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Influence of Service Quality, Corporate Image and Perceived Value on Customer Behavioral Responses: *CFA and Measurement Model*

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Abstract:
The paper aims at validating the instrument of the study by conducting Confirmatory Factor Analysis (CFA) and the measurement model and also the overall goodness of model fit indices. Similarly, the measurement model of both the combined exogenous and endogenous variables was performed in order to assess the psychometric properties of the measures in the study. Structural Equation Modeling with AMOS software was employed in the analysis. It was found that the measurement model fitted the data after checking modification indices and deleting items that have weak loadings and/or high correlation errors. It was therefore, concluded that the model fit the empirical data and is set for conducting construct validity and subsequently structural model.

Key words: Confirmatory Factor Analysis, Measurement Model, Consumer behavior, Nigeria

1. INTRODUCTION

Confirmatory Factor Analysis (CFA) or measurement model is the first step of conducting analysis using Structural Equation Modeling technique. CFA is similar to Exploratory Factor Analysis (EFA) but they are different altogether. In summary, CFA basically deals with the assessment of the relationship between construct and its indicators. While the structural model on the other hand is concerned with the relationships among the latent constructs. In CFA an attempt is made to validate the scale being adapted or adopted because it is important that the measurement of each variable is psychometrically sound (Byrne, 2010). Even with established scale, there is still need to confirm the validity and unidimensionality in a particular context of study (Hair at al., 2010). According to Byrne (2010), CFA is employed in assessing the validity of the indicator variables. Once this is confirmed, there would be much confidence on the findings derived from the structural model. Hence, issues related to the number of indicators and the type of construct specification should be addressed at the stage otherwise it could affect the entire analysis. In this paper, measurement model of all the constructs involved in the study and also the construct validity and reliability are reported. The fact that Cronbach Alfa reliability analysis does not take care the problem of measurement error, thus it is suggested that construct validity be examined before the assessment of the structural model (Anderson &

Gerbings, 1988). According to Hair et al. (2010) measurement model validity depends on establishing acceptable level of Goodness-of-fit for the measurement model and secondly on specific evidence of construct validity.

The fact that CFA is a confirmatory technique and should be driven by theory, thus, in the analysis of the relationships between observed and unobserved variables theoretical consideration is the keyword. In the analysis the aim is minimized the differences between the observed and the estimated matrices. In SEM, parameter estimation examines the interrelations between observed variables with latent constructs and the interrelationships between latent constructs (Hair et al. 2010). Maximum Likelihood (ML) estimation method is adopted in this study as all the requirements of the method have been met. It is a procedure that iteratively improves parameter estimates to minimize a specified fit function. This estimation technique important assumptions which requires adequate sample size of more than one hundred observations, normally distributed data, and continuous scale on the observed variables (Hair et al. 2010; Byrne, 2010).

The most commonly reported measures are: X^2 likelihood ratio test, Standardized Root Mean Residual (SRMR), Goodness of Fit Index (GFI), Comparative Fit Index (CFI) and Incremental Fit Index (IFI) (Bentler, 1988; Bollen, 1990). Due to the large number of GOF indices which makes it difficult to either report all or to select among them. Reporting all the indices results in redundancy of many and thus, it is recommended that four indices of different category provide adequate evidence of model fit (Hair at al. 2010). Accordingly, the researcher should report at least one incremental and one absolute index, in addition to X^2 value and degrees of freedom. Therefore, in this analysis, a mix of Chi-square (X^2) values, Degrees of Freedom (DF), Normed Chi-square (X^2/df), Probability value (p), Comparative Fit Index (CFI), Normed Fit Index (NFI) and Root Mean Square Error of Approximation (RMSEA) were used.

2. METHODOLOGY

Structural Equation Modeling technique of analysis was used. Specifically, Analysis of Moment Structure (AMOS) software was employed in the analyzing the data that was gathered from the customers of retail bank in Nigeria. Using cluster random sampling procedure, 800 copies of questionnaires were distributed. Eventually, after collation and data screening 555 questionnaires were used for the Confirmatory Factor Analysis/measurement model.

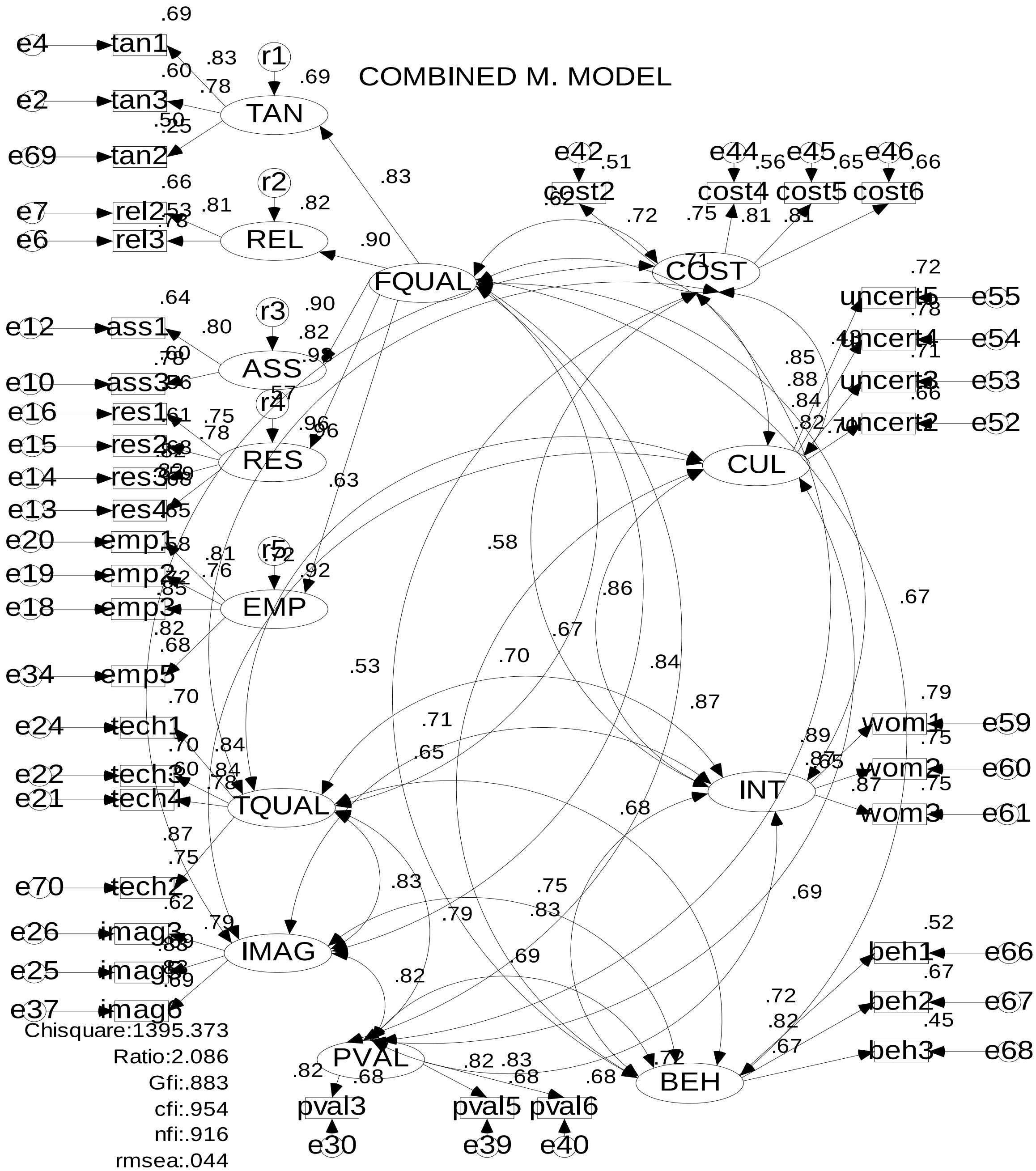
3. RESULTS AND DISCUSSION

In this section, results of the analysis are presented based on the aforementioned method. Similarly, the results were discussed.

Measurement Model

An attempt is hereby made to examine the measurement model of the combine variables. The assessment of the combined measurement model is considered important because the result derived will be used in determining construct reliability/validity specifically in the computation of Average Variance Extracted (AVE) and Composite Reliability in the following section. Similarly, the items confirmed and retained in the combined measurement model are the ones to be used subsequently in the structural model. The analysis of psychometric properties of the construct was guided by the theory, modification indices (MI) and factors loadings. Hence, any indicator that has high covariance in the modification indices, or very weak factor loadings of > 0.5 was carefully deleted.

Figure 1: Measurement Model



Based on the foregoing, out of the 70 observed variables 31 were removed and therefore, 39 were retained for further analysis. After modifying the model, all the values goodness of fit indices was achieved. For instance both CFI and NFI are 0.954 and 0.916, while the CMIN and RMSEA are 2.086 and 0.044 respectively (see figure 1). It clear from table 1 below that all the standardised factor loadings of the remaining items are above 0.5 and all the t-values for the items are significant at p < 0.001. For details of model fit values see appendix.

Table 1: Factor loadings, t-value and p-value of the remaining items

Variables	*Dimensions*	*Remaining Items*	*Standardised Regression Weights* (β)	*Standard Error*	*Critical Ratio (t-value)*	*P-value*
Functional quality	Tangibility	tan1	.831	.002	9.463	.000
		tan2	.502	.004	15.593	.000
		tan3	.777	.003	11.845	.000
	Reliability	rel2	.814	.003	10.259	.000
		rel3	.731	.003	13.311	.000
	Assurance	ass1	.800	.003	11.314	.000
		ass3	.778	.003	12.195	.000
	Responsiveness	res1	.746	.002	15.138	.000
		res2	.780	.002	14.675	.000
		res3	.822	.002	14.117	.000
		res4	.822	.002	14.103	.000
	Empathy	emp1	.808	.002	14.143	.000
		emp2	.760	.002	14.921	.000
		emp3	.850	.002	13.129	.000
		emp5	.824	.002	13.918	.000
Technical quality		tech1	.839	.002	13.270	.000
		tech2	.869	.002	12.213	.000
		tech3	.837	.002	13.299	.000
		tech4	.776	.002	14.503	.000
Corporate Image		imag3	.788	.002	13.473	.000
		imag5	.829	.002	12.284	.000
		imag6	.831	.002	12.507	.000
Perceived Value		pval3	.824	.002	12.777	.000
		pval5	.822	.002	12.778	.000
		pval6	.826	.002	12.700	.000
Switching Cost		cost2	.716	.003	14.040	.000
		cost4	.749	.003	13.407	.000
		cost5	.805	.002	11.978	.000
		cost6	.814	.002	11.614	.000

Culture	uncert2	.815	.002	13.753	.000
	uncert3	.840	.002	13.107	.000
	uncert4	.881	.002	11.578	.000
	uncert5	.851	.002	12.798	.000
Behavioural	wom1	.889	.001	11.151	.000
Intention	wom2	.868	.002	12.159	.000
	wom3	.867	.002	12.262	.000
Actual	beh1	.719	.003	13.580	.000
behaviour	beh2	.818	.002	10.571	.000
	beh3	.672	.003	14.234	.000
GOF INDICES:		VALUES:			
CMIN (X^2)		1395.373			
DF		669			
RATIO		2.086			
P. VALUE		.000			
NFI		.916			
CFI		.954			
RMSEA		.044			

Similarly, it is clear from table 1 that the inter-correlations among the variables were found to be within the acceptable range because none is more 0.9. Therefore, this is an indication of the absence of multicolinearity problems among the constructs under investigation. Multicolinearity is a problem that occurs when the exogenous variables are highly correlated to as high as 0.9 and above (Tabachnich & Fidell, 2007). When two or more variables are highly correlated it means that they contain redundant information and therefore, not all of them are needed in the same analysis.

Table 1: Correlations of Constructs in the Measurement Model

Constructs			*Estimate*
TQUAL	<-->	FQUAL	.859
IMAG	<-->	FQUAL	.841
PVAL	<-->	FQUAL	.866
FQUAL	<-->	BEH	.673
FQUAL	<-->	INT	.703
FQUAL	<-->	CUL	.714
FQUAL	<--	COST	.622

	>		
TQUAL	<-->	IMAG	.829
TQUAL	<-->	PVAL	.789
TQUAL	<-->	BEH	.684
TQUAL	<-->	INT	.705
TQUAL	<-->	CUL	.633
TQUAL	<-->	COST	.569
IMAG	<-->	PVAL	.819
IMAG	<-->	BEH	.750
IMAG	<-->	INT	.707
IMAG	<-->	CUL	.723
PVAL	<-->	BEH	.691
PVAL	<-->	INT	.724
PVAL	<-->	CUL	.695
PVAL	<-->	COST	.653
INT	<-->	BEH	.829
CUL	<-->	BEH	.652
COST	<-->	BEH	.527
CUL	<-->	INT	.673
COST	<-->	INT	.584
COST	<-->	CUL	.434
IMAG	<-->	COST	.594

4. CONCLUSION

Based on the analysis it could be concluded that the data reasonably fit the model with acceptable goodness of fit (GOF) indices. With this therefore, the data is ready for construct validity and ultimately for conducting Structural Modeling. Although, a number of items were removed from the analysis in an attempt to fit the model, the items affected were not significantly contributing in measuring their respective constructs.

Reference

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APPENDIX

1. Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	111	1395.373	669	.000	2.086
Saturated model	780	.000	0		
Independence model	39	16559.918	741	.000	22.348

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.003	.883	.864	.758
Saturated model	.000	1.000		
Independence model	.037	.104	.057	.099

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.916	.907	.954	.949	.954
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI

Model	PRATIO	PNFI	PCFI
Default model	.903	.827	.861
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	726.373	623.062	837.425
Saturated model	.000	.000	.000
Independence model	15818.918	15403.538	16240.674

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	2.519	1.311	1.125	1.512
Saturated model	.000	.000	.000	.000
Independence model	29.892	28.554	27.804	29.315

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.044	.041	.048	.998
Independence model	.196	.194	.199	.000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	1617.373	1634.649	2096.778	2207.778
Saturated model	1560.000	1681.401	4928.795	5708.795
Independence model	16637.918	16643.988	16806.358	16845.358

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	2.919	2.733	3.120	2.951
Saturated model	2.816	2.816	2.816	3.035
Independence model	30.032	29.283	30.794	30.043

HOELTER

Model	HOELTER .05	HOELTER .01
Default model	290	301
Independence model	27	28

2. ESTIMATES

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
TAN	<---	FQUAL	1.000				
REL	<---	FQUAL	1.178	.078	15.051	***	par_16
ASS	<---	FQUAL	1.104	.077	14.372	***	par_17
RES	<---	FQUAL	1.263	.079	15.895	***	par_18
EMP	<---	FQUAL	1.212	.078	15.500	***	par_19
tan3	<---	TAN	1.000				
tan1	<---	TAN	1.040	.058	17.940	***	par_1
rel3	<---	REL	.883	.050	17.606	***	par_2
rel2	<---	REL	1.000				
ass3	<---	ASS	1.000				
ass1	<---	ASS	1.039	.056	18.689	***	par_3
res4	<---	RES	1.000				
res3	<---	RES	1.006	.044	23.046	***	par_4
res2	<---	RES	.958	.045	21.292	***	par_5
res1	<---	RES	.916	.046	19.842	***	par_6
emp3	<---	EMP	1.063	.045	23.510	***	par_7
emp2	<---	EMP	.938	.047	19.880	***	par_8
emp1	<---	EMP	1.000				
tech4	<---	TQUAL	1.000				
tech3	<---	TQUAL	1.074	.051	21.262	***	par_9
tech1	<---	TQUAL	1.037	.049	21.246	***	par_10
imag5	<---	IMAG	1.000				
imag3	<---	IMAG	.960	.045	21.207	***	par_11
pval3	<---	PVAL	.995	.045	22.104	***	par_12
emp5	<---	EMP	1.030	.046	22.413	***	par_13
imag6	<---	IMAG	1.032	.046	22.611	***	par_14
pval5	<---	PVAL	.969	.044	22.158	***	par_15
pval6	<---	PVAL	1.000				
cost2	<---	COST	.907	.052	17.460	***	par_20
cost4	<---	COST	.932	.052	18.076	***	par_21
cost5	<---	COST	1.000	.051	19.746	***	par_22
cost6	<---	COST	1.000				
uncert2	<---	CUL	1.000				
uncert3	<---	CUL	1.022	.044	23.181	***	par_23
uncert4	<---	CUL	1.115	.045	24.586	***	par_24
uncert5	<---	CUL	1.027	.044	23.284	***	par_25

			Estimate	S.E.	C.R.	P	Label
wom1	<---	INT	.996	.035	28.188	***	par_26
wom2	<---	INT	1.002	.037	26.749	***	par_27
wom3	<---	INT	1.000				
beh1	<---	BEH	1.000				
beh2	<---	BEH	1.176	.068	17.396	***	par_28
beh3	<---	BEH	.960	.067	14.261	***	par_29
tan2	<---	TAN	.624	.057	10.963	***	par_57
tech2	<---	TQUAL	1.124	.050	22.288	***	par_58

Covariance: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
TQUAL	<-->	FQUAL	.034	.003	10.770	***	par_30
IMAG	<-->	FQUAL	.036	.003	10.965	***	par_31
PVAL	<-->	FQUAL	.038	.003	11.049	***	par_32
FQUAL	<-->	BEH	.024	.003	9.350	***	par_33
FQUAL	<-->	INT	.032	.003	10.276	***	par_34
FQUAL	<-->	CUL	.029	.003	10.218	***	par_35
FQUAL	<-->	COST	.026	.003	9.435	***	par_36
TQUAL	<-->	IMAG	.043	.004	12.062	***	par_37
TQUAL	<-->	PVAL	.042	.004	11.695	***	par_38
TQUAL	<-->	BEH	.030	.003	10.068	***	par_39
TQUAL	<-->	INT	.039	.003	11.199	***	par_40
TQUAL	<-->	CUL	.032	.003	10.368	***	par_41
TQUAL	<-->	COST	.029	.003	9.461	***	par_42
IMAG	<-->	PVAL	.046	.004	12.225	***	par_43
IMAG	<-->	BEH	.034	.003	10.768	***	par_44
IMAG	<-->	INT	.042	.004	11.527	***	par_45
IMAG	<-->	CUL	.039	.003	11.430	***	par_46
PVAL	<-->	BEH	.032	.003	10.302	***	par_47
PVAL	<-->	INT	.043	.004	11.641	***	par_48
PVAL	<-->	CUL	.038	.003	11.006	***	par_49
PVAL	<-->	COST	.036	.003	10.462	***	par_50
INT	<-->	BEH	.040	.003	11.591	***	par_51
CUL	<-->	BEH	.029	.003	10.026	***	par_52
COST	<-->	BEH	.024	.003	8.466	***	par_53
CUL	<-->	INT	.038	.003	11.220	***	par_54
COST	<-->	INT	.033	.003	9.950	***	par_55

			Estimate	S.E.	C.R.	P	Label
COST	<-->	CUL	.023	.003	7.947	***	par_56
IMAG	<-->	COST	.032	.003	9.841	***	par_59

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
EMP	.916
RES	.957
ASS	.816
REL	.819
TAN	.686
tech2	.755
tan2	.252
beh3	.452
beh2	.669
beh1	.516
wom3	.752
wom2	.754
wom1	.791
uncert5	.725
uncert4	.776
uncert3	.706
uncert2	.664
cost6	.662
cost5	.648
cost4	.560
cost2	.512
pval6	.683
pval5	.676
imag6	.691
emp5	.678
pval3	.679
imag3	.621
imag5	.687
tech1	.704
tech3	.700
tech4	.602
emp1	.653

	Estimate
emp2	.578
emp3	.722
res1	.556
res2	.609
res3	.675
res4	.676
ass1	.640
ass3	.605
rel2	.662
rel3	.535
tan1	.690
tan3	.604