewis index (TLI), normed fit index (NFI) and comparative fit index (CFI).

3.2. Model Estimation

The statistical inference and hypothesis testing as regards the specified model and parameters are appropriate when the sample size for the analysis is not too small for the selected model estimation method. A general guiding principle and the rule of thumb is that the minimum sample size should not be less than 200 cases when the observed variables are not multivariate and normally distributed (Bollen, 1989, 2014; Chen, Curran, Bollen, Kirby, & Paxton, 2008). According to the estimation of a model, may fail to converge as a result of an improper specification of the model provided. The use of structural equation modeling software is generally sensitive when there is an error in the steps with a message of warning on the screen of your system. Furthermore, all the parameter estimates are interpreted because they are within the correlation margin of the negative value of 1 and positive value of 1. There was no issue of ill-specified in the model, but in term of the data the sample size was small and still the variables are moderately correlated. This gives the evidence that there is no issue of multicollinearity since it is as a result of dependent variable having a high correlation with one another with a maximum value of threshold of > 0.85 (Westlund, Källström, & Parmler, 2008).

3.3. Model Evaluation

On the basis that the parameters of the model have been estimated with the model estimation, model evaluation would now be used to see which of the hypothesized model is to be retained or rejected using the classification of goodness-of-fit indices. The process of testing the hypothesis is essential by considering the null hypothesis being that the hypothesized model fits the data. The table 3 below classifies the fit of the model to the data into to 3 categories which are absolute fits, incremental feats and parsimonious fits to support the fitness with existing papers.

Table 1

Name of Category	Index full Name	Name of Index	Level of Acceptance	Literature
Absolute fit	Goodness0of-fit index	GFI	GFI > 0.90	Joreskog and Sorbom (1986)
	Absolute goodness-of-fit test	AGFI	AGFI > 0.90	Joreskog and Sorbom (1986)
	Standard root means square residual	SRMR	SRMR < 0.08	Bentler (1995)
	Root mean square error approximation	RMSEA	RMSEA < 0.8	Steiger and Lind (1982)
Comment	The higher the value of GFI and AGFI, as well as the lower value of SRMR and RMSEA, shows a better fit model to the data			
Incremental fit	Normed fit index	NFI	NFI > 0.90	Bentler and Bonett (1980)
	Tucker Lewis index	TLI	TLI > 0.95	Tucker and Lewis (1973)
	Relative non-centrality index	RNI	RNI > 0.90	McDonald and Marsh (1990)
	Comparative fit index	CFI	CFI > 0.95	Bentler (1990)
	Incremental fit index	IFI	IFI > 0.90	Bollen (1989)
Comment	The higher the value of the incremental fit indices shows an improvement of the model over the baseline model fit.			
Parsimonious fit	Chi-square/Df	Chi-square/Df	Chi-sq./Df < 5.0	Marsh and Hancover

				(1985)
Comment	The above information is sensitive to sample size of the study			

3.4. Model Modification

The process of model modification is required when the analysis is run and the model does not fit the data by checking the goodness-of-fit indices and the parameter loadings. Therefore, the step my looking at the modification indices from the output will give some evidence of some of the items that are needed to be covariance with each other to improve the fitness of the model to fit the data. In doing so, the existence of high correlation for each of the exogenous variables will result to the existence of multicollinearity. Apart from theses statistical assumption the item error terms must not correlate with each other. Based on the above scenario, scholars are advised against the regular changes of that are not strongly supported by an extensive theory (Byrne, 2009, 2012, 2013; Byrne, Shavelson, & Muthen, 1989). In conclusion the changes made based on the modification indices may not give the true model in term of the reality situation because it has been modified to fit the present situation (Jöreskog & Sörbom, 1982; Kaplan, 1990).

3.5. Discriminant validity

Discriminant validity is a process whereby the latent variable in a construct has the ability to account for more variance in the observed variable within the same conceptual framework. In case it does not happen, the evidence of individual item validity and the construct may be questionable (Fornell & Larcker, 1981). The share variance which is another name for the discriminant validity is also the total variance in a variable or construct that can be explained in another variable or construct of the same hypothesized model. The share variance is represented by the square, correlation between any two variable and construct a model. If the correlation between Y1 and Y2 is 0.6, then the shared shared variance between Y1 and Y2 is 0.36, and the if independent variable is correlated the predictive power will be shared over the dependent variable (Hair et al., 2006)

3.6. Average Variance Extracted (AVE)

The average variance extracted (AVE) is the amount of variance that the underlying variable is able to explain in the observed variable which is to be theoretically linked. The correlation between an underlying observed variable of construct B will correlate with the observed variable Y1 and Y2 that is theoretically related and are within the same construct of B. The correlation is generally denoted as a factor loading of the items in a model. The square of the factor loading will give the total variation in each of the observed variables the underlying variable accounted for in the model as share variance. Hence, the summation of all the variance across all the items that theoretically relate to a particular construct we lead to the generation of the Average variance extracted (Kline, 2005). According to Fornell and Larcker (1981), the method of assessing the discriminant validity of multiple variables is when the Average variance extracted of a construct is higher than the share variance with any other construct, then the discriminant validity is supported. The next table will present the summary if the type of reliability and validity with evidence of previous study. The next table will present the summarized type of reliability and validity with evidence of previous study to justify the use of confirmatory factor analysis in measuring items for the enhancement of the model for the further type of analysis.

Table 2: The Identified type of Reliability and Validity Measure

Validity	Technique	Description
Construct Validity		
Convergent Validity	Confirmatory factor analysis used in covariance based structural equation modeling only	GFI > 0.90, NFI> 0.90, AGFI > 0.90 and significant x^2 to indicate the evidence of unidimensionality. The items loading should be > 0.50 to show that more than half of the variance is captured by the latent construct Hair (2006)
Discriminant Validity	Confirmatory factor analysis used in covariance-based structural equation modeling only	Comparing the x^2 of the initial model with the revised model where the constructs in question

		are used as a construct. Hence, if the x^2 is significantly smaller in the original model that is the evidence of discriminant validity (Segars, 1997).
Convergent and Discriminant Validity	The principle component analysis and partial least square can be used to assess factors analysis, but it will not be as rigorous as confirmatory factor analysis in SEM with or without examining unidimensionality if the variables	The construct average variance extracted of each variable should be higher than its correlations in term of the construct. Also, each of the items should be higher on the assigned construct than on the other construct in the conceptual framework (Heller et al., 2015; Ramamurthy, Sen, & Sinha, 2008)
Construct Reliability		
Internal Consistency	This is measured with Cronbach Alpha	The reliability is measured with Cronbach alpha with a minimum threshold of 0.60 using exploratory factor analysis and 0.70 using confirmatory analysis (Nunnally, 1978).
	Structural Equation Modeling (SEM)	This is used to check the internal consistency coefficient is expected to greater than 0.70 (Hair et al., 2006).
Unidimensionality Reliability	The technique is based on the covariance in the Structural equation modeling only	The model comparison is better used in because is of important when we are talking of unidimensionality with significant value lower than the x^2 in the initial model before comparing with the revised model (Segars, 1997).

4. Data Analysis

With regard to the research objective of this paper which is to examine the determinants of an online tax system model using a confirmatory factor analysis onto the income taxpayers,' the confirmatory factor analysis is conducted. The first stage was to validate the measurement model prior to the modeling of the full flesh structural model. This paper has five construct dimension which is the intention to adopt (5 items), Information security (4 items), Compatibility (4), Government support (3) and Complexity (3). The evidence of good measurement model should have all the items loading greater than 0.50 (Hair et al., 2006) Table 3 shows the details of the items used for each of the variables.

Table 3 number of items on each variable

Construct	Number of items before remove	Number of Items after remove
Intention to adopt	7	5
Information Security	6	4
Compatibility	5	4
Government Support	5	3
Complexity	4	3
Total number of Items	27	19

Despite the procedure of unidimensionality, the model estimation, model evaluation, the model modification was applied to obtain the actual result from the analysis. On the basis of the unidimensionality measure mentioned above, the model evaluation is considered as the goodness-of-fit indices which was obtained based on

the Root Mean Square Approximation, the baseline comparison of (CFI, TLI and IFI) and the Chi-square divided by the degree of freedom (CMIN/Df). The full details are presented in Table 4.

Table 4 fitness before constraints

Variables	Chi-square	RMSEA	CFI	IFI	TLI
Types of fits	Parsimonious fits	Absolute fits	Incremental fits		
Intention to adopt	7.730	0.194	0.930	0.932	0.877
Information security	5.763	0.115	0.891	0.892	0.867
Compatibility	6.021	0.163	0.944	0.945	0.835
Complexity	10.75	0.184	0.912	0.913	0.849
Government support	8.433	0.142	0.972	0.972	0.868

The initial analysis result does not meet the requirement of a good fit model for the parsimonious fit all the fit indices are ≥ 5 given the evidence that the requirement is not achieved. The non-fit of indices in the initial analysis is as a result of multicollinearity issue when the model variables are run unilaterally. Based on the assumption of statistics the variables must be independent and not correlated with each other. The item with the lowest factor loading are removed and the model was re-specify to achieve a better model fit. The evidence of the data not fit with the model we employ the model modification to reduce the level of multicollinearity issues among the items. Thus, the model modification is important in this paper to ascertain the best fitting model. Table 5 gives the details of the result after the modification.

Table 5 fitness after constraints

Variables	Chi-square	RMSEA	CFI	IFI	TLI
Types of fits	Parsimonious fits	Absolute fits	Incremental fits		
Intention to adopt	2.109	0.051	0.978	0.978	0.970
Information security	1.133	0.054	0.982	0.982	0.955
Compatibility	1.061	0.025	0.955	0.955	0.967
Complexity	2.213	0.031	0.967	0.967	0.984
Government support	2.542	0.043	0.984	0.984	0.999
Intention to adopt	1.112	0.077	0.988	0.981	0.982

With regard to the table 6 below, all the variable shows that the correlation measure are ≥ 0.85. Thus, the evidence of discriminant validity is achieved and all these variables can be analyzed in the structural equation modeling for further analysis. According to Fornell and Larcker (1981) if the correlation between exogenous variables is higher than 0.85, the researcher can conclude that the discriminant validity is not achieved or not accepted. The correlation value ranged from 0.399 to 0.750 respectively. It is hence concluded that the variable shows a satisfactory result of discriminant validity to proceed for further analysis

Table 6: Correlation Result

	Estimate
INTA <--> COMP	.658
COMP <--> GOVS	.740
ISEC <--> COMP	.617
COPX <--> COMP	.399
COPX <--> INTA	.646
INTA <--> GOVS	.750
ISEC <--> GOVS	.729
INTA <--> ISEC	.661
COPX <--> ISEC	.467
COPX <--> GOVS	.683

The revised model has shown a good-of-fit indices after the removal of loading that are ≤ 0.50 and the constraint of the items that represent the model modification. Therefore, the construct validity was employed to validate the measurement model that consists of Average Variance Extracted (AVE) and the bivariate correlation (CR). If the bivariate correlation is ≥ 0.85 among the exogenous variables, the researcher should choose either one to remove from the subsequent analysis. This is because it is indicated that a highly bivariate correlation is having the same contribution among the same variable in a construct.

4.1. Convergent Validity

Accordingly, the convergent validity of the measurement model proposed three procedures to assess the convergent validity, which is the traditional method (Cronbach Alpha), Composite Reliability (CR) and Average variance extracted (AVE). According to Heller et al. (2015) the traditional method with the use of Cronbach alpha is with the minimum threshold of 0.70. This is also applied with the use of the Composite reliability with a threshold value of 0.70. While the average variance extracted is set to the minimum threshold of 0.50

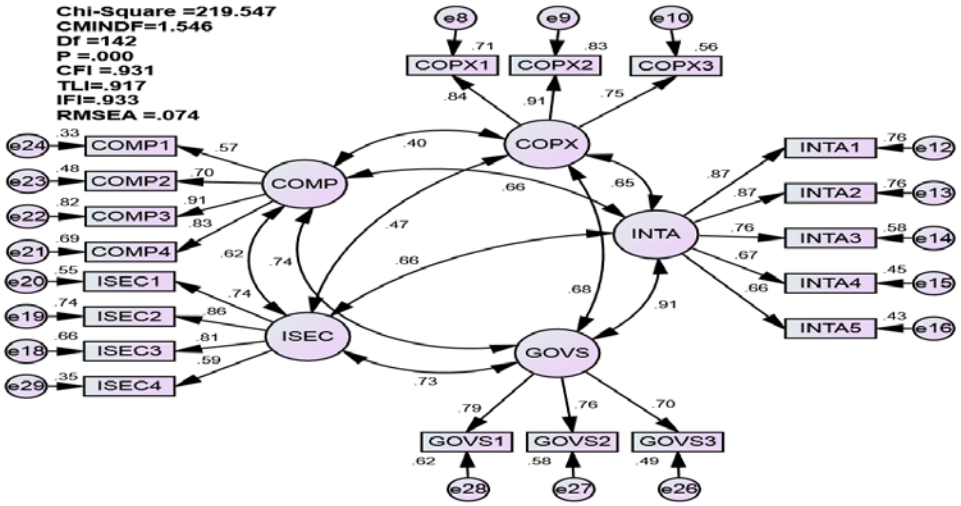
Composite reliability for all the variables in the model were above 0.80. The average variance extracted based on the result were all higher than the minimum threshold of 0.05 (Byrne, 2012, 2013). The evaluation of convergent validity was by examining the items loading and the squared multiple correlations from the measurement model. It shows that all the items loading is greater than 0.60 given the evidence of convergent validity as details in Table 7. Thus, all the variables in the measurement model had satisfactory reliability value and evidence of convergent validity.

Table 7: Convergent Validity

Construct	Items loadings	Factor loading	Cronbach Alpha	CR	AVE
	INTA	.873			
	INTA	.873			
Intention to adopt	INTA	.759	0.881	0.880	0.598
	INTA	.673			
	INTA	.659			
	ISEC	.810			
Information security	ISEC	.859	0.830	0.841	0.574
	ISEC	.745			
	ISEC	.688			
	COMP	.833			
Compatibility	COMP	.907	.831	0.845	0.583
	COMP	.696			
	COMP	.675			
	COPX	.840			
Complexity	COPX	.910	0.863	0.873	0.697
	COPX	.746			
	GOVS	.697			
Government support	GOVS	.763	0.789	0.883	0.662
	GOVS	.786			

The figure 2 below shows the structural model after evaluating the goodness of fit with a value of the correlation. This step is important to develop the discriminant validity for latent exogenous and endogenous variables. Hence, the constraint or double-headed arrow is required to examine the strength correlation between these constructs. Further analysis in the measurement model shows the df = 142, Chi-square value = 219.547 given the normed chi-square value to CMIN/DF = 1.546, P-value =0. 000, CFI= 0.931, IFI =0. 933, TLI = 0.9I7, and RMSEA = 0.074 which met all the requirements that the variables met the variance of observation in the study to proceed for the structural model for future study.

Figure 1: Construct Validity



4.1. Discriminant Validity

The discriminant validity is to measure and share the variance that exist between the variables and the average variance extracted from each of the individual variables. According to Fornell and Larcker (1981), discriminant validity is presented when the variance shared variables of a construct with another construct is less than the variance that the construct shares with it items. The analysis reveals that the shared variance among the variables were lower than the variance extracted for each of the variables. This gives the evidence of discriminant validity which is detailed in table 8. In conclusion, the analysis using confirmatory factor analysis for the measurement model demonstrated adequate reliability convergent and discriminant validity to proceed for the hypothesized structural model.

Table 8: Discriminant Validity

	COPX	INTA	COMP	GOVS	ISEC
COPX	0.835				
INTA	0.446	0.843			
COMP	0.399	0.658	0.763		
GOVS	0.483	0.605	0.740	0.849	
ISEC	0.467	0.661	0.617	0.729	0.757

5. Discussion and Conclusion

Using the determinant of the online tax system in the measurement model, the result revalued that the validity and reliability value by applying measurement model as a procedure is achieved through the confirmatory factor analysis. The confirmatory factor analysis is an important method of analysis when a researcher is trying to examine whether a particular item is measuring what is been required to measure. Hence, the reliability and validity applied in this study is to address the issue of multicollinearity and to improve the fitness of the specified model. In conclusion, a better model is said to depend on the goodness-0f-fit indices of the measurement model. Thus the requirement for the unidimensionality, validity and reliability needs to be addressed prior to the use of the full structural model.

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