Journal of the Nigerian Association of Mathematical Physics
Volume 64, (April – September, 2022 Issue), **pp111 – 126**

COMPARATIVE ANALYSIS OF CONPRO AND SERVQUAL MODELS

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Abstract

This study is a comparative analysis of a consumer-producer co-assessment service quality model, CONPRO and SERVQUAL model. The study demonstrated the efficacy of CONPRO and SERVQUAL model using some Commercial banks in Nigeria as case study. A field survey was conducted and a total of 1050 questionnaires were administered out of which 834 were selected to even out for the two questionnaires, that is, 278 for SERVQUAL, 278 for the Customers and 278 for the producers. The implementation of the CONPRO E- Service quality model was carried out and analyzed using Confirmatory Factor Analysis. The results of the analysis using model fit metrics provide a good case for recommending the CONPRO model for measuring e-service quality compared to the SERVQUAL model. The coefficients for the highest loading for the instruments from Exploratory Factor Analysis (EFA) were set to 1.0 and the reliability of the CONPRO instrument was high at 0.882, while that of the SERVQUAL instrument was 0.638. The mean Gap Score for the SERVQUAL instrument gave a value of 2.66, whereas the mean Gap Score for the CONPRO instrument gave a value of 2.64 using a weighed ratio of 50:50 for consumer and producer. The reliability of the SERVQUAL instrument was 0.638 while that of the CONPRO instrument 0.882. The fit indices for the CONPRO model were: CFI (0.902), IFI (0.897), NFI (0.921), RMSEA (0.012), PGFI (0.823), PNFI (0.811), AIC (0.201) and ECVI (53.192); which summarily indicated an adequate model for e-service quality measurement. These findings confirm the theoretical position that service quality is a combined construct of both the producer and consumer, which is expected given the generalized nature of service production as captured by the CONPRO instrument.

1. Introduction

Computer Science is the study, design, development and use of computer systems. These systems have revolutionized the service industry, which account for over 70% of the Gross Domestic Product of develop countries. Client fulfillment and quality of service are driving components within the framework of an organization; currently to a great extent decide the organizations competitiveness. Service quality is all about value creation, and capability of the service. The desire to oversee the relationships with customers prompts the way that organizations are beginning to focus on the improvement and execution of service standard.

The area of current market is becoming competitive and challenging than before. With these challenges and request for globalization, organizations are obligated to re-engineer their commodities and structures to remain competitive and improve Quality of service. To add value to Quality of service and still be in competition, there are needs to add value to their service because of the nature of the area of interest. These innovations are made possible by advances in information technology (IT) and man's ability to leverage the activities using information technology (IT) [1,2]. It is this IT driven services (e-service) that is the focus of service science [2] and it has become a multidisciplinary discipline.

The use of computer in services and product delivery gave birth to e-Services. Despite the recognition and significance of e-service quality, it has been widely considered to be useful, but it is not still without issues, in terms of its operations [3]. Different methods have been put up for electronic service quality, even though Quality has been part of service [4; 5]. The focus of this study is on quality of electronic service or the measurement of the services in the banking sector orchestrated by Information

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Technology (IT). Globalization and liberalization brought an increased use of IT (Information Technology), as a result of its future value such as responsiveness, to achieving a good service. Banks have also been known to attract clients to their organization by better improvement to their services to customers [6].
Virtually no empirical attempt has been carried out to evaluate electronic service quality from consumer/producer view point. Thus this study was motivated to carry out a comparative analysis of CONPRO, a consumer/Producer co-assessment model and SERVQUAL, a model for estimating how clients (Consumers) identify electronic service quality [7].

2. Factor Analysis

Principal Component Analysis (PCA) creates factors that are linear combination of the first factors. The new factors have the property that the factors are for the most part symmetrical. The main segments can be utilized to discover cluster in the dataset. PCA is a variance centered methodology which tries to duplicate the aggregate variable variance, in which parts reflect both normal and unique variance of the variable. *Linear Discriminant Analysis (LDA*) is utilized to discover a linear combination of attributes that describes at least two classes of piers or objects. The subsequent combination might be utilized as a linear classifier, or for leverbility reduction before grouping. LDA is generally appropriate for classification or clustering analysis. LDA is similar to analysis of variance (ANOVA) and regression analysis.
Since factor analysis leaves from a correlation matrix, the utilized factors are estimated at (somewhere around) an interim scale. Secondly, the factors ought to generally be regularly dispersed; this makes it conceivable to "sum up the consequences of your investigation past the example gathered. Thirdly, the example size ought to be mulled over, as relationships are not safe, and can subsequently genuinely impact the unwavering quality of the factor analysis. As much has been written about the necessary sample size for factor analysis resulting in many rules-of-thumb. For instance, expresses that an analyst ought to have "no less than 10-15 subjects for every factor. Monte Carlo research has brought about more specific statement concerning sample size. The general conclusion of these investigations was that the most vital factors in deciding reliable factor solutions are the sample size and size of factor loadings: the more regular and higher the loadings are on a factor, the better sample can be. Likewise provided details regarding a later report which presumes that “as communalities become lower, the importance of sample size increases”. When variables have relationship amongst one another, it is conceivable to make a correlation matrix by computing the relationships between each variable. The accompanying (theoretical) matrix offers a case of this.

3. Extraction Methods

There are different types of extraction methods. In *Principal Axes Factor (PAF) Extraction, t*he initial estimate of communality coefficient which can be obtained either from principal components or as a variable regression equation predicting each variable from all other variable (multiple R^2) to provide starting rules when the data move in size, it is likely to converge well. This extraction technique tends to be favoured when multivariable normally is not tenable assumption.
Maximum Likelihood (ML) Extraction is another iterative process, that is being used in logistic repression, confirmatory factor analysis, structural equation modeling it extracts factor and parameter that optimally rebirth. The population correlation (covariance mature) if for instance, the individual variable are normally distributed, if some factor are extracted from this population factory observed variable, then the information can be used to rebound, the rebirth of recurrence of correlation matrix. The parameters are tweaked iteratively in order to maximize the likelihood of the recurrence of the population correlation matrix. This technique is particularly sensitive to quiets in the data.
Unmitigated Least Square (ULS) and *Generalized Least Square (GLS)* extraction method are both used the same process of maximum likelihood extraction method. These methods are only good for non-normal data. *Alpha Extraction* method tends to increases the cronbachs alpha estimate of the reliability extraction of a factor. Alpha extraction method differs from other extraction due to its generalization. The disadvantage of Alpha extraction is that its properties are lost, if rotation is used. (Nunnally and Bemsteix 1994). The *Extraction method* used extraction method used in this research was the maximum likelihood as it gives a better estimate of the construct, as the latent variables were in order.
The *Structural Equation Modeling (SEM)* contains endogenous and exogenous latent factors with a straight bolt interfacing both of them. The model is the insignificant yet completely logical model where there are the same numbers of parameter estimates as there are degrees of freedom. The process of testing the SEM model is divided into three phases; strictly confirmatory, alternative and model generating [8]. In a strictly confirmatory phase the researcher proposes a single model and then tests it. This approach is defined as a model tested using SEM goodness-of-fit(Garson, 2008). The saturated model assumes spontaneously laudable covariance between each pairs of observed variables. The model estimates many parameters at each data point and has a perfect fit with zero degree of freedom. By comparism the independence model adopts 0 for all the relationship which exist amongst measured variables are equal to 0. This indicates that no correlation exists and it is also known as the null model. The null model assumes a fixed value of zero for all observed variables and had a lot of degree of freedom at each data point.
In summary, SEM is a statistical procedure that utilizes hypothesis testing technique in analyzing of data. In SEM two important assumptions are of essences which are “theories modeled in the study are represented by a series of structural (regression) equations and structural equations can be modeled to create a clearer conceptualization of the theory under study”. SEM comprises of two part; structural model and measurement model.

4. Research Methodology

4.1 Research Models

The research models include the CONPRO and SERQUAL models. The factor structure for the CONPRO Model was based on previous work done using Factor analysis. For each dimension, one factor was selected to be constrained. The functional model is as shown in figure 1. The CONPRO model was realized after subjecting the 58 constructs from the survey through Exploratory Factor Analysis. The first part of factor analysis is the correlation matrix of the latent variable, followed by data reduction using Principal component analysis. Then the Kaiser MeryerOkline test of Spericity was carried out to test if the data was adequate for the model. According to [9],a data set is said to be adequate for a model if it 0.5 or above, at the end of the test, our KMO was 0.678 which shows a good fit. The next stage was to select the dimension for the model; a data extraction technique with rotation method was used. The Maximum likelihood extraction method was adopted with promax rotation. At the end of this, a dimension with an Eigen value one and above were selected. That shows that the dimension was strong enough. The dimension selected then passed through an oblique rotation with the varying 58 items, to see which items loaded well each dimension. Those that did not load well were discarded. At the end of the analysis, fourteen dimensions for both consumer and producer were realized. Nine dimensions for consumer: tangible, responsiveness, reliability, assurance, empathy, feedback, security, value and Privacy, while the producer part was Management, Aesthetics, value, innovation and users experience. The Questionnaire was subject to a Seven point Likert scale.

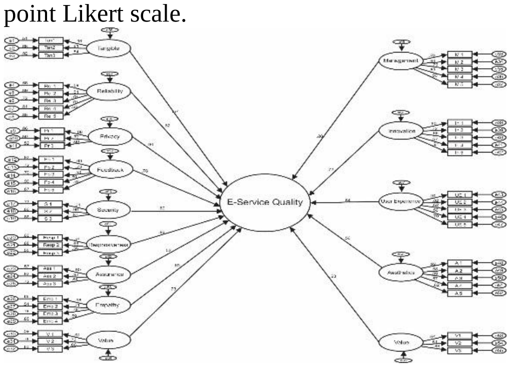

Figure 1: Sempath Analysis for CONPRO model

SERVQUAL model was also based on the work of Servqual (see figure 2) from work carried out in the research. Since SERVQUAL model serves as a defector to this research work.

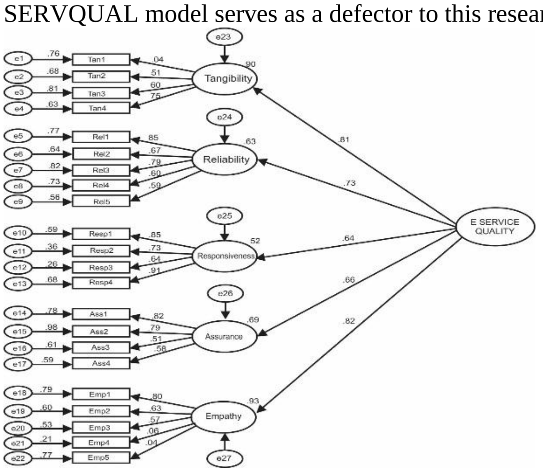

Figure 2: Sem Path analysis for SERVQUAL model

4.1.1 Conpro-E-Service Dimensions in Relationship to Customer

The nine Quality of service dimensions that were extracted for customer end is are as follows:

4.1.1.1 Responsiveness: The quickness consumer/producer entity play in their role in service co-creation mechanism

4.1.1.2 Empathy: Respect, Loyalty, emotional attachment of consumer/producer in the service co- creation mechanism

4.1.1.3 Assurance: Guarantee that the consumer/ producer entity will behave as expected.

4.1.1.4 Tangible: This has to do with the physical facilities and infrastructures supporting consumer/producer service co- creation.

4.1.1.5 Reliability: Extent to which fault or error is introduced by consumer/ producer.

4.1.1.6 Privacy: Extent to which customer/ producer private information is protected

4.1.1.7 Security: Extent to which consumer/producer data are protected from deletion, corruption and theft.

4.1.1.8 Feedback: Extent to which consumer/producer gets information
4.1.1.9 Value: Extent to which consumer/ producer gets reward for service

4.1.2 Conpro-E-Service Dimensions in Relationship to Service Provider

The five Quality of service dimensions that were extracted for customer end is are as follows:
4.1.2.1Management: Policy and procedural seamlessness in service co-creation
4.1.2.2 Innovation: Improvement/ modernization capability of consumer/ producer in service co-creation mechanism.
4.1.2.3 User experience
4.1.2.4 Value: Satisfaction, benefit or gain of consumer/ producer in service co-creation mechanism
4.1.2.5 Aesthetics: The look and feel of the instrument of interaction between consumer/producer in service co-creation

4.2 Research Design

The second survey was carried out to test and validate the CONPRO model. This time three set of questionnaires which were for consumer, producer and servqual were distributed. In this regard, the same study areas were used. A total of 1050 questionnaires were distributed and also shared among users and producers of e-service quality.

4.3 Data Collection Instruments

The questionnaire was sub-divided into three main parts, the demographic character, the different construct, and constructs harvested from literature. The dimensionality of the CONPRO instrument employed is an extension of the SERVQUAL model [10]. A total of fourteen (14) dimensions with vary number of items from the questionnaire was defined for our proposed CONPRO model. The structural validity of the novel CONPRO e-service quality measurement model was implemented through a multiple item scaled questionnaire specifying the 14 dimensions: nine (9) Consumer-centric: Tangible, Reliability, Privacy, Feedback, Empathy, Value, Assurance, Responsiveness, and Security and five (5) Producer-centric dimensions: Management, Innovation, User-Experience, Aesthetics and Value; which was comparatively analyzed with the customer-centric SERVQUAL model specified by five (5) dimensions: Tangible, Reliability, Responsiveness, Assurance and Empathy. The questionnaire survey technique was chosen because this technique is also suitable for empirical research. In deriving the questionnaire, special concerns were in developing a standardized questionnaire that is clear, practical, reliable, and administrable [11].

4.4 Sample and data collection

A field survey was carried out and the research instrument was utilized to harvest dimensions from both the consumer and producer of service. A total of 1050 data questionnaires were administered out of which 834 were selected to even out for the three questionnaires, that is 278 for SERVQUAL, 278 for the Customers and 278 for the producers. The dimensionality of the instrument employed is an extension of the SERVQUAL model. The constructs of the model were established using Exploratory Factor Analysis (EFA), while the construct items were extracted using Maximum Likelihood Extraction method.

4.5 Data Analysis and Interpretation

The CONPRO and SERVQUAL models were comparatively accessed via Structural Equation Modeling (SEM) which incorporates both EFA and Confirmatory Factor Analysis (CFA) methodologies implemented using the AMOS 16.0 version software environment. The Exploratory factor Analysis (EFA) was utilized in detecting latent variable that describes e-service quality in the banking sector from both service provider and customer. The SERVQUAL and CONPRO were implemented and tested using the factor analysis, structural equation modeling (SEM) and Analysis of Moment Structure (AMOS) graphics. Factor analysis is a correlation centered methodology trying to recreate relationships among factors, in which the elements "represent the common variance of variables, excluding unique variance". Regarding the correlation matrix, this relates with concentrating on clarifying the off-diagonal terms. Factor analysis is for the most part utilized when research objective is to investigate data structure or relationship among variables. Other reduction techniques only tend to trim out non-significant variables from large set of variables as explained below.

Maximum likelihood extraction method and the Promax Kaiser Normalization rotation method was used in choosing the EFA. Maximum Likelihood (ML) method was used as the estimation technique because of its inherent ability defaulted for many model-fitting programs. Likewise ML estimation is synchronous; estimates are computed at the same time. On the off chance that the estimate is thought to be population values, they amplify the probability (likelihood) that the data were drawn from the population. Therefore, maximum likelihood estimation strategies are ideal for non-typically distributed data information and small sample size.

This technique was carried out on 58 items for determining the loading factor. If the factor loading is greater than 0.6 it is high, but if factor loading is less than 0.6 and greater than or equal to 0.3 it is low (Klien 2005). The factor loading cut of is 0.50 ± 0.03. The factor analysis and item scale reliability was carried out for the respondent to the dimensional items, after which 55 items were then realized. Then the Kaiser-Meyer-Olkin test of Sphericity was carried out to test if the data was adequate for the model. Kaiser-Meyer-Olkin and Bartlett's Test was employed in carrying out sample adequacy test. Maximum Likelihood (ML) technique was used for extraction of data. Cronbach alpha measurement was used in the measurement of the reliability in the instrument of measurement. The implementation of the CONPRO E- Service quality model was carried out and analyzed using Confirmatory Factor Analysis.

4.5.1 The Structural Equation Model

The structural equation model or latent variable model specifies the casual relationships among the latent variables. See Equation (1):

Ꞁ = ßη + ṛε̧ + ζ (1)

Where **η** is the vector of latent dependent variables
ε̧ is a vector of latent independent variables
ζ is a vector of errors in equations
ß is a matrix of coefficient relating the latent dependent variables to another and
ṛ is a matrix of coefficients relating the latent independent variables to the latent dependent variables.

Therefore, the structural equation model is a general matrix representation in which assumed causal relationships between latent variables are described.

4.5.2 The Measurement Model

The measurement model specifies how the latent valuables of the structural equation are measured in terms of the observed variables. A measurement model is a factor Analytical model derived from theory in which researches identifies the latent variables (unobserved) construct of interest and also determine which observed variables will be used to measure each latent construct. The measurement model consists of confirmatory factor equations. See equations (2) and (3).

$$Y = \Lambda y \eta + \varepsilon \quad (2)$$

$$X = \Lambda x \xi + \delta \quad (3)$$

Where
Y is the vector of the observed dependent variables.
X is a vector of the observed independent variables
ξ and δ are vectors of unique factors (that is errors in measurement),
Λy and Λx are matrices of loadings of the observed y variables and the observed x variables on the latent η variables and the latent ξ variables respectively.

The equations of the measurement model in essence describe the multivariate regressions of y on π and of x on ξ. Once an acceptable measurement model is developed, the measurement model will then be converted into a hybrid model (measurement and structural model combined), to investigate the relations between latent variables.

4.5.3 Approach to SEM modeling for this study

We study both alternative model testing (as we are dealing with two models, and questionnaires for measuring Quality of service) and a model generating approach as the CONPRO model in the course of testing may need adjustment or pruning of the constructs to improve model fit. Basically the approach used in this study will follow seven steps.

4.5.4 Model specification

In this study, two models are specified: the SERQUAL model and the CONPRO model. The coefficients for the highest loading for the instruments for the instruments or from our EFA (as appropriate) were set to 1.0.

5. Results and Discussions

Table 1: Demographic characteristics of the Study participants in the CONPRO and SERVQUAL Models

Characteristics		Frequency	Percentage (%)
CONPRO			
Producer Sex	Male	123	14.75
	Female	155	18.59
Consumer Sex	Male	135	16.19
	Female	143	17.15
SERVQUAL Sex	Male	145	17.39
	Female	133	15.95
Age Category	18-29	136	16.31
	30-39	206	24.70
	40-49	285	34.17
	50-59	111	13.31
	60 and above	96	11.51
Work Mode	Bank Staff	278	33.33
	Customer	556	66.67

The age, sex were also represented in the Bar chart and Histogram. The number of Male and female for were represented for the two models. The table 1 shows the distribution of the study participants by sex, among the study respondents.

The distribution of the study participants within states in the six (6) geopolitical zones of the country are The states covered are Kogi (Lokoja) in North Central 8%, Bauchi State (Bauchi) in North East 13%, Kano (Kano) for North West 14%, Anambra (Onitsha) for South East 14%, Edo (Benin City) for South South 26%, and Lagos (Ikeja) for South West 25%.

The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO-test) (see table 2) yielded a value of0.686 with p-value of <0.001, thereby suggesting an adequate model. The KMO indicates adequacy and Bartlett's. Bearden *et al*. (2003) asserted that "a KMO correlation above 0.60- 0.70 is considered adequate for analyzing the EFA output".

Table 2: Kaiser-Meyer-Olkin (KMO) and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.686
Bartlett's Test of Sphericity	Approx. Chi-Square	13962.438
	Df	1653
	Sig.	.000

Readings are displayed in table 3 to 6. The extracted factor from table 3 was used to plot the graph in figure 4

Table 3: Extracted Factors and Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.137	8.856	8.856	4.594	7.920	7.920
2	3.574	6.163	15.019	3.057	5.271	13.191
3	3.295	5.680	20.699	2.779	4.791	17.981
4	2.631	4.537	25.236	2.046	3.527	21.508
5	2.556	4.406	29.643	2.122	3.659	25.167
6	2.351	4.053	33.696	1.866	3.217	28.384
7	2.299	3.963	37.659	1.793	3.091	31.475
8	2.183	3.764	41.423	1.698	2.928	34.403
9	1.898	3.272	44.695	1.397	2.409	36.812
10	1.771	3.053	47.748	1.270	2.190	39.001
11	1.673	2.884	50.632	1.142	1.970	40.971
12	1.508	2.600	53.232	1.068	1.841	42.812
13	1.429	2.463	55.695	.933	1.609	44.421
14	1.324	2.282	57.978	.859	1.481	45.902
15	1.249	2.154	60.131	.814	1.404	47.306
16	1.135	1.958	62.089	.626	1.079	48.385
17	1.054	1.818	63.907	.556	.958	49.343
18	.986	1.699	65.607			
19	.960	1.654	67.261			
20	.940	1.621	68.882			
21	.890	1.535	70.417			
22	.832	1.435	71.852			
23	.806	1.389	73.241			
24	.794	1.369	74.610			
25	.739	1.274	75.885			
26	.694	1.196	77.081			
27	.672	1.159	78.241			
28	.648	1.118	79.359			
29	.621	1.070	80.429			
30	.605	1.043	81.472			
31	.582	1.004	82.476			
32	.559	.963	83.440			
33	.553	.953	84.392			
34	.523	.901	85.294			
35	.505	.871	86.165			
36	.491	.847	87.012			
37	.484	.835	87.847			
38	.466	.804	88.651			

39	.453	.781	89.432			
40	.434	.749	90.180			
41	.427	.737	90.917			
42	.417	.719	91.636			
43	.407	.701	92.338			
44	.379	.654	92.991			
45	.364	.627	93.618			
46	.359	.619	94.237			
47	.348	.600	94.837			
48	.333	.573	95.410			
49	.324	.559	95.969			
50	.315	.544	96.513			
51	.308	.531	97.044			
52	.289	.499	97.543			
53	.278	.480	98.023			
54	.263	.453	98.476			
55	.249	.429	98.905			
56	.244	.420	99.325			
57	.202	.348	99.673			
58	.190	.327	100.000			

Extraction Method: Maximum Likelihood.

Using the scree plot (see figure 3), the slope of the curve started leveling out after just 15 factors. The eigen values with one and above were selected. This brought about the extracted factors with new names in table 4.4, which formed the new dimensions of the CONPRO model.

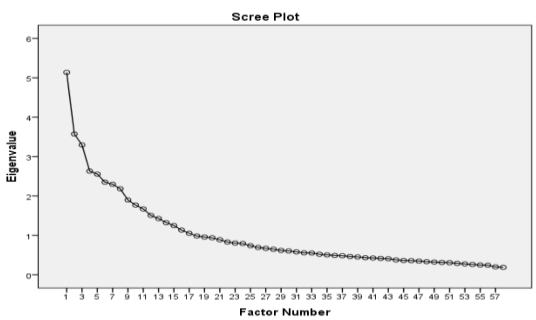

Figure 3: Scree Plot

Table 4: Extracted Factors with new names

Merged Factor(s)	**Items Retained**	**Construct Name**
1 (4 items)	QUES11, QUES23, QUES43, QUES45	Responsiveness
2 (4 items)	QUES10, QUES21, QUES44, QUES46	Empathy
3 (3 items)	QUES6, QUES42, QUES47	Assurances
4 (3 item)	QUES1, QUES4, QUES39	Tangibles
5 (5 items)	QUES5, QUES8, QUES38, QUES48, QUES53	Reliability
6 (3 items)	QUES15, QUES16, QUES57	Privacy
7 (5 item)	QUES13, QUES 20, QUES22, QUES34, QUES50	Feedback
8 (3 items)	QUES17, QUES18, QUES53	Security
9 (3items)	QUEST 7, QUEST 24, QUEST 54	Value
10 (5 item)	QUES2, QUES9, QUES29, QUES33, QUES55	Management
11 (5 item)	QUES26, QUES35, QUES36, QUES37, QUES40	Innovation
12 (5 item)	QUES14, QUES19, QUES25, QUES27, QUES40	User Experience
13(5 items)	QUES3, QUES7, QUES30, QUES31, QUES32	Aesthetics
14 (4 item)	QUES7, QUES24, QUES 28, QUES54	Value
15 (1 item)	QUES12	{no name}
16 (1 item)	QUES13	{no name}
17 (1 item)	QUES9	{no name}
18(1 item)	QUES8	{no name}

Table 5: Goodness of fit test

Chi-Square	Df	Sig.	CMIN/Df	Recommended
2406.811	.803	.000	2 .300	1 and 3

The benefit of using ML technique for extraction is that it provides goodness of fit statistics for factor model, which is similar to the confirmatory factor analysis. As could be perceived from the Chi-square, goodness of fit test was significant, showing that there was a difference in perceptions among the data used in the study. The other method for measuring goodness of fit is the CMIN/DF value this is the ratio of degree of freedom and Chi-Square. . The value of CMIN/DF is between 1- 3, the smaller the value the better the result. The CMIN/DF value for this model is 1.215 which indicated that the model fits.

Table .6: Reliability Statistics

Factor Label	Reliability (Cronbach's Alpha)	Specifications
Responsiveness	0.835	Impressive
Empathy	0.675	Impressive
Assurances	1.000	Impressive
Tangibles	0.577	Not Impressive
Reliability	0.675	Impressive
Privacy	0.676	Impressive
Feedback	0.645	Impressive
Security	0.765	Impressive
Value	0.755	Impressive
Management	0.985	Impressive
Innovation	1.000	Impressive
User Experience	1.000	Impressive
Aesthetics	0.677	Impressive
Value	1.000	Impressive

5.1 Reliability of the CONPRO and SERVQUAL instrument Used

When developing and evaluating an instrument in research study; reliability is an important issue that must be examined. An instrument is said to be reliable when it measures what it purports to measure. (Zikmund, 2000).Reliability is concerned with the consistency in the instruments of measurement, this means that the questionnaire will realize the same result when it used (Norland, 1990). In statistics cronbach alpha measurement can be used in determining the reliability of an instrument. If the reliability value obtained using cronbach alpha measurement is greater than or equal to 0.6 then the instrument has a high level of reliability. The reliability of the CONPRO instrument was high at 0.882 than that of SERVQUAL see table (7)

Table 7: Reliability Statistics

CONPRO		**SERVQUAL**	
Cronbach's Alpha	N of Items	Cronbach's Alpha	N of Items
.882	55	.638	22

5.2 Measuring Quality of Service Using SERVQUAL and CONPRO

For each statement, the gap score was computed. To compute the average gap score for the dimension we sum the gap score for each statement in a dimension and divide the sum by the number of statements in the dimension. The dimension gap scores were summed up and divided by the total number of dimensions of each instrument. The table 8 shows the SERVQUAL and CONPRO scores for the study respondents. Based on the fact that the expectation values were very high in the range of 7, the mean perception values for the SERVQUAL instrument gave a value of 2.66 with a mean perception value of 4.26, Tangible (MP:4.52,MG:2.39); Reliability (MP:4.40, MG:2.52), Responsiveness (MP:4.03, MG:2.88) Assurance (MP:4.00,MG:2.91) and Empathy (MP:4.33,MG:2.58).

Table 8: Gap scores for the SERVQUAL AND CONPRO instrument

	SERVQUAL		CONPRO	
Dimension	***Mean Perception**	**Mean Gap**	***Mean Perception**	**Mean Gap**
Tangible				
Item 1	4.43	2.48	4.40	2.43
Item 2	4.43	2.48	4.28	2.60
Item3	4.72	2.19	4.45	2.47
Item 4	4.50	2.41	-	-
Overall mean	**4.52**	**2.39**	**4.38**	**2.50**
Reliability				
Item 1	4.55	2.37	4.17	2.71
Item 2	4.44	2.48	4.17	2.71
Item3	4.44	2.48	4.35	2.53
Item 4	4.28	2.64	4.25	2.63
Item 5	4.28	2.64	3.97	2.91
Overall mean	**4.40**	**2.52**	**4.18**	**2.70**
Responsiveness				
Item 1	4.03	2.88	4.01	2.87
Item 2	4.03	2.88	4.01	2.87
Item3	4.03	2.88	4.01	2.87
Item 4	4.03	2.88	-	-
Overall mean score	**4.03**	**2.88**	**4.01**	**2.87**
Assurance				
Item 1	4.14	2.77	4.03	2.85
Item 2	3.64	3.27	4.03	2.85
Item3	4.40	2.51	4.03	2.85
Item 4	3.84	3.07	-	-
Overall mean score	**4.00**	**2.91**	**4.03**	**2.85**
Empathy				
Item 1	4.37	2.54	3.45	3.43
Item 2	4.32	2.59	4.22	2.65
Item3	4.32	2.59	3.30	3.58
Item 4	4.32	2.59	4.22	2.65
Item 5	4.32	2.59	-	-
Overall mean score	**4.33**	**2.58**	**3.80**	**3.08**
Privacy				
Item 1			4.83	2.05
Item 2			4.83	2.05
Item 3			4.51	2.37
Overall mean score			**4.72**	**2.16**
Feedback				
Item 1			3.38	3.50
Item 2			3.57	3.31
Item3			3.39	3.49
Item 4			3.38	3.50
Item 5			3.38	3.50
Overall mean score			**3.42**	**3.46**
Security				
Item 1			Item 1	4.53
Item 2			Item 2	4.53
Item3			Item3	4.53
Overall mean score			**4.53**	**2.35**

Value				
Item 1			2.78	4.10
Item 2			3.19	3.69
Item3			2.91	3.96
Overall mean score			**2.78**	**4.10**
Unweightedservicegap score				**2.90**
Producer				
Management				
Item 1			3.88	3.04
Item 2			3.88	3.04
Item3			3.61	3.30
Item 4			3.61	3.30
Item 5			3.61	3.30
Mean gap score			**3.72**	**3.20**
Innovation				
Item 1			3.86	3.06
Item 2			3.86	3.06
Item3			4.06	2.85
Item 4			3.84	3.07
Item 5			3.70	3.21
Mean gap score			**3.86**	**3.05**
User experience				
Item 1			4.03	2.88
Item 2			4.03	2.88
Item3			4.08	2.83
Item 4			4.08	2.83
Item 5			4.08	2.83
Mean gap score			**4.06**	**2.85**
Aesthetics				
Item 1			5.56	1.31
Item 2			5.56	1.31
Item3			5.50	1.38
Item 4			5.19	1.69
Item 5			5.51	1.37
Mean gap score			**5.46**	**1.41**
Value				
Item 1			5.49	1.39
Item 2			5.49	1.39
Item3			5.49	1.39
Mean gap score			**5.49**	**1.39**
Unweighted Quality of Service gap score		**2.66**		
Quality of service gap score(Producer)				**2.38**
Quality of service gap score(Producer)				**2.38**
*****CONPRO Weighted Quality of service gap score***			**2.64**	

*Overall instrument mean service perception=4.26
*Mean perception of consumer=3.98; for producer=4.518

From the table 9 to table 11, the mean expectation score of the producers of 4.517, was higher than that of the consumer of 3.98, showing that the producers tend to have a higher perception of their services rendered, while the consumers appear to be more critical. Using a weighed ratio of 50:50 for consumer and producer, the total Quality of service gap score was 2.64, which was lower than that derived from a consumer-centric instrument (SERVQUAL) of2.66; and lower than that of the consumer-part of the CONPRO instrument which was 2.90, and higher than the producer-part which was 2.35. It should be noted that the lower the gap, the better the quality of service. It is notable that the two consumer related questionnaires gave higher gap scores and the producer part had lower gap scores, this exemplifies the case that a different notion of Quality of service rating can be achieved if there are realistic expectations on Quality of service as introduced by assessing the perspectives of the producer, who might be able to judge the Quality of service from the perspective of the feasible, thus representing and taking care of constraints to service production that are without the purview of the consumer.

Table 9: Summary of the measurements of the two instruments.

Dimension	SERVQUAL		CONPRO			
			Consumer		Producer	
	Mean Perception	Mean Gap	Mean Perception	Mean Gap	Mean Perception	Mean Gap
Tangible	4.52	2.39	4.38	2.50	-	-
Reliability	4.40	2.52	4.18	2.70	-	-
Responsiveness	4.03	2.88	4.01	2.87	-	-
Assurance	4.00	2.91	4.03	2.85	-	-
Empathy	4.33	2.58	3.80	3.08	-	-
Security	-	-	4.53	2.35	-	-
Value	-	-	2.78	4.10	5.49	1.39
Privacy	-	-	4.72	2.16	-	-
Feedback	-	-	3.42	3.46	-	-
Management	-	-	-	-	3.72	3.20
Innovation	-	-	-	-	3.86	3.05
User experience	-	-	-	-	4.06	2.85
Aesthetics	-	-	-	-	5.46	1.41
Value	-	-	-	-	3.62	2.21
Overall mean score	4.26	2.66	3.98	2.90	4.518	2.35
Quality of service gap score		2.66	2.64			

Table 10: Questionnaire Statistics

CONPRO				SERVQUAL			
	N	Mean	Std. Deviation		N	Mean	Std. Deviation
conp1	278	2.0504	1.10348	conval1	278	4.1007	.90960
conp2	278	2.0504	1.10348	conval2	278	4.1007	.90960
conp3	278	2.3705	.95539	conval3	278	3.6906	1.17648
contan1	278	2.4748	.75840	conass1	278	2.8525	.61554
contan2	278	2.6007	.71265	conass2	278	2.8525	.61554
contan3	278	2.4317	.75573	conass3	278	2.8525	.61554
conrel1	278	2.7122	.55388	conres1	278	2.8705	.83111
conrel2	278	2.7122	.55388	conres2	278	2.8705	.83111
conrel3	278	2.5288	.69363	conres3	278	2.8705	.83111
conrel4	278	2.6259	1.04258	consec1	278	2.3489	.66678
conrel5	278	2.9065	.90240	consec2	278	2.3489	.66678
confd1	278	3.4964	.50089	consec3	278	2.3489	.66678
confd2	278	3.3094	.74416	proman1	278	3.0360	.86162
confd3	278	3.4892	1.09391	proman2	278	3.0360	.86162
confd4	278	3.4964	.50089	proman3	278	3.3022	.81196
confd5	278	3.4964	.50089	proman4	278	3.3022	.81196
conemp1	278	3.4281	1.19575	proman5	278	3.3022	.81196
conemp2	278	2.6547	1.05934	proinn1	278	3.0576	1.09985
conemp3	278	3.5755	1.31351	proinn2	278	3.0576	1.09985
conemp4	278	2.6547	1.05934	proinn3	278	2.8525	.99267
				proinn4	278	3.0719	.86771
				proinn5	278	3.2122	1.12804
				prouseexp1	278	2.8849	.85884
				prouseexp2	278	2.8849	.85884
				prouseexp3	278	2.8309	.81735
				prouseexp4	278	2.8309	.81735
				prouseexp5	278	2.8309	.81735
				proaesth1	278	1.3129	.70525
				proaesth2	278	1.3129	.70525
				proaesth3	278	1.3813	.80965
				proaesth4	278	1.6906	.92185
				proaesth5	278	1.3669	.70218
				proval1	278	1.3921	.48910
				proval2	278	1.3921	.48910
				proval3	278	1.3921	.48910

Table 11: Mean and Standard Derivation of SERVQUAL MODEL

	Mean	Std. Deviation	N
Aa	2.4820	1.03966	278
Ab	2.4820	1.03966	278
Ac	2.1942	.91421	278
Ad	2.4065	.83486	278
Aerel	2.3669	1.49436	278
Afrel	2.4784	1.73660	278
Agrel	2.4784	1.43621	278
Ahrel	2.6367	1.18399	278
a8rel	2.6367	1.18399	278
resp1	2.8813	.98561	278
resp2	2.8813	.98561	278
resp3	2.8813	.98561	278
resp4	2.8813	.98561	278
ass1	2.7698	.92550	278
ass2	3.2734	.74858	278
ass3	2.5144	1.10372	278
ass4	3.0719	.82943	278
emp2	2.5899	.90974	278
emp1	2.5396	.94442	278
emp3	2.5899	.90974	278
emp5	2.5899	.90974	278
emp4	2.5899	.90974	278

5.5 Questionnaire Reliability and Validity

The CFA and AVE were used to analyze the questionnaire. CFA means Confirmatory Factor Analysis and AVE means Average variance Extracted. To this end, the construct reliability and AVE index were calculated with SPSS v 22 and Amos and results are shown in table 4.6.Validity is established when AVE index is greater than 0.5 [9]. As shown in table 12, the AVE index for all variables are greater than 0.5.Consequently, it can be established that both questionnaires have acceptable validity. The Cronbach's alpha value is used in measuring reliability. For an instrument to be considered reliable the Cronbach's alpha value must be greater than 0.7. In this case the Cronbach's alpha values for all constructs are shown in table 12 and they are all greater than 0.7 except for Innovation that has a value of 0.63.

Table 12: The Cronbach's Alpha and AVE for the CONPRO and SERVQUAL questionnaire.

Items	CONPRO questionnaire		SERVQUAL questionnaire	
	Overall construct reliability (β)	AVE	Overall construct reliability (β)	AVE
Tangible	0.74	0.58	0.623	0.53
Reliability	0.88	0.61	0.618	0.61
Privacy	0.76	0.51	-	-
Feedback	0.84	0.66	-	-
Empathy	0.81	0.71	0.801	0.52
Value	0.76	0.50	-	-
Assurance	0.91	0.62	0.747	0.54
Responsiveness	0.77	0.52	0.712	0.43
Security	0.86	0.55	-	-
Management	0.71	0.62	-	-
Innovation	0.63	0.55	-	-
User-Experience	0.83	0.52	-	-
Aesthetics	0.73	0.67	-	-
Value	0.71	0.61	-	-

5.6 Testing model hypotheses

The regression coefficient (R^2) and p values were used to test the relationship amongst the variables in each hypothesis. The outcome of the hypothesis testing and the testing is based on SEM.As seen the relationship between all the variables on

measurement of Quality ofe- service is significant (as p values were less than 0.05).All hypotheses are supported. According to $R^{2,}$ the impact of Tangible can explain 59.5% of changes in electronic service quality, taken single, reliability can predict changes in Quality of service by 41.1%, privacy by 58.8%, feedback by 59.3%, empathy by 53.4%, consumer perception of value by 45.2%, assurance by 59.3%, security by 51.3%; while on the producer and Management by61.5%, Innovation by 51.6%, user experience by 61.7%; Aesthetics by 45.2%, producer value by 62.6%. The deficits of these percentage ratios can be attributed due to forecasting errors. Overall the consumer component of the model can explain changes in Quality of service by 70.1%, while the producer can predict changes by 67%.Overall the impact on Quality of service measurement is 68.1% (see table 12).
The dimensions Tangible can explain changes in Quality of service measurement by 60%, Reliability by 52.1%, responsiveness by 64.2%, assurance by 68.2% and empathy by 57%. It can also be seen that the SERVQUAL model has a total impact on the measurement on Quality of service by 63.1%, also implying that 36.9% is due to measurement errors.

Table 13: The Relationship between the Variables of Hypotheses for CONPRO **Model and SERQUAL Model**

	CONPRO Model					
Items	$\mathbf{R^2}$	**P value**	**Remark**	$\mathbf{R^2}$	**P value**	**Remark**
Tangible	0.595	0.026	Good impact	0.595	0.012	Good impact
Reliability	0.411	<0.0001	Good impact	0.521	0.001	Good impact
Privacy	0.588	<0.0001	Good impact			
Feedback	0.593	<0.0001	Good impact			
Empathy	0.534	<0.0001	Good impact	0.565	<0.0001	Good impact
Value	0.452	<0.0001	Good impact			
Assurance	0.593	<0.0001	Good impact	0.682	0.001	Good impact
Responsiveness	0.734	<0.0001	Good impact	0.642	0.000	Good impact
Security	0.513	<0.0001	Good impact			
Management	0.615	<0.0001	Good impact			
Innovation	0.516	<0.0001	Good impact			
User-Experience	0.617	<0.0001	Good impact			
Aesthetics	0.452	<0.0001	Good impact			
Value	0.626	<0.0001	Good impact			
Consumer	0.701	<0.0001	Good impact			
Producer	0.665	<0.0001	Good impact			
Overall impact	**0.681**			**0.631**		

5.7 Goodness-of-Fit (GOF) indices

For structural equation models, a huge variety of' fit indices has been developed. The GOF of a measurement model describes how well it Ills into a set of observations. GOF indices sum up the discrepancy between the observed qualities and the qualities expected under a measurable model. (IOF statistics are GOF indices with known sampling distributions usually obtained using asymptotic methods that are used in statistical hypothesis testing. GOF measurements arc (01) indices with known sampling distributions, usually obtained using asymptotic methods, that arc used in statistical hypothesis testing. While assessing the model goodness-of-lit, Hair et al. (2010) recommended the following Ills criteria, namely: Absolute Model Fit. Incremental Model fit and Parsimonious Model Fit.

I. **Absolute Model Fit** — is a direct measure of how well the model specified by the researcher reproduces the observed data that is the discrepancy between a model and the data. Assessing absolute model is critical in applications, as inferences drawn on poorly fitting models may be badly misleading. Continuing, they noted that applied researchers must examine not only the overall fit of their models, but they should also perform a piecewise assessment. It may well be that a model fits well overall but that it fits poorly some parts of the data, suggesting the use of an alternative model. The piecewise GOF assessment may also reveal the source of misfit in poorly fitting models. These include: χ^2 - Chi-square; df- degree of freedom; p - Probability value (Recommended to be less than 0.05); RMSEA - Root Mean Square Error of Approximation (Recommended to be less than 0.1); and GFJ - Goodness of Fit index (Between 0-1. higher values indicate good model lit).

• The χ^2 test statistic is estimated using equation 4:

$$x^2(df) = (N-1)F[S, \varepsilon(\theta)] \tag{4}$$

With df = s-t degrees of freedom.
Where:
s is the is the number of no redundant element in S,
t is the total number of parameters to be estimated,

N is the sample size
S is the empirical covariance matrix, and
Σ (θ) is the model-implied covariance matrix
RMSEA is estimated using equation 5:

$$\varepsilon_a = \sqrt{\max\left\{\left(\frac{F(S,\Sigma(0))}{df} - \frac{1}{N-1}\right),0\right.} \quad (5)$$

Where;

F(S, Σ(0)) is the minimum of a fit function,
Df = s – t is the number of degree of freedom, and
N is the sample size

Goodness-of-fit-Index (GFI) is estimated using equation 6:

$$GFI = 1 - \frac{F_t}{F_n} = 1 - \frac{x_t^2}{x_n^2} \quad (6)$$

Where;

x_n^2 is the chi-square of the null model (Baseline model)

x_t^2 is the chi-square of the target model, and

F is the corresponding minimum fit function value

These measures provide the most fundamental indication of how well the proposed theory fits the data (Hooper et al. 2008). Unlike incremental fit indices, their calculation does not rely on comparison with a baseline model hut is instead a measure of how well the model fits in comparison to no model at all.

II. **Incremental Model Fit** - differs from absolute fit indices in that they assess how well the estimated model fits relative to some alternative baseline model, that is, the discrepancy between two models. Incremental model Iii is also known as relative model fit or Comparative Model Fit. These include: CFI - Comparative Fit Index (Between 0-1. Higher values indicate good model fit); NFl- Normed Fit Index (Recommended to be above 0.8); and TLI- Tucker Lewis Index (Recommended to be above 0.8). As the name implies, they are a group of indices that do not use the chi-square in its raw form but compare the chi-square value to a baseline model.

The Comparative Fit Index (CFI) is estimated using equation 7:

$$CFI = 1\frac{\max\left|\left(x_t^2 - df_t\right),0\right.}{\max\left[\left(x_t^2 - df_t\right),\left(x_t^2 - df_i\right),0\right]} \quad (7)$$

Where:

Max denotes the maximum of the values given in brackets

x_i^2 is the chi-square of the independence model (Baseline model)

x_t^2 is the chi-square of the target model, and

df is the number of degree of freedom

The Normed Fit Index (NFI) is estimated using equation 8:

$$NFI = \frac{x_i^2 - x_t^2}{x_i^2} = 1 - \frac{x_t^2}{x_i^2} = 1 - \frac{F_t}{T_i} \quad (8)$$

Where:

x_i^2 is the chi-square of the independence model (Baseline model),

x_t^2 is the chi-square of the target model, and

F is the corresponding minimum fit function value

For these models the null hypothesis is that all variables arc uncorrelated.

III. **Parsimonious Model Fit** Having a nearly saturated, complex model means that the estimation process is dependent on the sample data (Hooper et al. 2008). This results in a less rigorous theoretical model that paradoxically produces better fit indices. To overcome this problem, parsimonious model lit was developed. It was designed specifically to provide information about which model among a set of competing models is best, considering its fit relative to its complexity. These include: χ^2/df- Chi-square/degree of freedom (Below 5. The less, the better); AGFI- Adjusted Goodness of Fit Index; (Recommended to be above .80), and PNFJ- Parsimony Normed Fit Index (Between 0-1. Higher values indicate good model fit).

Adjusted Goodness-of—Fit-Index (A GFI,) is estimated using equation 9:

$$AGFI = 1 - \frac{df_n}{df_t}(1 - GFI) = 1 = \frac{x_t^2 / df_t}{x_n^2 / df_n^{,}} \tag{9}$$

Where:

x_n^2 is the chi-square of the null model (Baseline model),

x_t^2 is the chi—square of the target model,

df_n =s = p(p+l)/2 is the number of degree of freedom for the null model, and
df_t= s -t is the number of degree of freedom for the target model.

Parsimony Normed Fit index (PNFI) is estimated using equation 10:

$$PNFI = \frac{df_t}{df_i} NFI \tag{10}$$

Where

df_t is the number of degrees of freedom of the target model,
df_i is the number of degree of freedom of the independence model, and
NFI is the Normal Fit index.

From our review, 'a number of criteria can be used to assess the "goodness of fit models. This include Chi-square, Normed Fit index (NFI) and Goodness of Fit index (GFI), which are all recommended to be greater than 0.8 (Hair et al. 2010). The most popular index is possibly the chi-square statistics. Significant values of this chi-square indicate poor model fit while non-significant values indicate good fit. However, in large samples, the chi-square statistic is almost always significant since chi-square is a direct function of sample size. Hence, several researchers recommend that multiple fit criteria be used in order to minimize biases in results.

5.8: Evaluation of the models using the fit indices

The CON-PRO and SERVQUAL models are compared using the fit indices. A summary of the fit indices are shown in table 13.

Table 14: Summary of Fit indices

Metric	CONPRO (model 1)	SERVQUAL (Model 2)	Comments
CFI	0.902	0.813	Should be >0.9
IFI	0.897	0.716	Should be >0.9
NFI	0.921	0.889	Should be >0.9, and 0.8
RMSEA	0.012	0.094	Good fit if <= .05, adequate fit if <=.08
PGFI	0.823	0.742	Should be >.95 or at least .9
PNFI	0.811	0.742	Should be >.9, sometimes .8 used
AIC	0.201	0.211	Close to zero is a good fit
ECVI	53.192	69.11	Lower is better

It may be observed that the reliability and fit of the model parameters were reported first before overall fit metrics of the structural model, so that the structural fit of the model could be understood in the background of its importance in view of the good measurement validity of the model dimensions. The CFI (0.902) and the IFI(0.897)values are approximately at about 0.9 the recommended cut-off for good fit, while for the SERVQUAL model there are relatively lower 0.813 and 0.715 respectively. Also the NFI value for the CONPRO model is 0.921 compared to the value of 0.889 for the SERVQUAL model. The RMSEA values for the CON-PRO model is less than 0.05 which indicates a good fit, compared to the SERVQUAL model which has a corresponding value of 0.094. For the PGFI metric the values are 0.823 for the CON-PRO model while for the e-SERVQUAL the values is 0.742; which are both less than the 0.9, though the CON-PRO model is closest to 0.9. The PNFI values for the CON-PRO model is 0.811 which is greater than the current heuristic of 0.8, while for the SERVQUAL is 0.742 which should be >0.8. Summarily, the outcome of the analysis of the individual parameter estimates based on reliability, Average values and model fit metrics provide a good case for recommending the CON-PRO model.

5.9 Discussion

The comparisons of the two models indicate the different perceptions on the two sides of service production: Consumer and Producer, and socio-cultural adjustments on Quality of service measurement. The CONPRO model indicated mean expectation score of the producers at 4.52 which was higher than that of the consumer at 3.98, showing that the producers tend to have a higher perception of their services rendered, while the consumers appear to be more critical. This tends towards a most balanced realization of Quality of service, also the total Quality of service gap score was 2.64, which was lower than that derived from a consumer-centric instrument (SERVQUAL) of 2.66; and lower than that of the consumer-part of the CONPRO instrument which was 2.90, and higher than the producer-part which was 2.38; on the whole the Quality of service gap of the CONPRO model was higher than that of the SERVQUAL instrument. This difference demonstrates that a different notion of Quality of service rating can be achieved if there are realistic expectations on Quality of service as introduced by assessing the perspectives of the producer, who might be able to judge the Quality of service from the perspective of feasibility thus representing and taking care of constraints to service production that are necessary to achieve customer satisfaction.

The SEM modeling indicated that the instruments were reliable, and had good model fits, which for the purpose of this study, affirms the theoretical position that Quality of service is a combined construct of both the producer and consumer. These results are expected given the generalized nature of service production as captured by the CONPRO instrument. Added to the impact of Quality of service evaluation, is that perceptions are moderated from the individuals perspective of the service spectrum; being that service providers can also be service consumers. The final model presented in this thesis has been selected after a long specification search process. Even if this process has been driven both by goodness-of-fit and substantive considerations.

6. **Conclusion**

Service quality is critical to the competitiveness and survival of any service industry. A major challenge of the internet as a service delivery channel is how service firms can manage service quality as these remote systems like the banking industries bring significant change in customer interaction and behavior. The findings of the study shows that the coefficient of CONPRO e-service dimension was significant at 95% and a $p < 0.05$. The study also shows that the regression analysis and the impact of e-service quality was greatest in Responsiveness (B= 0.92) followed by reliability at (B=0.82). The Mean Gap score for CONPRO was lower at 2.64 than that of SERVQUAL, which was 2.66. The study also exposed the fact that E-service quality gives a more realistic result when it is accessed from both consumer and producer point of view. The results of the analysis using model fit metrics provide a good case for recommending the CONPRO model for measuring e-service quality compared to the SERVQUAL model which was only consumer centric. Service quality is critical to the competitiveness and survival of any service industry. A major challenge of the internet as a service delivery channel is how service firms can manage service quality as these remote systems like the banking industries bring significant change in customer interaction and behavior. Measuring service quality is therefore imperative to any service organization that wants to remain relevant in this global competitive world. This research can further be carried out in other services areas like insurance, using the CONPRO model. And the numbers of survey instrument can be higher than the one used in this research.

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