

Reengineering Tax Service Quality Using a Second Order Confirmatory Factor Analysis for Self-Employed Taxpayers

Siti Normala bt Sheikh Obid and Bojuwon Mustapha

Abstract—Reengineering tax service quality using second order confirmatory factor analysis, namely, responsiveness, reliability, informativeness, assurance and usability is viewed as an enabler of tax administration effectiveness in collecting government revenues. This paper examined the psychometric properties of tax service quality items for tax administration effectiveness on the self-employed taxpayers. A total of 181 received and usable data was collected and analyzed. The findings shows the goodness fit indices are adequate with the model fit indices showing the chi-square value of 215.334, DF =146, p -value = 0.000, normed chi-square (CMIN/DF) =1.475, CFI =0.967 and RMSEA = 0.051. In other words, the findings show that the factors help the tax administrator for providing effective tax system.

Index Terms—Tax service quality, second-order CFA factor, Bayesian and self-employed taxpayers.

I. INTRODUCTION

Due to the success of the pilot study in the United States, most of the developed and developing nations have adopted the use of online tax system for tax administration effectiveness. This includes United Kingdom, Canada, Taiwan, Australia, Malaysia, Singapore, Kenya, Thailand and South Africa among other countries [1]. Also the implementation was as a result of the benefit time saving, convenience and cost reduction for both tax compliance and tax administration [2].

However, tax service quality is the overall evaluation of the quality of service being provided by the tax authority with the use of information technology [3]. Parasuraman [4] defines service quality as the scope to which information is conveyed in line with the taxpayer's expectation. Tax service quality can also be interpreted as the use of resources by the tax administration sector to achieve the best output of the tax system. In addition, [5] added that the general factors contributing to the tax service quality level that involved the availabilities of service and infrastructure facilities.

The five-factor solutions of tax service quality are more towards evaluating the factors toward effective tax system. Hence, this paper examines the psychometric properties of tax service quality items for tax administration effectiveness on

the self-employed taxpayers. (However, most significant critics of the Servqual model (SM) developed by V.A. Zeithamal *et al.* [6] was criticized based on the number of variable/dimension with their substantial stability when used in different context).

Thus it was suggested that the items of Servqual model is a second order factors with multidimensional first order variables [7], [8]. The advantage of employing a second order CFA is numerous [9]. Given that its results are more parsimonious with the use of smaller parameter to test the hypotheses. Hence, a higher order factor represents the pattern of the association that exists among the first order [10]. Also, compound dimension structures are simply interpretable with the use of a second order measurement model [11]. The psychometric properties includes reliability, convergent, and discriminant validity on the usage of online tax system for tax administration effectiveness in Nigeria.

II. LITERATURE

Initially, tax service quality is considered as a limited paradigm that is challenging to understand [12]. The development of the SM was based on the integration of theoretical and empirical study result that considered tax service quality as a multidimensional construct. This construct used in the above study consists of five dimensional variables, namely, tangibles, reliability, responsiveness, assurance and empathy. Since then the application of SM in the research had gained momentum to measure the service quality in the area of education and legal profession [13], [14]. Without any geographical challenges, the use of online tax system has been viewed as an advantage in the filing of tax return through the emergence and availability of information technology [15]-[17].

The adoption of online tax system by taxpayers is increasing because it is convenience, cost effective and time saving [18]-[20]. Accordingly, the use of online tax system as a new information technology is to achieve an effective tax admiration system. Chang *et al.* [21] found that the effective use of online tax system are related to the tax service quality provided by the tax authority which also have effect on the cost reduction from the taxpayers and tax authority.

Despite the benefits of online tax system the taxpayers still faces some challenges with the service provided. The use of Servqual items was explored and concluded to be problematic by [22]. The use of Servqual model for the tax service quality in this paper are composed of a five-factor solution construct to include responsiveness, reliability,

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Siti Normala Bt Sheikh Obid is with the Department of Accounting faculty Economic and Management Science, International Islamic University Malaysia (e-mail: drcnormala@yahoo.com).

Bojuwon Mustapha is with the Faculty of Economic and Management Science, International Islamic University Malaysia, P.O Box 10, 50728 Kuala Lumpur, Malaysia (e-mail: bojuwon@live.com).

informativeness, assurance and usability from the perspective of the self-employed taxpayers crucial outcome of the analysis to evaluate the usage of online tax system to the measure of tax administration system.

The items used in this paper are scale to the tax service quality in the context on online tax system with the tax administration sector in Nigeria. The items were measured with the expectation of the self-employed taxpayers to the tax authority to evaluate the quality of the service provided. The evaluation of the items was adapt and modified to the tax service quality context [23]. Santos [3] described service quality as perception of users in the evaluation of a system based on their experience in it uses for a particular period of time. Recently, Pantouvakis *et al.* [23] proposed the scale of five key variables such as tangible, reliability, assurance, responsiveness and empathy in the context of online book trade. Furthermore, the empirically tested Serviquial model by Parasuraman [4] and Zeithamal *et al.* [24] examined the multidimensional items scale with fundamental service quality aspect of five dimension which is applied and used in this paper.

In addition, Ulrike Bauernfeind *et al.* [25] examines the extent of tax service quality measurement using structural equation modeling to find the existing relationship between efficiency, information quality, security and usability. The result indicates that responsiveness is the most influencing factors in the process of online tax system. Based on this study there are still areas of loopholes in the tax service quality system where the conceptual model needs to be improved. Santos [3] conducted an exploratory study to understand the determinant of tax service quality in United Kingdom school of business which consist of six to ten members focus group. The finding shows that reliability has the highest influence on the determinant of the tax service quality.

The hypothesized model of tax service quality to the items in the administered items are explained with the five factors i.e. responsiveness, reliability, informativeness, assurance and usability. According to Hair *et al.* [26] the CFA is a direct strategy that researcher postulates in a particular model that poised a set of relationships among variables with the application of structural equation modeling (SEM) to evaluate the adequacy of the conceptual model. Furthermore, for the support of either the model fit the data nor the data fit the model, was based on the initial model through the application of the model comparisons with the Bayesian analysis in the finding section of this paper.

Furthermore, Santos [3] investigates the variables that may serve as a deterrent on tax service quality. The discussion above is in line with the study by Parasuraman [4] who stated reliability as a dimension which has the highest influence on the tax service quality factor. Stiglingh [27] proposed a theoretical framework for the tax service quality to include the tax practitioners in the tax authority setting, using the critical techniques of quantitative approach. Also Zeithamal [24] conceptualize the construct by measuring the service quality delivered through the website. These variables are most applicable to the present study because an increase in the quality of the variable will provide a significant output for the tax administration system. On these notes, the hypotheses

are developed: (1) tax service quality is influenced by five-factor solution. (2) Each of the items of tax service quality has a non-zero loading on the hypothesized factor. The remaining sections of this paper are literature review of tax service quality, method, result, conclusion recommendation and direction for future study. The next section discussed the methodology of this paper.

III. METHODOLOGY

The components factor structure of a 19 items of quality related to the measurement of tax service quality for tax administration effectiveness was examined. The measurement of tax service quality are composed of five subscale variables; responsiveness, reliability, informativeness, assurance and usability. The items comprising subscales were adapted from existing model of Serviquial by Parasuraman [4].

The full set of the items are given a caption for in table 1 of the exploratory analysis to identify the items that loaded under each of the component factors. A seven point likert-scale ranging from 1- strongly disagree to 7- strongly agree was used to achieve the reliability scores on the scale representing tax service quality. Data were collected from self-employed taxpayers that registered with the federal Inland Revenue service board.

Tax service quality is imprecise because it cannot be directly measured. It is only reflected in a theory, which is measured by other latent variables such as responsiveness, reliability, informativeness, assurance and usability in the context of this study. However, for the researcher to measure this variable there is a need to undertake some statistical analysis process. Therefore, the studies quantify tax service quality by applying a statistical analysis on the items. Thus, the tax service quality was measured via the use of the latent variables with the applicability of administered items stating the operational meaning of the variables. The sampling technique is explained in the following section. The items and the data were screened in order to test the second order confirmatory factor analysis techniques in addressing the model hypothesized.

A. Sampling

A random sampling technique was employed on the registered taxpayers with the Federal Inland Revenue Service Board. In general a total number of 500 self-employed taxpayers were administered, said to be a representative from the total population of 1,200 [28]. From 500 questionnaires, 200 were received and the usable one is 181. This account for 59% of the respondent response rate which is considered adequate for the purpose of this paper [29].

During the procedure of data screening for outliers, 19 dataset were removed as a result of Mahalanobis distance values more than the χ^2 value ($\chi^2=40.00$; $n=12$, $p<0.001$) leaving a final 181 dataset to be analyzed. Statistical validity tests and analysis were then conducted such as reliability test and validity tests using second order CFA for construct validity and discriminant validity for multicollinearity treatment, composite reliability, and average variance extracted, testing the fit for the hypothesized CFA model and

the revised model.

B. Instrumentation

The items focused on the five latent variables of tax service quality that revolved around the tax administration effectiveness based on the service provided to incorporate and to internalize them as discussed in the literature review. Every variable consists of several items. Where responsiveness have 4 items, reliability with 3 items, and informativeness with 4 items, assurance 4 items and usability with 4 items, respectively. Hence, these data were keyed in using SPSS version 20.0 for component identification and second order confirmatory factor analysis for the hypothesis testing using AMOS 20.0 version.

IV. DATA ANALYSIS

An exploratory factor analysis (EFA) and second order confirmatory factor analysis (CFA) was used to examine the factor structure of the 19 items through the principle component analysis if the EFA scales. All the 19 items were subjected to EFA which generated five factor structure components and the CFA was used to assess the fit indices of the data to the model whether tax service quality is a factor solution or multidimensional solution. We employed multivariate analysis where the result suggested that the items are not homogeneous (e.g., mean correlation among the a priori scales or average item-total correlation).

A. Assessing Validity and Reliability

In assessing the reliability and validity, Hair *et al.* [26] suggested that the assessment is based on the dependability between the dimensions of the variables used in the analysis. Then the data were run using internal consistency test based on a complete scale used with the reliability value, namely, the Cronbach's alpha and the overall reliability of individual variables values. The result shows that the overall value of the reliability values is higher than the threshold value of 0.70, suggested by Hair *et al.* [26]. The details of the coefficient value are shown in Table I. The result indicate that the Cronbach's alpha coefficient value of all the items administered were acceptable and reliable for the analysis with the overall value of 0.937.

The individual reliability scale value of the items based on component are also analyzed which shows that responsiveness, reliability, in formativeness, assurance and usability, where the reliability scale value of Cronbach' alpha shows 0.854, 0.858, 0.859, 0.854 and 0.877, respectively. We then employed construct validation to test on the effectiveness on the application of maximum likelihood (ML), for the second order of CFA. (The CFA is used to hypotheses the model based on the underpinning theory and model which will be detailed in the next sub section). Table I also exhibits the mean and the standard deviation values of the items which indicate that quality tax service will lead to tax administration effectiveness, and hence increase in revenue generation.

TABLE I: THE INTERNAL CONSISTENCY OF THE CONSTRUCT EXTRACTED FOR TAX SERVICE QUALITY

Observed Variable	Mean	SD	Cronbach Alpha	Std loading	SMC=R ²	AVE	CR
res3	5.36	1.125		.758	.575		
re4	5.24	1.058		.757	.571		
res1	5.19	1.255	0.854	.727	.529	.60	.86
ree2	5.18	1.236		.783	.612		
rel1	5.41	1.059		.819	.671		
rel2	5.39	1.020	0.858	.873	.763	.68	.86
rel3	5.03	1.159		.775	.601		
inf4	5.33	1.100		.762	.581		
inf2	5.45	1.132		.779	.606		
inf3	5.31	1.186	0.859	.805	.647	.60	.86
inf1	5.40	1.153		.764	.584		
ass3	5.56	1.097		.953	.909		
ass4	5.26	1.275		.857	.734		
ass5	5.52	1.009	0.854	.735	.541	.63	.87
ass1	5.61	1.068		.587	.344		
usb1	5.10	1.493		.815	.665		
usb2	5.31	1.217		.870	.758		
usb3	5.39	1.223	0.877	.835	.697	.65	.88
usb4	5.10	1.408		.709	.503		

Note: Res= responsiveness, Rel= reliability, Inf =Informativeness, Ass= Assurance and Usb= Usability

B. Discriminant Validity of the Construct

The average variance (AVE) was carried out in order to test the discriminant validity of the five components. The result suggested that the higher the correlation square supports the discriminant validity [30]. To test whether the component items are interrelated with each other within the

same construct, the composite reliability (CR) is applied.

The finding on AVE for responsiveness, reliability, in formativeness, assurance and usability is 0.60, 0.68, 0.60, 0.63 and 0.65, respectively. While CR for responsiveness, reliability, in formativeness, assurance and usability is 0.86, 0.86, 0.86, 0.87 and 0.88, respectively. The result shows that AVE is above the threshold of 0.50 and CR is above 0.70.

This indicates that the selected component have a good measure with each of the items loading on a specific tax service quality variables. In other words, the factor's loading of each of the variables have a significant loading that indicate a very good and comprehensive model for the tax service quality as suggested by [26] and [31].

V. SECOND ORDER CONFIRMATORY FACTOR ANALYSIS (CFA)

The application of second order confirmatory factor analysis is to test the construct validity of the administered survey items. This indicate how each of the construct component are been explained by the latent variables [26]. Thus, the high correlation of the items with the same construct component is relatively high which shows the evidence of construct validity of the items.

The regression weights based on the factor analysis are correlated and the Square Multiple Correlation (SMC) of the items specified by the construct contributed to the construct validity of the model. Fig. 1 below show the conceptual model with the five component variables and the 19 items used for getting the perception of the respondent on the tax service quality for tax administration effectiveness

A. Initial Model of Tax Service Quality

From the initial model of this paper the CFA results on the hypothesized model shows that there is an inter-correlation and significant regression weight and there is no offending estimate issue on the loading of the items. An offending estimate occur when there is inter-correlation value and regression weight less than 0 and greater than 1 on the inter-correlation of the items.

In addition, CFA result as exemplified as in Table II. It was observed that the factor loading of first component, responsiveness has a loading value range from 0.73 to 0.78. The second component reliability has a loading value ranging from 0.82 to 0.87. The third, in formativeness and the fourth, assurance component shows a loading value of ranging from 0.76 to 0.81 and 0.59 to 0.95. The fifth component, usability has a loading value ranging from 0.71 to .87, respectively. (This regression weight estimates of the observed latent variables are higher than the threshold Of 0.50, as has been suggested [32].

Thus, the regression weight based on each of the component variable are responsiveness with value ranging from 0.50 to.066; reliability with value range from 0.60 to .076; in formativeness with the regression weight value range from0.58 to 0.61; assurance with value ranging from 0.35 to 0.91;and finally, usability regression weight value range between0.51 to 0.76. The above regression weight value are acceptable due to higher threshold then suggested by [31], which is 0.20. Thus, the high correlation of the items with the same construct component is relatively high which shows the evidence of construct validity of the items.

The items that best explained component is the one with the highest loading on the same component which is res <--> ifs .801. More so, the correlation coefficient among the five variables are acceptable with group number and the default model of res1 <-- res= .727, res2 <-- res = 783, res3<-- res =

759, res4 <-- res = 756, rel1 <-- rel = 819, rel2 <--rel =874, rel3 <--rel =.775, ass1 <--ass =.587, ass2 <-- ass = .735, ass3 <-- ass =.953, ass4<--ass =.857, inf1 <-- inf=.763, inf2 <--ass =.779. inf3 <-- inf = .805, inf4 <--inf = .763, usb1 <-- usb =.835, usb2 <--usb = .899, usb3 <--usb =.795 and usb4 <--usb=.659 respectively. The next section explained the discriminant validity of the model based on the data.

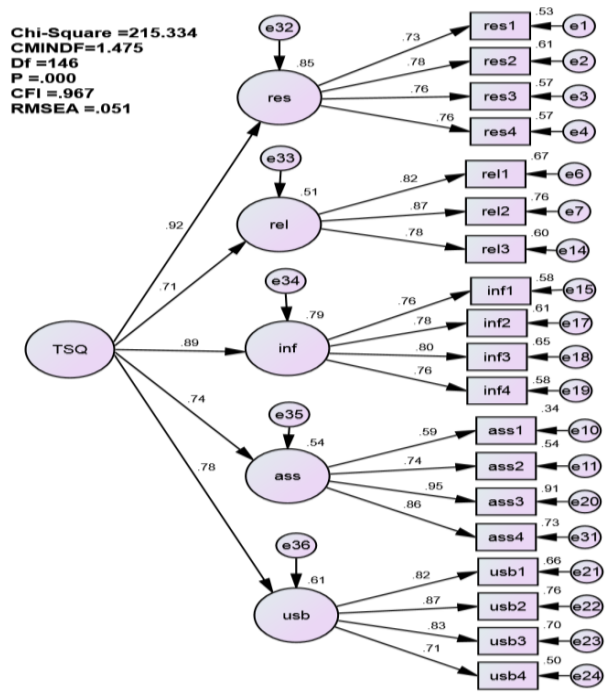


Fig. 1. Five-factor variable of second order CFA model for tax service quality.

B. Comparison of Bayesian and Confirmatory Factor Analysis

The maximum likelihood estimation (ML) of Likert scale items have significant effects on the use of non-normally distributed data with categories of variables less than 4 responses and a sample size less than 200, i.e. small sample size [33]. This paper is found to be under this type of issue, where the total number of cases is 181 which is less than 200 minimum cases, as suggested by Byrne (2009).

TABLE II: BAYESIAN CONFIRMATORY FACTOR ANALYSIS (CFA)

Construct items	ML	Bayesian
res2 <-- res	1.017	1.004
res3 <-- res	1.278	1.265
res4 <-- res	1.259	1.247
inf2 <-- ifs	1.049	1.051
ass2 <-- ass	1.453	1.449
inf3 <-- ifs	1.137	1.136
usb2 <-- usb	.874	0.870
usb3 <-- usb	.840	0.835
usb4 <-- usb	.824	0.822
ass3 <-- ass	1.491	1.480
rel2 <-- rel	1.023	1.015
rel3 <-- rel	1.034	1.026
inf4 <-- ifs	1.048	1.049
ass4 <-- ass	1.417	1.414

Thus, Arbuckle [34] suggested to use Bayesian estimation (BE) for the re-affirming the earlier CFA conducted in the

data analysis. (Bayesian analysis was further analyzed for the appraisal of unstandardized loading regression weights). Hence, the finding shows that little differences observed between the loading value between ML estimation of CFA and the Bayesian estimation analysis. This application justify that the CFA with the application of ML estimation is acceptable with the value of the re-specified model by the comparative analysis, detailed as in Table II.

VI. DISCUSSION AND CONCLUSION

The initial specification of the model as indicated in Fig. 2 shows five-factor variables of Second order CFA model of tax service quality. The figure shows the conceptual model with the five component variables and the 19 items used to attain the perception of the respondent on the tax service quality for tax administration effectiveness. The CFA results on the hypothesized model shows that there is an inter-correlation and significant regression weight and there is no offending estimate issue on the loading of the items.

Based on the same model the standard multiple correlations for the responsiveness in this case are endogenous. The first variable is estimated since tax service quality cannot be directly measure. The result shows that responsiveness explains 0.86 percent of variance while 0.14 percent of the variance is unexplained. The standard regression weights for the itemized variable which are also called the factor loading indicates that when item is 1 (res 1) (res2), (res3) and (res 4), the standard deviation of responsiveness goes up to .73, .78, .76 and .76, respectively.

The second result is the reliability constructs which explain 61 percent variance and 39 percent of the variance is unexplained. The standard regression weights for the itemized variable indicate that when the item 1 (rel. 1) (rel. 2) and (rel. 3) goes up by one, the standard deviation of reliability will go up by .81, .87 and .78, respectively. Also for the third variable, informativeness construct explain 79 percent variance and 21 percent is unexplained. The standard regression weights for the itemized variable indicates that when item 1 (inf 1) (inf 2), (inf 3) and (inf 4) goes up by one then the standard deviation of reliability go up by .76, .78, .80 and .76, respectively.

The fourth variable, assurance, 64 percent of variance was explained and 36 percent is unexplained. The standard regression weights for the itemized variable indicates that when item 1 (ass 1) (ass 2), (ass 3) and (ass 4) goes up by one, the standard deviation of reliability goes up by .59, .74, .95 and .86, respectively. Finally 0.61 percent of the construct was explained by usability and 39 percent is unexplained The standardized regression weights for the itemized variable indicates that when item 1 (usb 1) (usb 2), (usb 3) and (usb 4), the standard deviation of reliability will go up by .82, .87, .83 and .71, respectively.

The result of the second order confirmatory factor analysis support the adequacy of the hypothesed model with chi-square value of $X^2 = 215.334$, $DF = 146$, the p-value = 0.000, Normed chi-square $CMINDF = 1.475$, $CFI = 0.967$, and $RMSEA = 0.051$. However, all the fit indices items meet up the threshold requirement since the value are higher than the suggested threshold value. To conclude, the result

indicates that the five factor solution of tax service quality model fit the data and there were no significant difference between data and the model taking the measure consideration of modification indices and the rule of thumbs in the confirmatory factors analysis techniques.

There is also evidence of convergent, divergent and discriminant validity for the five factor solution of tax service quality as the value of the item ranges from .71 to .95. Based on the above explanation, the goodness of fit index findings recommends that the model did not generate any offending estimate of the covariance matrix.

Basically the five factor solution of tax service quality fit the measure of tax administration effectiveness using second order confirmatory factor analysis for the model. For the items of tax service quality that has a non-zero loading the result indicates all the items are statistically significant with value higher than 0.5 as shown in table 2.0. The loading are significant with responsiveness .902, reliability .717, informativeness .891, assurance .741 and usability .727. The significant loading show that when tax service quality goes up by one, standard deviation each of the variable will goes up by the significant loading indicated above.

Furthermore, the RMSEA shows significant divergences amongst the direct covariance and the indirect matrices by supporting the degree of good fitness of the data. One of the main aim of this paper is to examine and validate the value for tax service quality TSQ framework as suggested by Parasuraman (2005) where the TSQ quality is an important variable in measuring the effectiveness of tax administration system.

It is believe that the findings are significant and relevant to tax authority and practitioners such as tax management to embrace the quality tax service (FIRS) it will led to increase in revenue generation from self-employed taxpayers. In addition the techniques used to evaluate the tax service quality is proven to be psychometrically sound against the five factor solution, namely, responsiveness, reliability, informativeness, assurance and usability. The findings show that the tax service quality model is an important determinant for measuring tax administration effectiveness that provide an empowering relevant to the tax administration system especially at the federal Inland Revenue Service Board Nigeria.

The results could not be generalized because the studies only focus onto a specific group of taxpayer, self-employed taxpayers. Hence, for future research the study should take into consideration of other types of taxpayers such as corporate taxpayers and individual taxpayer's. To comprehend the present result, future study could apply other techniques of analysis such as MPLUS and LISREL.

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Siti Normala Sheikh Obid is an associate professor at the Department of Accounting, Kulliyah Economic and Management Sciences, International Islamic University Malaysia. She obtained her MBA degree in decision support system in USA, PhD degree in economic (taxation) in UK. Her research interest includes taxation, Islamic finance and banking, micro finance, auditing, accounting, zakat and corporate governance.



M. Bojuwon is currently pursuing his PhD degree in accounting at International Islamic University Malaysia. He obtained master of science degree in International Accounting from University Utara Malaysia and bachelor degree in accounting from Kogi State University Anyigba Nigeria, a Respectively. His current research focuses on the perception of self-employed taxpayers on the usage on online tax system. Other areas of his interest include taxation, accounting information system and application of statistical software (AMOS, EQS, LISREL MPLUS and PLS) in running quantitative research.