Service Quality Model: Model Fit Indices Results

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Service Quality is very important factor for telecom and mobile services as mobile services are almost completely intangible. Service quality is further source of effects that may influence perceived value, customer satisfaction and post purchase intentions. Further, perceived value may have direct effects on customer satisfaction and post purchase intentions. In theoretical modeling, the relationships of latent variables are tested on the model fit indices. The Model fit indices are improved through modification indices. The research work is based on SERVPERF and SERVQUAL Scale ordinal data. For theoretical modeling, SERVPERF scale data is used to obtain the model fit indices.

Keywords: service quality, mobile services, perceived value, customer satisfaction, post purchase intentions, SERVPERF and SERVQUAL Scale, modification indices, model fit, indices.

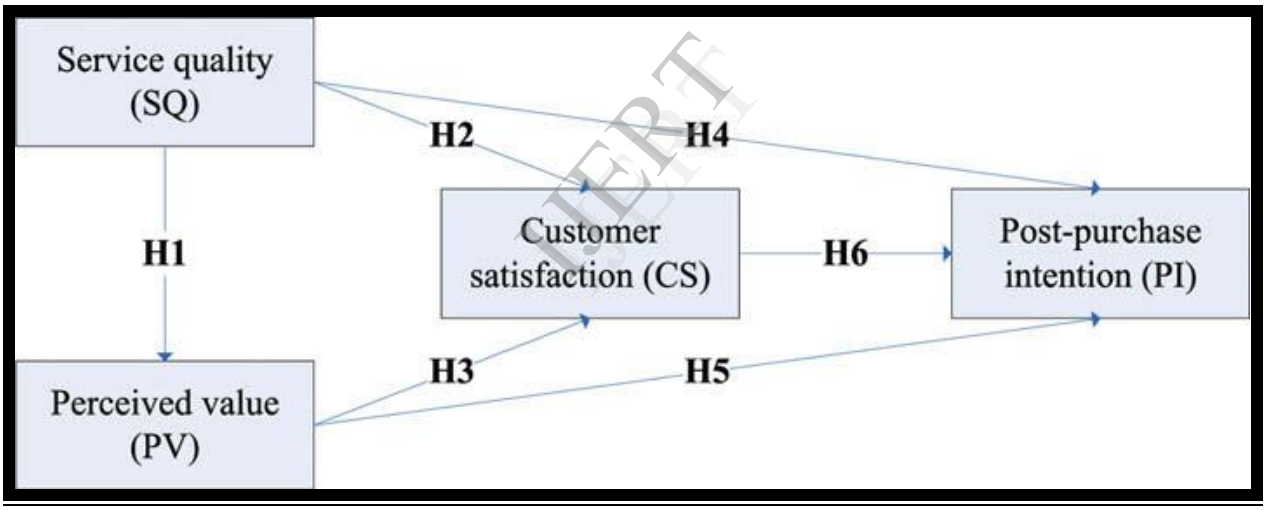
1. Introduction

The mobile phone service in India has expanded exponentially and at the same time, quality of services has been pivotal in retaining customers. The cut-throat competition among telecom companies led to churn each others of customers by low cost offers. After attracting the customer, the service quality becomes crucial and it should be so effective that customer becomes immune to the competitive offers and continue with the company. Service quality has multiple dimensions such as call connectivity, network coverage, SMS services, Value Added Services, Call Center Responsiveness, ability to overcome from critical failures, pricing of plans etc. These dimensions composes overall service quality. Service quality, may affect perceived value and it might create customer satisfaction. Finally, customer satisfaction may lead to post purchase intentions. In the discussion above; service quality, perceived value, customer satisfaction and post purchase intentions are latent variables which are directly not measurable.

The are measured through the manifest variables. Each latent variable can be expressed by many manifest variables. In this research, service quality (SQ) is measured by 13 manifest variables, perceived value (PV) is measured by 3 manifest variables, customer satisfaction (CS) is measured by 2 manifest variables and post purchase intention (PPI) is measured by 3 manifest variables.

The research is aimed at testing the theoretical modeling of service quality, perceived value, customer satisfaction and post purchase intentions. This is in fact, a confirmatory factor analysis in which the already existed model is tested in different settings. The service quality model as depicted below is being tested for fit with observed data in developing country like India, larger sample size of 1921 and telecom industry settings. Previous researches were done on small sample size, in developed country and other industry settings.

Figure 1: Service Quality Model



2. Research Methodology

The researcher took 1921 mobile phone users' responses for the analysis. A structured questionnaire consisting of some demographic questions, 21 expectations from service quality 7-point Likert scale questions and 21 service quality performance 7-point Likert scale questions is used. The questionnaire was emailed to the recipients through surveymonkey.com plate-form and 1921 valid responses were included for analysis. The age group of respondents is 18 years to 40 years.

3. Pre-Settings

The service quality model shown in Figure 1 has been proposed by many service marketing researchers and equally it has been tested in different settings to re-assess its validity for universalization and generalization**.** The most commonly used method for Confirmatory Factor Analysis is Structured Equation Modeling (SEM). SEM is widely used technique where data is based on larger sample size, ordinal scale and possibility of missing values in the observed data. It is the combination of Analysis of Variance (ANOVA) and factor analysis. The service quality model under reassessment is recursive due to direction of relationships flowing from service quality to post purchase intentions. Each manifest variable is attached with error variable/term. In proposed research, there are four latent variables, 21 manifest variables and 21 error variables. The latent variables are co-variated with each other.

Through Maximum Likelihood Estimation (MLE) in SEM, factor loadings are obtained for the directional relationships between latent variables. The MLE is an iterative process which is based on computer based guessing and obtaining the minimum between implied and calculated covariance matrix. Residuals are minimized to find best fit of the regression line to the data and regressions coefficients.

4. Modification Indices

Model can be improved to fit the observed data by estimating the most likely relationships between variables. Modification indices can be used to direct the improvements by adding additional paths or removing paths to the model. The modification indices which are abnormally high and are related to one latent variable can be experimented to-covariate for improvement of the model. It is not right to covary error terms with observed or latent variables, or with other error terms that are not part of the same factor. Thus, only modification available to coary is error terms that are part of the same factors.

The Various manifest variables related to respective latent variable are listed below:

TABLE 1: Manifest Variables and Latent Variables Used in Service Quality Model Based on SERVPERF Scale

Sr. No.	SERVPERF Manifest Variables/ Respective Code	SERVPERF Error Terms/ Respective Codes	SERVPERF Latent Variables/ Respective Code
1	Service Quality 1 / SQ1	sqe1	Service Quality / SQ
2	Service Quality 2 / SQ2	sqe2	
3	Service Quality 3 / SQ3	sqe3	
4	Service Quality 4 / SQ4	sqe4	
5	Service Quality 5 / SQ5	sqe5	
6	Service Quality 6 / SQ6	sqe6	
7	Service Quality 7 / SQ7	sqe7	
8	Service Quality 8 / SQ8	sqe8	
9	Service Quality 9 / SQ9	sqe9	
10	Service Quality 10 / SQ10	sqe10	
11	Service Quality 11 / SQ11	sqe11	
12	Service Quality 12 / SQ12	sqe12	
13	Service Quality 13 / SQ13	sqe13	
14	Perceived Value 1 / PV1	pve1	Perceived Value / PV

15	Perceived Value 2 / PV2	pve2	
16	Perceived Value 3 / PV3	pve3	
17	Customer Satisfaction 1 / CS1	cse1	Customer Satisfaction / CS
18	Customer Satisfaction 2 / CS2	cse2	
19	Post Purchase Intention 1 / PPI1	ppie1	Post Purchase Intentions / PPI
20	Post Purchase Intention 2 / PPI2	ppie2	
21	Post Purchase Intention 3 / PPI3	ppie3	

The Modification indices obtained for pairs of variables after reiterative co-variating the relevant error terms of same latent variables are as follows:

TABLE 2: Modification Indices

Variable Pair	Modification Indices
ppie3 and PPI	7.736
Ppie3 and CS	18.295
ppie2 and PV	8.995
Ppie1 and CS	7.659
ppie1 and PV	14.362

ppie1 and ppie3	8.768
cse2 and PPI	9.646
cse2 and PV	21.741
cse2 and ppie3	30.348
cse2 and ppie2	25.670
cse2 and ppie1	14.503
cse1 and PPI	21.429
cse1 and PV	43.940
cse1 and ppie2	35.455
pve3 and ppie3	43.971
pve3 and ppie1	16.991
pve3 and cse2	18.253
pve3 and cse1	29.175
pve2 and ppie3	10.015
pve2 and ppie2	19.218
pve2 and ppie1	4.571
pve2 and cse1	5.859
pve1 and ppie3	28.095
pve1 and ppie1	12.561

sqe10 and sqe12	5.570
sqe9 and sqe12	7.657
sqe8 and sqe12	9.589
sqe8 and sqe11	7.738
sqe8 and sqe9	11.325
sqe6 and PV	4.728
sqe6 and sqe8	4.844
sqe5 and sqe9	6.811
sqe4 and sqe11	10.447
sqe4 and sqe8	13.128
sqe3 and pve3	6.240
sqe3 and sqe12	45.235
sqe3and sqe11	24.427
sqe3 and sqe9	41.743
sqe3 and sqe8	26.464
Sqe1 and sqe10	5.566
Sqe1 and sqe8	5.169
Sqe1 and sqe5	9.802
Sqe1 and sqe3	17.247

And the covariated pairs of error terms are tabled below:

TABLE 3: Covariated Pairs of Error Terms

Latent Variables	Covariated unobserved variables groups
Service Quality (SQ)	sqe4, sqe5, sqe6, sqe10, sqe11sqe12
Perceived Value (PV)	pve1, pve2

After co-varying the error terms of the same latent variables as mentioned in Table 3, the modification indices are obtained.

5. Model Fit Indices

Various model fit indices are available to find the best fit of the theoretical model with observed data. For the proposed service quality model on mobile phone services, following modification indices are obtained:

CMIN

CMIN is the ratio of Chi-square statistic and degree of freedom. CMIN value of 3 or less is acceptable and model is assumed to be good fit with the observed data. The index statistics are as follows:

TABLE 4: Chi Square Statistic Model Fit Indices

	CMIN	P-Value	CMIN/Degree of Freedom
Model Fit indices	543.661	0.000	4.420

RMR, GFI, AGFI and PGFI

Root Mean Residuals indices should be as small as possible. GFI for goof fitting model should be greater than 0.95 or near to 1. Similarly, AGFI value should be greater than 0.95 for good fitting model. PGFI should be more than 0.50 and it is more realistic goodness fit when

numbers of parameters are more. For the proposed research model following are the RMR, GFI, AGFI and PGFI:

TABLE 5: RMR, GFI, AGFI and PGFI Model Fit Indices

	RMR	GFI	AGFI	PGFI
Model Fit Indices	0.014	0.969	0.957	0.697

Baseline Comparison with NFI, RFI, IFI, TLI and CFI

Base comparison indices like NFI, RFI, IFI, TLI and CFI should be greater than 0.95 for excellent fit of model with observed data. For the proposed model, following indices are calculated:

TABLE 6: Baseline Comparison Model Fit Indices

	NFI	RFI	IFI	TLI	CFI
Model Fit Indices	0.976	0.970	0.981	0.976	0.981

Parsimony Adjusted Measures Indices

PRATIO, PNFI and PCFI are parsimony adjusted model fit indices. Closer they are near to one, better is the model fit with observed data Following parsimony adjusted measures are calculated for the proposed theoretical model:

TABLE 7: Parsimony Adjusted Model Fit Indices

	PRATIO	PNFI	PCFI
Model Fit Indices	0.804	0.784	0.789

FMIN

FMIN index of model fit is useful when CMIN does not give favorable result due to larger sample size. The closer the FMIN index to zero the better is the model fit with observed data. For proposed research model, following are the FMIN indices obtained:

TABLE 8: FMIN Model Fit Indices

	FMIN	F0	LO 90	HI 90
Model Fit Ind.	0.283	0.210	0.184	0.259

RMSEA

Root Mean Square Error Approximation index ranges between 0 and 1. Its value 0.05 or lower is indicative of model fit with observed data. P Close value tests the null hypothesis that RMSEA is no greater than 0.05. If P Close value is more than 0.05, the null hypothesis is accepted that RMSEA is no greater then 0.05 and it indicates the model is closely fitting the observed data. The following RMSEA is calculated for proposed service quality model:

TABLE 9: RMSEA Model Fit Indices

	RMSEA	LO 90	HI 90	P Close
Model Fit Indices	0.042	0.039	0.046	1.000

HOELTER

HOELTER index is calculated to find if chi-square is insignificant or not. If its value is more then 200 for the model then model is considered to be good fit with observed data. Following are the HOELTER indices for service quality model:

TABLE 10: HOELTER Model Fit Indices

	HOELTER 0.05	HOELTER 0.01
Model Fit Indices	530	574

6. Conclusions

By observing the model fit indices, the model seems to have good fit with observed data. Except for CMIN and Chi-square statistic, other model fit indices are under the acceptable limits. Though, HOELTER indices suggest that, any sample size above 574 makes CMIN and Chi square statistic indices insignificant even if they are not under acceptable limits and researcher took sample size of 1921, yet improvement in the model is desirable. There is need to introduction of new latent variable in the service quality model which might mediate the relationship of service quality with other latent variables. Further, model can be retested or reassessed on SERVPEX scale which is parsimoniously more suitable then SERVQUAL and SERVPERF scales.

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