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Appraisal of service quality in power sector of NCR

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Abstract
The experimental approach for the service quality of electricity is represented in this paper for better insight of its determinants. This approach is particularly used to segregate the different aspects of electricity services in the National Capital Region. EFA as an independent method is used to filter out the dimensions of service quality. The five dimensions of service quality are chosen and data are collected by two step questionnaire, a set of two hundred responses is selected randomly. Although, this study is confined to electricity services provided by electricity companies in NCR, the study provides an excellent scope for the researchers to explore different areas of service quality.

Keywords: quality of service, NCR, EFA

1. Introduction
Quality is defined as "the conformation of product to the parameters of technical standards" and service is stated as "the entire process involved in creating the value of the product from planning and communication at different levels and stages". Hence, service quality of the company makes the basis of the expectations of end users. Service quality, unlike the past, has become necessary for product managers, practitioners, researchers and even entrepreneurs. Today, the market conceives the belief that service quality is the strongest tool for cost saving, product performance, business execution, end user's satisfaction and his loyalty. Absence of all these leads to heavy distribution losses to the company (Saini, 2017, 2018[a], 2018[b], 2018[c]; Singh, 2016; Saini, 2018[j]) [7, 24, 25, 26, 27, 36, 37]. Service Quality is the best mean to fast and desired profitability in business.

Service Quality is the professional parameter to measure and compare the expectation and performance of any product. WOM (Word of Mouth) for a product is the best marketer in its market due to increasing awareness of customers (Saini, 2018[i], 2018[k], 2018[l]) [33, 38, 39]. Any end user before buying a product counts his past experience and clarifies his queries. Based on personal experience after the use of the product, he recommends the product to his peers and relatives. However, there may be a gap between the expectations of the customer for the product when compared to the real experience after use of the same. Parasuramam, Zeithaml and Berry highlighted the need for high quality of service. GAP model focuses over the unsuccessful delivery of services which the customer retains for further reference. There is a bridge between the experience and expectation of a customer which when doesn't reach the other end, the gap is created.

If the capital of India wants to achieve the name of a world class capital, it has to uplift its efficiency and become power-sufficient maintaining the cost-standard as well. In 2003, some reforms were made in this direction and private sectors were engaged in the distribution of power in Delhi. This was the first step taken towards the target. As a result, the amount of metered power increased to a good level and made a good impact on cost cutting as well as controlled losses which reduced the burden of finance on the electricity distribution companies. It helped to reach a certain level of economical advancements. By 2010, Delhi achieved the name of a power-surplus city. The generation capacity though remained the same; Delhi was able to stand as an ideal of unique power reform unlike one of the south-east States of India which appeared unplanned. Beside these efforts, attention towards quality of supply and smart distribution systems also grew (Beniwal, 2018[a], 2018[b]; Kumar, 2018[a], 2018[b]; Sumit, 2018; Saini, 2018[m]) [40, 41, 42, 43, 45]. Literature comprises of many significant works addressing the analysis of quality of electricity supply (Kapoor, 2011, 2007, 2013; Saini, 2018, 2017, 2013) [3, 7, 24, 4].

2. Literature Review
The study of service quality gained attention and importance since 1980. From then, several renowned people devoted their contribution in the research of service quality. Their quantitative and qualitative analysis towards service quality has become a reference for the learners (Saini, 2018[d], 2018[e], 2018[f], 2018[g], 2018[h]) [28, 29, 30, 31, 32]. The approaches of Taylor, Berry, Oliver, Parasuramam and many others are worth mentioning (Cronin & Taylor, 1992; Gronroos, 2007; Kang & James, 2004) [15, 16, 18]. SERVQUAL and SERVPERF are two models used to measure the level of service quality (Brochado, 2009; Brysland & Curry, 2001) [10, 11]. Still, more models are readily found for empirical studies. However, to study the quality industry-wise, it is better to go with customized model which suits the norms of the industry. Customization is required as operational management of every utility differs from each other. Empathy, reliability, communication, tangibility, assurance, responsiveness,

credibility, security, durability, etc. are the different parameters to measure service quality. Researchers have also studied these parameters and defined their importance.

How does service quality contribute to the household income of the consumers?

Investigation on this was made in 2014 by Ujjayant Chakravorty. Two fields (extent of electrification and quality of electricity supply) were considered two parameters to analyse the service quality by investigating the data of around 10000 households. The report described that non-agricultural income of rural households profit by 9% due to grid connection and quality supply encourages to get it raised by approximately 29%. Hence, grid connection alone is not sufficient to raise the income, high quality of electricity supply is even more important.

Reviewers write that in electricity sector customer service performance measures grew to develop privatization in 1989. Information and Incentive projects (IIP) are management initiatives on organizational level in an electricity distribution company. It needs to develop and grow to accommodate the global comparison of service standards. In South Haryana utilizing multiple analysis regressively (Sharma, 2010), a valid and trustworthy instrument was developed to check the customer perceived service quality. The results indicated the best supply of electricity which attracted pricing, convenience, empathy, assurance, responsiveness and reliability.

The correlation and regression analysis was useful set up to measure service quality, customer loyalty and satisfaction among the industrial customers who are served by public sectors for distribution of electricity (Chodzaza *et al*., 2013) [14]. SERVQUAL seeks the consumer's feedback for the quality of service provided to them. Parasuramam invented this model. Writers highlight the dissatisfaction in industries in Malawi. This study focused on the examining the functional dimensions of service quality alone. It did not count the relation of technical parameter of service quality comparing with satisfaction or loyalty of the end user.

Sometimes, due to major faults, interruption occurs. There may be some responsibility of the consumer as well apart from the utility. Emphasis has been made upon the question of compensation to the customers by the utilities for bad or dissatisfactory service. Ken Costello (2012) [12] worked upon all the positive and negative aspects and outcomes of the compensation to find an answer and the question was: Should utilities compensate the consumers? If yes, how much?

The total variability of EFA has five main dimensions - reliability, tangibility, assurance, responsiveness and empathy in service quality which accounts approximately 63%. S. Achchuthan *et al*. (2014) [1] worked hard to find the exact dimensions of service quality in Badulla, Sri Lanka provided by Ceylon Electricity Board. Based on model of Parasuramam model, he designed questionnaires and collected secondary data through random sampling technique. This has become a major tool in public sector. Private sectors too can enrich the services by progressing the analysis of service quality.

South Indian electricity sector received a new model of service quality enhancement (Satapathy, 2014) [34]. To evaluate electricity customer satisfaction, SEM (Structural Equation Modeling) is utilized and also ensured to count the quality satisfaction. Hence, SEM checks the terms between the electricity service and dimensions of service quality. The report of empathy, reliability, communication, tangibility, assurance, responsiveness, credibility, security, durability can be easily obtained and trusted through this model.

Table 1: Demographic analysis of respondents

Variable	Category	Frequency	Percentage
Age	18-30 years	29	19.3
	30-40 years	43	28.7
	40-50 years	49	32.7
	50-60 years	19	12.7
	Above 60 years	10	6.7
Gender	Male	129	86.0
	Female	21	14.0
Category	General	87	58.0
	OBC	49	32.7
	SC/ST	14	9.3
Education	Illiterate	5	3.3
	Matric	17	11.3
	Upto 10+2	39	26.0
	Graduate	56	37.3
	Post Graduate/ Above	28	18.7
	Others	5	3.3
Monthly Income	Upto Rs. 10000	38	25.3
	Rs. 10000-50000	80	53.3
	Rs. 50000-100000	26	17.3
	Above Rs. 100000	6	4.0
Locality	Rural	81	54.0
	Urban	69	46.0
Employment	Self-employed	69	46.0
	Government Job	45	30.0
	Private Service	26	17.3
	Unemployed	7	4.7
	NGO Worker	3	2.0
	Others	0	0.0

3. Research Methodology

In this study, we took the entire population of NCR who consumes the electricity power. Department of Census says there are 13215 users approximately. According to Kreicie & Morgan (1970) [19], 95% of confidence level was kept and data was collected from 200 users out of the total population. The thumb rule given by Roscoe in 1975 says that sampling should be between 30 to 500 to give appropriate results. 78% of the total distributed questionnaires were recollected with feedback for the survey.

Developed through previous review, this survey method has a set of questions (questionnaires having sections A and B) wherein the respondents' answers are recorded by them. Here, part A contains questions based on demographic profile which is gender, age, occupation, society, marital status, etc. Each question has variables which are grouped for measurement on nominal scale. Certain codes are assigned to the objects for easy answers and quick assessment as well. Part B is structured with 22 statements which have five indicators as point-scale. To collect the data based on the service quality of electricity supplied, 5-point scale is arranged from the lowest

to the highest (strongly disagree-1, strongly agree-5). With the help of this questionnaire, degree of agreement or disagreement of the respondent is collected to measure the items on a scale of intervals.

4. Discussion

Demographic information of the respondents are listed in Table 1. The majority belonged to middle class. 56% male earn high salary. 47% females earning middle class income.

Table 2: Reliability analysis using Cronbach's alpha

Code	Statement	Alpha Value
T1	All equipments in good condition.	.823
T2	Visually appealing physical facilities	.813
T3	Employees in proper uniform	.826
T4	Properly maintained records	.802
R1	Services within the promised time	.833
R2	Employees deal every problem with sincerity	.862
R3	Correct solution in first visit only	.842
R4	Employees give correct estimated time of supply restoration	.818
R5	Error free records	.823
RS1	Not much waiting time in queue	.848
RS2	Employees ready to help	.827
RS3	Quick mitigation of faults	.842
RS4	Quick response to customers' requests	.855
A1	Trustworthy employees	.832
A2	No danger in using electricity	.854
A3	Employees courteous towards customers	.821
A4	Knowledgeable employees	.803
E1	Individual attention to every customer	.854
E2	Operating hours according to customers' needs.	.843
E3	Employees give personal attention.	.832
E4	Employees resolves customers' complaints	.833
E5	Understand customers' needs	.827

4.1 Test of Reliability and Validity

It is readily proven by the different blackouts faced in the different areas such as in 1999 that stability reflects in terms of continuity of electricity. Reliability of the participating factors must be ensured to affirm validity measures used. For internal consistency analysis, we measure the factor reliability from factor analysis. The Cronbach's alpha of 0-1 range of representation is mostly employed for reliability confirmation. Value of alpha>0.6 is acceptable measure in case of exploratory research (Black and Porter, 1996) [9]. But, the thumb rule for the internal reliability is that alpha should be greater or equal than 0.7 (Nunnally, 1978) [21]. The various coefficients of reliability for respective factor are shown in Table 2.

4.2 Statistics of Reliability

If alpha for tools is more than 0.8 for 0-1 scale, the tools are considered reliable (Rubin & Babbie, 2009) [23]. The value of alphas, calculated here, ranges between 0.802 to 0.862 which shows that all the values are higher than the threshold value.

4.3 Guiding principle for KMO test

Table 3: KMO Value for Factor Analysis

KMO Value	Degree of Common Variance
0.90 to 1.00	Marvelous
0.80 to 0.89	Meritorious
0.70 to 0.79	Middling
0.60 to 0.69	Mediocre
0.50 to 0.59	Miserable
0.00 to 0.49	Unacceptable

Methods for measuring the variables factorization and relationship strength becomes more complex if measured by Bartlett's Test of Sphericity and the Kaiser-Meyer-Olkin Test of Sampling Adequacy

4.4 Bartlett's test and KMO measure

Table 4: KMO and Barlett's Sphericity test values

Description	Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.701
Bartlett's Test of Sphericity Approx. Chi-Square	2829.714
df (degree of freedom)	180
Significant	.000

(KMO) (Beavers *et al*., 2013) [2]. KMO & Bartlett's Sphericity test allowable index should be over 0.5 (Kaiser, 1974) [17]. The Bartlett's Test conducted on the collected responses displays the validity, effectiveness and importance of the study. KMO matrix value lies in the middle range which is 0.701 and also the chi-square test value is 2829.714 (significant at $p<0.05$). These test values justify the appropriateness and suitability of the data.

4.5 Exploratory Factor Analysis (EFA)

The group of primary procedure for data reduction and summarization is known as Factor Analysis (Malhotra and Satyabhushan, 2010) [20]. In this study, identification of crucial factors or say dimensions of electric service quality in NCR, the exploratory factor analysis (EFA) is used with Principal Component Analysis (PCA) extraction method. The total variance in the data is estimated with the help of PCA method (Malhotra and Satyabhushan, 2010) [20].

4.6 Factor loadings matrix

Table 5: Results of Factor Analysis

Factor	Factor (variance)	Variables included in the factors	Factor
F1	Tangibility (16.464)	All equipments in good condition	.823
		Visually appealing physical facilities	.841
		Employees in proper uniform	.819

		Properly maintained records	.725
F2	Empathy (13.932)	Individual attention to every customer	.532
		Operating hours according to customers' needs	.712
		Employees give personal attention	.785
		Employees resolves customers' complaints	.720
		Understand customers' needs	.743
F3	Responsiveness (13.790)	Not much waiting time in queue	.832
		Employees ready to help	.765
		Quick mitigation of faults	.843
		Quick response to customers' requests	.633
F4	Reliability (9.843)	Employees deal every problem with sincerity	.554
		Correct solution in first visit only	.543
		Correct estimated time of supply restoration	.787
		Error free records	.657
F5	Assurance (8.869)	Trustworthy employees	.565
		No danger in using electricity	.755
		Employees courteous towards customers	.676

A variance of 16.453% of five items is taken as tangibility in factor F1. A new item is considered additionally while all other dimensions are equal to the original dimensions. Factor 2 has variance of 13.945% and it contains 5 items. Whereas, four items are taken in factor 3 and considered as responsiveness. Similarly, factor 4 and factor 5 with variance 9.824% and 8.858% named as reliability and assurance respectively. Item marked as "A3" was isolated in EFA initial run. With the above considered five service quality factors, a model defining all is planned in the results and the planned model is formulated by statistical evidence.

5. Conclusion

This research is carried out to define service quality dimensions of electricity distribution services in NCR. 22 items (statements) are measured in the formulated questionnaire. The SERVQUAL model suggested by Parasuramam et al. (1985) was the main mechanism to set up the questionnaire. The service quality dimensions are identified by Exploratory Factor Analysis (EFA) and factor analysis; by this method, twenty one key variables and five factors/dimensions are identified. The first order factors of service quality in NCR are categorized as first order factor depending upon these five dimensions. These five dimensions are reliability, empathy, assurance, tangibility and responsiveness. The total variability of the selected factors calculated by the analysis is 62.886%. The different statements are listed and classified for every dimension. Further, the study is directed toward the NCR electricity services. The study is open to fine tune the explored electricity service dimensions and for new dimensions' identification for future purpose

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