



Service Quality Gap with Special Focus on DISCOMs in India: An Empirical Assessment

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ABSTRACT: Service quality is visualized as the disagreement between the expectations of customers from the service provider and the actual services delivered. This paper investigates the scenario of this disagreement in context of Indian electricity DISCOMs where the concept of service quality has recently emerged as an important concern for both consumers and suppliers. The service quality of DISCOMs is empirically assessed in terms of gap between the customer's expectation and perception with respect to ten different aspects of the company's services as per SERVQUAL model, e.g., tangibility, empathy, responsiveness, reliability, communication, security, courtesy, credibility, competence and accessibility. Empirical analysis of the service quality gap has brought certain dimensions of service quality to the fore about which DISCOMs need to seriously work harder to improve the balance between customer expectations and perceptions. This study has been carried out by surveying the electricity customers of different DISCOMs to explore about different aspects of services of various DISCOMs. The comparative assessment of multiple DISCOMs' services has been done by using paired sample *t*-test and independent sample *t*-test. Findings of this work highlight significant differences between customer expectations and perceptions with respect to all dimensions of service quality.

Keywords: DISCOM, Expectations, Gap, Perceptions, SERVQUAL, Service Quality.

I. INTRODUCTION

Service quality was not so much important in earlier times. In the past, the electricity customers of DISCOMs used to get satisfied with the nominal services which were not upto the mark. But, in today's world with the economic development and growth of society, people have become more aware and concerned about the quality of service for which they are spending money [1]. They want the best quality of services for every utility whether it is electricity, water, telephone etc. Consequently, service sector has become more important and competitive [2]. The entire service sector depends on the quality of its services. Service quality introduces competition into the market driven by service industry.

Service means actions, methods and performances shown by one person or company for another person or company [3]. Services can be characterized by following properties: (i) Intangibility (ii) Heterogeneity and Perishability. On account of these properties, measurement of quality of services is not an easy job as it can't be touched, stored or weighed [4]. Literature abounds with definitions of service quality. For the service sector, the definition of quality was primarily given by Gronroos [5] who interpreted quality as the product of evaluation in which the expectations of customers get compared with the perceptions which customer get from the present experiences. Zeithaml *et al.* [6] described that service quality depends on customers' judgments that how much the services of the utility company fulfill the customers' expectations. Fulfillment of the expectations results into such

perceptions of the services which develops customer satisfaction. Service quality is defined by Reeves and Bednar [7] as perfection, value, agreement with the specifications and meeting or surpassing expectations of the customers. To study service quality, Parasuraman *et al.* [4] developed SERVQUAL model in 1985 which identifies the gap between the expectations and perceptions. This model is also known as 'GAP' model [8], and it has also become a standard for measuring service quality [9].

SERVQUAL model consists of basically five dimensions but it has been extended to ten dimensions, namely: tangibility, responsiveness, reliability, communication, empathy, accessibility, credibility, assurance, courtesy and security. This model measures the gap between what customers expect from the company on these dimensions and what they experience. In this modern world, customers' expectations are rising continuously but company is not performing upto the mark leading to increasing gap between actual services provided and the expectations. This situation has created an alarming stage for the service firms to improve their services so that they can win in the Indian marketplace. Electricity DISCOMs constitute an important segment of the service sector. As per current scenario, the service quality of DISCOMs, especially the Government owned DISCOMs, is not meeting the customers' expectations [10]. In some States like Haryana, the entire electricity distribution sector is in hands of the Government DISCOMs. As a result, the customers are not getting the satisfactory services and even, the DISCOM is not getting the due financial gains and growth.

Table 1: Interpretation of dimensions of service quality in context of DISCOMs.

Dimension	Interpretation
Tangibility	zonal offices, electricity connections and billing records, equipments etc.
Empathy	personal attention to customer's grievances
Responsiveness	help and quick service to customers
Reliability	provide the assured service reliably and correctly
Communication	prompt and in advance information system to facilitate customers
Security	financial safety and personal safety to customers from hazards
Courtesy	respectful and considerate attention towards customers
Credibility	ability to inspire trust and confidence of customers
Competence	ability to fulfill customers' expectations
Accessibility	facility of grievance reporting and redressal to the customers

Therefore, this paper explores about the service quality of DISCOMs, particularly belonging to an Indian State, i.e., Haryana where only two DISCOMs are in operation and both DISCOMs are government owned making the scenario of service quality more intense. There are two DISCOMs working under the Government of Haryana, namely, Uttar Haryana Bijli Vitran Nigam (UHBVN) and Dakshin Haryana Bijli Vitran Nigam (DHBVN). In this work, SERVQUAL model has been utilized to assess the service quality of both the companies of Haryana. Ten aspects of service quality have been looked into which are tangibility, empathy, responsiveness, reliability, communication, security, courtesy, credibility, competence and accessibility. These aspects can be briefly interpreted as tabulated in Table 1. This work measures the gap between customers' expectations and perceptions towards all these dimensions. This gap determines whether the customer will be satisfied or dissatisfied. This work used paired sample t-test to test whether the gap between customer expectations and perceptions is significant or not. This analysis provides the dimensions on which DISCOM's performance is not meeting the customers' expectations.

II. RELEVANT LITERATURE

Service quality is a well explored field of research; still it can be further prospected for exploring into the methods for prosperity of service industry. Numerous models have been proposed for service quality analysis [11]. There are plentiful studies concentrating on the analysis of service quality in different service sectors like banking, health, travel, electricity etc. [12]. Few significant studies focusing on service quality of electricity distribution sector are briefed here. Chodzaza and Gombachika analyse the service quality of public electricity utility of Malawi and the resultant loyalty and customer satisfaction in case of industrial customers in Malawi [13]. Authors find out the customer dissatisfaction using the relationship between service quality, customer satisfaction and customer loyalty. ChingangNde and Lukong show the importance of customer satisfaction employing a model called SERVQUAL model for measuring the service quality in grocery stores [14]. Sharma proposes a reliable tool having seven dimensions for assessment of service quality of DHBVN offered to South Haryana [15].

This assessment tool can be used by policy makers of DHBVN and other suppliers in retail electricity supply industry for monitoring and improvement of service quality, keeping in view the perceptions of their customers. Andaleeb *et al.* examine the impact of service quality on the post-complaint satisfaction of electricity customers [16]. They perform the regression analysis and find the dimension of empathy as the most effective dimension in impacting the customers' satisfaction level. Gunatilake *et al.* [17] perform an experiment in Madhya Pradesh, India and show that if the service quality in terms of hours of supply, power quality etc., degrades then willingness of the customers to pay bill also decreases.

Manjunath *et al.* show that service quality of the services offered by Electricity Company decides the consumer behavior towards electricity consumption and the company [18]. Achchuthan *et al.* use the SERVQUAL model having five dimensions (tangibility, empathy, responsiveness, reliability and assurance) with 21 items in total for the measurement of service quality of Ceylon Electricity Board in Sri Lanka [19]. Satapathy proposes a model for service quality enhancement to explore about scope of service quality and customer satisfaction in the electricity industry using a questionnaire based survey [1]. Tabassum and Rahman propose the most suitable variables to predict the electricity supply quality, particularly in Bangladesh through correlation and regression analysis [20]. Rahman *et al.* assess the service quality of DISCOM in Dhaka particularly with respect to their online bill payment system [21]. They utilized better version of SERVQUAL model, i.e., SERVQUAL-butterfly model to study the relationship between customer expectations, their perceptions and satisfaction level.

James and Priyadarshini survey the customer expectations and perceptions towards the service quality of electricity services in Kerala region and have found that service quality doesn't meet the customer expectations [22]. Resende and Cardoso apply multivariate statistical analysis techniques for analysing the multidimensional nature of service quality [23]. Some of the service quality indicators are interruption of electricity services, voltage level of electricity services, tariff, bill, efficiency in bill delivery, meter reading errors, consumption variation, undue service suspension, non-compliance with deadlines etc.

Besides electricity distribution sector, efficiency assessment has been the topic of concern in electricity generation sector also [24]. Despite of all these studies, there is lack of study aimed at the service quality analysis of the Government owned Indian DISCOMs like DHBVN and UHBVN supplying electricity to South and

North Haryana respectively. Such kind of study can easily help the policy makers of electric utilities of Haryana to focus on the areas where the company services do not match with the customers' expectations.

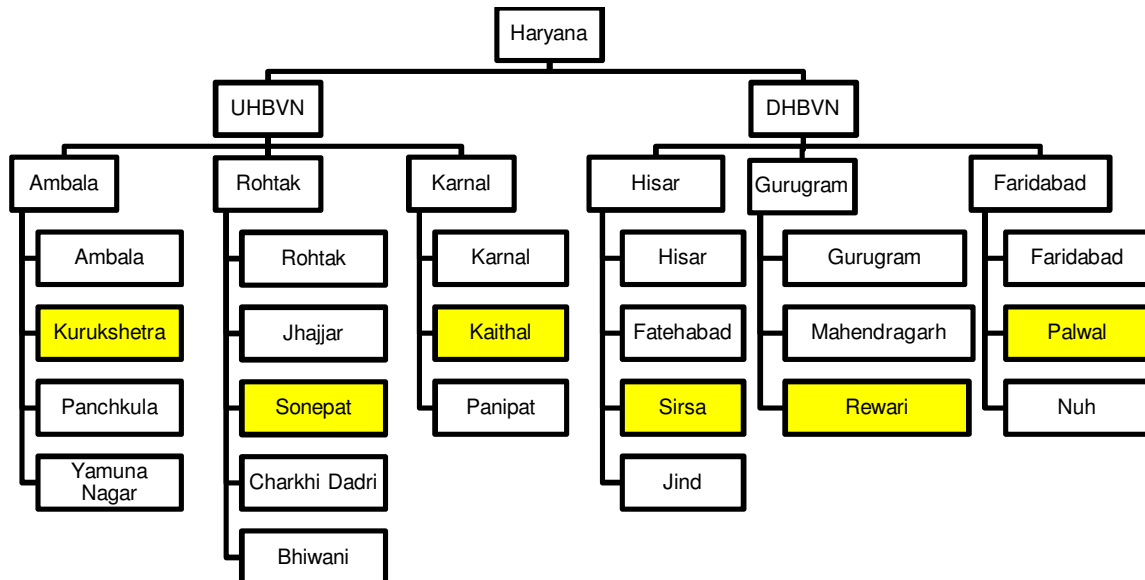


Fig. 1. Organizational structure of Haryana on the basis of commission level.

III. RESULTS AND DISCUSSION

The present study has been carried out for analyzing the customers' expectations from services of DISCOM and the actual services of DISCOM. The main purpose of this work is the assessment of difference between the expected and actual service quality of electricity supply companies in Haryana. SERVQUAL model has been chosen for the analysis of service quality. According to SERVQUAL model, service quality is a function of gap in customer expectations and their perceptions regarding the services of DISCOM. Focusing on this fact, the objective of this work has been chosen as follows: To make a gap analysis of customer expectations and perceptions towards electricity distribution companies in Haryana.

This objective has been achieved by empirical analysis of difference between customers' expectations and perceptions collected through a structured questionnaire on a five-point scale as defined in the forthcoming sub-sections. For statistically verifying the results, a hypothesis has been framed which is as follows: There is no significant difference between the expectation and perception of customers regarding distribution companies' service quality. This hypothesis is about the difference in overall service quality of both DISCOMs, i.e., UHBVN and DHBVN. Based on this hypothesis, ten sub-hypotheses have also been framed which talk about difference between expectation and perceptions in case of both companies with respect to ten different dimensions of SERVQUAL model.

A. Survey Instrument Design

The major research instrument used in collecting the data for this study, i.e., the questionnaire has been designed to measure the customers' expectations and perceptions towards the service quality of electricity supply companies. Questionnaire has two sections; one is for capturing the demographic information of the respondent and another is for collecting the customers' expectations and perceptions. The dimensions adopted in the questionnaire for judging the service quality are based on the SERVQUAL model proposed by Parasuraman *et al.* [4]. Dimensions are tangibility, empathy, responsiveness, reliability, communication, security, courtesy, credibility, competence and accessibility. A total of 50 scale-items for ten dimensions of service quality having 5 items each are used. The questionnaire is presented in a 5-point Likert rating scale with 5 = "very strongly agree" and 1 = "very strongly disagree" at both extremes.

B. Sample and data collection

The sample population for this study are the electricity customers (domestic, commercial and industrial customers) in the State of Haryana being served by two electricity supply companies: UHBVN and DHBVN. For data collection from the sample population, stratified random sampling has been used to select the samples in such a manner that the sample can represent the entire population with good accuracy. In stratified random sampling, the population is segmented into mutually exclusive groups or strata and then each strata is randomly sampled.

Table 2: Total number of electricity customers in districts selected for sample survey.

Divisions	Districts	Domestic		Commercial		Industrial		Total	
		No. of Customer	%	No. of Customer	%	No. of Customer	%	No. of Customer	%
Ambala	Kurukshetra	179371	14.77	29071	19.98	2471	12.49	210913	15.29
Hisar	Sirsa	220702	18.17	31283	21.50	3527	17.84	255512	18.52
Rohtak	Sonepat	285287	23.49	27592	18.96	6185	31.28	319064	23.13
Gurugram	Rewari	185046	15.24	19204	13.19	2349	11.88	206599	14.98
Faridabad	Palwal	169098	13.93	16760	11.52	3094	15.65	188952	13.69
Karnal	Kaithal	174820	14.39	21589	14.84	2144	10.84	198553	14.39
Total		1214324	100	145499	100	19770	100	1379593	100

Source: <http://uhbvn.org.in/staticContent/documents/>; <http://www.dhbvn.org.in/staticContent/information/statisticaldata/>

This type of sampling is very useful when it is important to have certain characteristics of the overall population in the selected sample. In the present study, samples are chosen according to proportionate stratified random sampling in which the sample size of each stratum is in proportion to its complete population size. Sample size of each stratum is calculated by using following equation:

$$n_s = \frac{n}{N} * N_s \quad (1)$$

Where n_s is the sample size of stratum s and N_s is the total population of stratum s . N is total population size and n denotes total sample size. In this formula, $\frac{n}{N}$ is the sampling fraction which remains same for each stratum. Proportionate stratified random sampling method has certain advantages like greater precision, requirement of smaller sample and protection against an “unrepresentative sample”. There are six divisions in Haryana which have further some districts under them. The administrative structure of Haryana is shown in Fig. 1. UHBVN supplies electricity to three divisions which are Ambala, Rohtak and Karnal. DHBVN supplies electricity to three divisions which are Hisar, Gurugram and Faridabad. Each division contains multiple districts which have been considered as different stratum. One district (or a stratum) is selected from each division for sample survey. Selected districts (or strata) are Kurukshetra, Kaithal, Palwal, Rewari, Sirsa and

Sonepat. Selected districts (or strata) are highlighted in yellow colour in Fig. 1.

While choosing the districts for sample survey, it has been taken care of that number of customers in the chosen district should neither be very less or very large. In case of small sample, there is lesser probability of getting response which could really represent the expectation and perception of whole population. In case of large sample, data collection is little bit difficult due to poor response rate of customers and also needs a lot of time and money resources. In all of the six divisions, formula for sample size calculation has been applied separately. Here, total sample (n) is taken as 500 for each division. For data collection, each electricity connection has been considered as one individual. The total number of connections in the selected districts are shown in Table 2. As shown in Table 2, there are three types of electricity connections surveyed in this work which are domestic, commercial and industrial. Consequently, number of respondents has also been computed separately for each type of connection depending on the proportion of domestic, commercial and industrial connections in the total number of connections. Sample size of each selected district is tabulated in Table 3. Thus, total responses to be collected through method of scheduling from UHBVN and DHBVN customers are 1099 and 1038 respondents respectively.

Table 3: Selection of respondents on the basis of divisions and selected districts.

Division	Districts	Domestic			Commercial			Industrial			Total		
		U	R	Total	U	R	Total	U	R	Total	U	R	Total
Ambala	Kurukshetra	42	72	114	84	29	113	38	40	78	164	141	305
Rohtak	Sonepat	49	99	148	98	38	136	47	146	193	194	283	477
Karnal	Kaithal	33	104	137	73	40	113	33	34	67	139	178	317
Total (UHBVN)		124	275	399	255	107	362	118	220	338	835	602	1099
Hisar	Sirsa	40	86	126	97	46	143	80	64	144	217	196	413
Gurugram	Rewari	37	105	142	71	47	118	16	33	49	124	185	309
Faridabad	Palwal	44	98	142	80	36	116	19	39	58	143	173	316
Total (DHBVN)		121	289	410	248	129	377	115	136	251	484	554	1038

Note: U stands for Urban and R stands for Rural. Top three rows show districts coming under UHBVN and bottom three rows show districts coming under DHBVN.

Source: Secondary data

C. Statistical analysis method

The complete statistical analysis has been performed in SPSS. Data analysis consists of a two-phase approach. The first phase aims to investigate about reliability and validity of the dimensions and the second phase performs the empirical analysis of the customers' expectations and perceptions. Reliability analysis has been first done using Cronbach's alpha after the process of data cleaning to verify the validity of dimensions of the survey instrument and thus validity of collected data. Demographic analysis is done to take an overview of demographic information of sample population whose responses have been collected. Gap analysis is carried out for the empirical analysis of the customers' expectations and perceptions towards the electricity supply services of both companies: UHBVN and DHBVN.

IV. EMPIRICAL ANALYSIS

A. Sample profile

Demographic profile of customers including age group, gender, education level, income group, category, type of employment has significant impact on customer expectations and perceptions regarding the service quality of DISCOM. For instance, highly educated customer will expect more from DISCOM. Likewise education, all demographic characteristics affect customers' expectation and perception differently.

Therefore, there is need to study demographic profile of respondents as a primary concern. 1099 and 1038 respondents, respectively, have been asked for survey of service quality of UHBVN and DHBVN. Table 4 presents the demographic profile of respondents which is composed of age group, gender, category, qualification, income group, locality and employment. Out of 1099 respondents who are UHBVN customers, 36.4%, 24.6%, 19.1%, and 12.7% respondents are of age group 40-50 years, 30-40 years, 18-30 years and 50-60 years respectively. 87.2% respondents are male and only 12.8% respondents are female. 61.2%, 28.3% and rest of the respondents belong to general, OBC and SC/ST category respectively. 44.6%, 22.1%, 17.5%, 5.7%, 9.4% and 0.7% respondents are qualification of graduate, up to 10+2, matric passed, illiterate, post-graduate/above and another qualification respectively. Locality-wise, 56.1% and 43.9% respondents account for rural and urban residents respectively. Among all respondents, 24.7%, 39.1%, 23.8% and 12.3% respondents are earning up to Rs. 10,000, up to Rs. 50,000, between Rs. 50,000 and Rs. 1,00,000 and above Rs. 1,00,000 respectively in a month. 73.3%, 8.6%, 9.9% and 0.3% respondents have employment of own business, Government job, private companies and NGO workers respectively.

Similarly, in case of DHBVN customers, respondents are composed of 91.6% male and 8.4% female.

Table 4: Demographic profile of UHBVN and DHBVN respondents.

Variable	Category	UHBVN		DHBVN	
		Frequency	Percentage	Frequency	Percentage
Age Group	18-30 years	210	19.1	191	18.4
	30-40 years	270	24.6	339	32.7
	40-50 years	400	36.4	313	30.2
	50-60 years	140	12.7	128	12.3
	Above 60 years	79	7.2	67	6.5
	Total	1099	100%	1038	100%
Gender	Male	958	87.2	951	91.6
	Female	141	12.8	87	8.4
	Total	1099	100%	1038	100%
Category	General	673	61.2	656	63.2
	OBC	311	28.3	251	24.2
	SC/ST	115	10.5	131	12.6
	Total	1099	100%	1038	100%
Education Level	Illiterate	63	5.7	113	10.9
	Matric	192	17.5	273	26.3
	Up to 10+2	243	22.1	249	24.0
	Graduate	490	44.6	308	29.7
	Post Graduate/ Above	103	9.4	85	8.2
	Others	8	0.7	10	1.0
	Total	1099	100%	1038	100%
Income Group	Up to Rs. 10000	272	24.7	363	35
	Rs. 10000-50000	430	39.1	350	33.7
	Rs. 50000-100000	262	23.8	178	17.1
	Above Rs. 100000	135	12.3	147	14.2
	Total	1099	100%	1038	100%
Locality	Rural	616	56.1	555	53.5
	Urban	483	43.9	483	46.5
	Total	1099	100%	1038	100%
Type of Employment	Self-employed	806	73.3	803	77.4
	Government Job	94	8.6	58	5.6
	Private Service	109	9.9	88	8.5
	Unemployed	69	6.3	72	6.9
	NGO Worker	3	0.3	1	0.1
	Others	18	1.6	16	1.5
	Total	1099	100%	1038	100%

In relation to age, 30.2%, 32.7%, 18.4% and 12.3% respondents are of age group 40-50 years, 30-40 years, 18-30 years and 506-60 years respectively. In total, 63.2%, 24.2% and 12.6% respondents are of general, OBC and SC/ST category respectively. In terms of education level, 29.7%, 24%, 26.3%, 10.9%, 8.2% and 1.0% respondents are graduate, up to 10+2, matric passed, illiterate, post-graduate/above and another qualification respectively. In total, 53.5% respondents belong to rural areas and 46.5% respondents are of urban areas. Among all respondents, 35%, 33.7%, 17.1% and 14.2% respondents are earning up to Rs. 10,000, up to Rs. 50,000 between Rs. 50,000 and Rs. 1,00,000 and above Rs. 1,00,000 respectively. 77.4%, 5.6%, 8.5% and 0.1% respondents have employment of own business, Government job, private companies and NGO workers. All the respondents have different profile which has implications on what they expect from DISCOM and how they perceive the services of DISCOM.

B. Reliability analysis

Reliability represents the internal consistency with which the instrument surveys about desired concepts and it also helps to check the goodness of a measure. Cronbach's alpha value is commonly used for testing the reliability [25]. A measure which provides Cronbach's alpha value above 0.7 is considered as reliable [26]. In this work, Cronbach's alpha value has been evaluated for both expectations and perceived service quality with respect to each dimension of SERVQUAL model.

Table 5 presents the value of Cronbach's alpha for expectations and perceived service quality with respect to all ten dimensions. Cronbach's alpha for the expectations with respect to each dimension of service quality is above 0.7 for both UHBVN and DHBVN. Also, the perceived service quality with respect to each dimension has Cronbach's alpha greater than 0.7 for both UHBVN and DHBVN. In the case of UHBVN, highest internal consistency is calculated as $\alpha=0.823$ for customer expectation and $\alpha=0.899$ for customer perception. Whereas in the case of DHBVN, courtesy has maximum internal consistency with $\alpha=0.805$ for expectation and with $\alpha=0.906$ for perception. The overall customers' expectations in UHBVN and DHBVN have sufficiently good value of Cronbach's alpha. The overall perceived service quality has rather better value of

Cronbach's alpha for both UHBVN and DHBVN as compared to expectations. Thus, the findings signify that data of overall expectations and perceived service quality with respect to ten dimensions of SERVQUAL model are reliable for measuring service quality of DISCOMs in Haryana.

C. Service quality analysis

The empirical analysis of customers' expectations and perceptions has been done using the mean scores. The mean values of customers' expectations, perceptions and their gap with respect to different dimensions of UHBVN's and DHBVN's services are presented in Table 6 for all 50-items. The gap between customers' expectations from the company's services and customers' perceptions about the company's services has been calculated by subtracting the expectations from perceptions regarding the quality of services offered to the customers as per SERVQUAL model. Thus, service quality gap can be written as:

$$\text{Gap} = \text{Perception (P)} - \text{Expectation (E)}$$

This expression helps to quantify the gap between customers' expectations and perceptions.

Expectation Scores: It is apparent from Table 6 that the mean values for the expectation scores are ranging from 4.40 to 4.62 for UHBVN while expectation scores for DHBVN are ranging from 4.35 to 4.65. The results clearly show the differences in the expectation scores for both DISCOMs, i.e., UHBVN and DHBVN. With respect to UHBVN services, customers have maximum expectation from the tangibility dimension of the company's services with expectation score of 4.61. In tangibility dimension, customers' expectations are particularly highest for 'well-maintained offices' and 'well-maintained records, bills etc.' with same expectation score of 4.62. UHBVN customers have high expectations from responsiveness dimension also with the overall score of 4.57. If responsiveness of the company is talked about, customers highly expect 'prior information of power cuts' with expectation score of 4.62. UHBVN customers have minimum expectation score of 4.41 towards the credibility dimension of company's services. Expectation score is low for 'repairing of equipments without charging money from customers' and 'secured toll free number / online facility to report against employees'.

Table 5: Value of Cronbach's alpha for UHBVN and DHBVN customers.

Dimensions	No. of Items	UHBVN		DHBVN	
		Expectation	Perception	Expectation	Perception
Tangibility	5	0.823	0.878	0.767	0.897
Empathy	5	0.816	0.892	0.782	0.851
Responsiveness	5	0.817	0.891	0.796	0.889
Reliability	5	0.785	0.869	0.782	0.887
Communication	5	0.802	0.898	0.788	0.885
Security	5	0.786	0.844	0.789	0.888
Courtesy	5	0.804	0.86	0.805	0.906
Credibility	5	0.801	0.855	0.769	0.88
Competence	5	0.780	0.853	0.775	0.848
Accessibility	5	0.816	0.899	0.798	0.889
Overall	50	0.701	0.938	0.713	0.931

Table 6: Mean scores of expectation and perception values for SERVQUAL dimensions.

Statements		UHBVN			DHBVN		
		P	E	Gap (P-E)	P	E	Gap (P-E)
Tangibility	The company has modern tools and technology.	3.32	4.57	-1.25	2.55	4.55	-2
	The company has well managed offices.	3.30	4.62	-1.32	2.62	4.57	-1.95
	Forms (for new connections, load change etc.) are simply written in regional languages.	2.95	4.61	-1.66	2.56	4.54	-1.98
	The records (of electricity connection, bills and meter, etc.) are maintained properly.	3.29	4.62	-1.33	2.68	4.60	-1.92
	Wires are well organized on electric poles.	3.04	4.61	-1.57	2.48	4.65	-2.17
	<i>Overall value of mean score</i>	<i>3.18</i>	<i>4.61</i>	<i>1.43</i>	<i>2.58</i>	<i>4.58</i>	<i>2.00</i>
Empathy	Employees personally attend the customers for their queries and complaints.	2.87	4.55	-1.68	2.51	4.55	-2.04
	Company staff has operating hours suitable to customer's needs.	3.23	4.53	-1.3	2.63	4.53	-1.9
	Rural customers get subsidies in electricity bill.	3.36	4.55	-1.19	2.54	4.43	-1.89
	Company motivates the customers to use energy saving bulbs, fans and other products.	2.99	4.59	-1.6	2.71	4.57	-1.86
	Bill collection centers are near to customer residence.	3.28	4.57	-1.29	2.63	4.46	-1.83
	<i>Overall value of mean score</i>	<i>3.15</i>	<i>4.56</i>	<i>1.41</i>	<i>2.60</i>	<i>4.51</i>	<i>1.90</i>
Responsiveness	There are not long queues at bill collection centers.	3.37	4.53	-1.16	2.57	4.55	-1.98
	Employees quickly respond to customers' complaints.	2.94	4.59	-1.65	2.53	4.58	-2.05
	Every electricity office has helpdesk for enquiry.	3.48	4.54	-1.06	2.80	4.53	-1.73
	Company gives information in advance for power cuts.	2.91	4.62	-1.71	2.51	4.61	-2.1
	Customers get the satisfactory service in the first visit to the company office.	3.17	4.55	-1.38	2.62	4.59	-1.97
	<i>Overall value of mean score</i>	<i>3.18</i>	<i>4.57</i>	<i>-1.39</i>	<i>2.61</i>	<i>4.57</i>	<i>-1.96</i>
Reliability	Employees give reliable answers to customers' enquiries.	3.07	4.59	-1.52	2.59	4.52	-1.93
	The company provides correct electricity bills.	3.21	4.56	-1.35	2.82	4.52	-1.7
	Customers get full voltage all the time.	3.23	4.52	-1.29	2.44	4.50	-2.06
	Company gives 24 hours supply.	2.82	4.42	-1.6	2.34	4.35	-2.01
	Meter reader honestly notes correct reading from meter.	3.32	4.62	-1.3	2.81	4.56	-1.75
	<i>Overall value of mean score</i>	<i>3.13</i>	<i>4.54</i>	<i>-1.41</i>	<i>2.60</i>	<i>4.49</i>	<i>-1.89</i>
Communication	Prior information about due date of bill is given to customers through phone.	3.22	4.53	-1.31	2.31	4.43	-2.12
	Company provides toll-free numbers for enquiries.	3.46	4.49	-1.03	2.82	4.50	-1.68
	Employees communicate with customers in regional language.	3.47	4.44	-0.97	2.87	4.45	-1.58
	Company runs awareness programs through advertisement, social media and newspapers.	3.25	4.43	-1.18	2.73	4.45	-1.72
	Company gives notice before disconnection of meter.	3.51	4.51	-1	2.91	4.48	-1.57
	<i>Overall value of mean score</i>	<i>3.38</i>	<i>4.48</i>	<i>-1.09</i>	<i>2.73</i>	<i>4.46</i>	<i>-1.74</i>
Security	Customers are secured in all financial transactions.	3.44	4.47	-1.03	2.67	4.52	-1.85
	Employees show ID proof while visiting to customer premises (for meter reading etc.).	2.39	4.56	-2.17	2.39	4.49	-2.1
	Company does timely maintenance of transformers.	3.12	4.48	-1.36	2.51	4.48	-1.97
	Supply lines are far from the reach of customers.	2.75	4.54	-1.79	2.54	4.56	-2.02
	Company properly seals the electricity meters.	3.44	4.51	-1.07	2.79	4.52	-1.73
	<i>Overall value of mean score</i>	<i>3.03</i>	<i>4.51</i>	<i>-1.49</i>	<i>2.58</i>	<i>4.51</i>	<i>-1.94</i>
Courtesy	Employees behave respectfully with customers.	2.89	4.45	-1.56	2.66	4.47	-1.81
	Behavior of employees is same with all customers.	2.98	4.46	-1.48	2.67	4.55	-1.88
	At entrance of electricity office, ramps are available for physically challenged customers.	2.97	4.47	-1.5	2.53	4.55	-2.02
	Expert staff is available to properly deal with physically challenged (deaf, dumb, blind) customers.	2.67	4.50	-1.83	2.53	4.57	-2.04
	Customers get new connection with less formalities.	3.10	4.43	-1.33	2.53	4.49	-1.96
	<i>Overall value of mean score</i>	<i>2.92</i>	<i>4.46</i>	<i>-1.54</i>	<i>2.58</i>	<i>4.53</i>	<i>-1.94</i>
Credibility	Company does repairing of equipments without charging money from customers.	3.25	4.36	-1.11	2.67	4.43	-1.76
	The supply is restored within the minimum time.	3.10	4.46	-1.36	2.52	4.55	-2.03
	Electricity bills are provided by company at time of meter reading.	2.37	4.41	-2.04	2.09	4.43	-2.34
	Customers have secured toll free number/online facility	2.69	4.40	-1.71	2.55	4.46	-1.91

	to report against employees.						
	Electricity meter runs at normal speed.	3.24	4.43	-1.19	2.80	4.49	-1.69
	<i>Overall value of mean score</i>	<i>2.93</i>	<i>4.41</i>	<i>-1.48</i>	<i>2.53</i>	<i>4.47</i>	<i>-1.95</i>
Competence	Billing is done on monthly basis.	3.02	4.42	-1.4	2.84	4.45	-1.61
	Employees ensure safety of customers after repairing and maintenance work.	3.02	4.43	-1.41	2.63	4.51	-1.88
	Customers get electricity bill at least 7 days before due date.	3.43	4.52	-1.09	2.91	4.52	-1.61
	Major equipments (like transformer) are replaced without any delay.	2.90	4.51	-1.61	2.33	4.52	-2.19
	Company takes strict actions for theft complaints.	3.12	4.55	-1.43	2.64	4.58	-1.94
	<i>Overall value of mean score</i>	<i>3.10</i>	<i>4.49</i>	<i>-1.39</i>	<i>2.67</i>	<i>4.52</i>	<i>-1.85</i>
Accessibility	Employees are available in any emergency conditions.	2.99	4.46	-1.47	2.41	4.49	-2.08
	Bill correction procedures are easy for customers.	2.99	4.45	-1.46	2.37	4.47	-2.1
	Customers have facility of online complaint registration.	3.44	4.50	-1.06	2.76	4.54	-1.78
	Customers get online facility to apply for new connections.	3.39	4.48	-1.09	2.54	4.51	-1.97
	Company provides facility to pay bill through various modes (cash, cheques, online and drafts).	3.56	4.45	-0.89	2.98	4.50	-1.52
	<i>Overall value of mean score</i>	<i>3.27</i>	<i>4.47</i>	<i>-1.19</i>	<i>2.61</i>	<i>4.50</i>	<i>-1.89</i>

The expectation score of DHBVN customers also is maximum for tangibility dimension of company's services having value of 4.58. Unlike UHBVN customers, DHBVN customers have maximum score of 4.65 on expectation for 'well-organized wires on electric poles' under tangibility dimension. DHBVN customers have relatively lower expectation score of 4.46 for communication dimension of company's services. Under communication dimension, customers' expectation score is very low, i.e., 4.43 for 'awareness programs through advertisements, social media and newspapers'. Both UHBVN and DHBVN customers expect so much from the company's services as visualized by high values of expectation score.

Perception Scores: The mean scores of customers' perception range from 2.37 to 3.56 in case of UHBVN and from 2.09 to 2.98 in case of DHBVN. This significant difference between the perception scores of UHBVN and DHBVN customers indicates towards much differences in the service quality of both DISCOMs. The perception score of UHBVN customers is comparatively higher for communication dimension of company's services, particularly for 'notice before disconnection of meter' with score of 3.51. Perception score is also higher for accessibility dimension with overall score of 3.27. Under accessibility, perception score is maximum

for 'bill payment facility through various modes (cash, online etc.)'.

In DHBVN also, customers' perception score is maximum in communication dimension of company's services with the value of 2.73. In communication dimension, highest score is of 'notice before disconnection of meter'. Another dimensions having high perception scores are competence, accessibility and responsiveness. Under competence dimension, 'electricity bill 7 days before due date' has maximum perception score of 2.91. Under accessibility, DHBVN customers like UHBVN customers have high perception score for 'bill payment facility through various modes (cash, online etc.)'. If the overall perception score is considered, then credibility dimension has lowest perception score with value 2.53. Whereas, if single items are considered, minimum perception score is with the item 'electricity bills are provided at the time of meter reading'.

Gap Scores: The gap analysis results in case of UHBVN and DHBVN are shown item-wise in Table 6 and dimension-wise in Table 7. Overall values of customer's expectations and perceptions with respect to each dimension are also tabulated in Table 7 for comprehensive analysis.

Table 7: Overall descriptive results of customers' expectations and perceptions.

Dimensions	Company-1 (UHBVN)					Company-2 (DHBVN)				
	Expectation		Perception		Gap	Expectation		Perception		Gap
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Mean	Std. Dev.	Mean	Std. Dev.	Mean
Tangibility	4.61	0.49	3.18	1.20	-1.43	4.58	0.54	2.58	1.18	-2.00
Empathy	4.56	0.52	3.15	1.16	-1.41	4.51	0.64	2.60	1.10	-1.91
Responsiveness	4.57	0.51	3.18	1.22	-1.39	4.57	0.54	2.61	1.15	-1.96
Reliability	4.54	0.55	3.13	1.19	-1.41	4.49	0.59	2.60	1.22	-1.89
Communication	4.48	0.54	3.38	1.24	-1.09	4.46	0.57	2.73	1.22	-1.74
Security	4.51	0.53	3.03	1.17	-1.49	4.51	0.55	2.58	1.25	-1.94
Courtesy	4.46	0.53	2.92	1.17	-1.54	4.53	0.54	2.58	1.22	-1.94
Credibility	4.41	0.57	2.93	1.18	-1.48	4.47	0.58	2.53	1.21	-1.95
Competence	4.49	0.51	3.10	1.24	-1.39	4.52	0.57	2.67	1.25	-1.85
Accessibility	4.47	0.52	3.27	1.23	-1.19	4.50	0.53	2.61	1.21	-1.89
Overall	4.51	0.53	3.13	1.19	-1.38	4.51	0.56	2.61	1.20	-1.91

*bold indicates the mean gap in service quality of UHBVN and DHBVN

*Gap = Perception – Expectation

Dimension-wise scores facilitate the comparison of services of both the companies with respect to different dimensions. For UHBVN, the maximum gap of -2.17 with the item 'Employees show ID proof while visiting to customer premises (for meter reading etc.)' under security dimension, shows that meter readers and DISCOM's employees do not show their ID cards during visit. On the overall basis, dimension of courtesy has highest gap of 1.54 in UHBVN services. In case of DHBVN, maximum gap of 2.19 exists in the item 'major equipments are replaced without any delay'. Among ten dimensions, tangibility dimension is having the maximum gap score of -2.00 on average basis in case of DHBVN. There is large gap in what services the customers expect and what services they get from the company with respect to almost all the dimensions according to SERVQUAL model.

D. Hypothesis testing

The result of gap analysis carried out through empirical results of customers' expectation and perceptions has been also statistically verified in this sub-section. Before undertaking this study, it was assumed that there is no difference in the company's services which customers expect and what they get. Moreover, the service quality of both DISCOMs, i.e., UHBVN and DHBVN was assumed to have no statistically significant difference. These assumptions have been considered as hypotheses and tested using independent sample t-test and paired sample t-test.

Table 8 shows the customers' overall perception and expectation on service quality along with SERVQUAL gap of both UHBVN and DHBVN. The SERVQUAL gap is calculated by taking the difference of mean score of expectation and perception. Negative values of gap show poor service quality.

Table 8: Results of paired sample t-test showing difference between overall perception and expectation.

Company	Overall Perception(P)	Overall Expectation(E)	Overall SERVQUAL Gap (P-E)	t-value (Sig. value)
UHBVN	3.127	4.509	-1.383	-57.21 (0.00)
DHBVN	2.609	4.514	-1.906	-76.73 (0.00)

Note: Level of Significance 0.05

Table 9: Results of independent sample t-test showing differences between expectations and perceptions of UHBVN and DHBVN customers.

	Company	Mean	Mean difference	SD	t-value (Sig. value)
Expectation	UHBVN	4.509	-0.005	0.201	-0.58 (0.56)
	DHBVN	4.514		0.219	
Perception	UHBVN	3.127	0.518	0.793	15.1 (0.00)
	DHBVN	2.609		0.782	

Note: Level of Significance 0.05

Table 10: Differences between perception and expectation on ten dimensions by using paired sample t-test.

Company	Dimension	Perception (P)	Expectation (E)	Gap(P-E)	t-value (Sig. value)
UHBVN	Tangibility	3.181	4.608	-1.427	-42.67 (0.00)
	Empathy	3.146	4.555	-1.409	-44.99 (0.00)
	Responsiveness	3.175	4.565	-1.389	-43.65 (0.00)
	Reliability	3.128	4.542	-1.414	-45.89 (0.00)
	Communication	3.383	4.479	-1.096	-33.49 (0.00)
	Security	3.027	4.514	-1.487	-49.24 (0.00)
	Courtesy	2.922	4.461	-1.539	-49.89 (0.00)
	Credibility	2.929	4.414	-1.484	-46.40 (0.00)
	Competence	3.101	4.487	-1.387	-43.30 (0.00)
	Accessibility	3.273	4.467	-1.194	-36.85 (0.00)
DHBVN	Tangibility	2.579	4.583	-2.004	-60.45 (0.00)
	Empathy	2.603	4.508	-1.905	-62.01 (0.00)
	Responsiveness	2.606	4.570	-1.964	-62.69 (0.00)
	Reliability	2.601	4.490	-1.889	-55.63 (0.00)
	Communication	2.727	4.463	-1.735	-51.28 (0.00)
	Security	2.579	4.515	-1.936	-56.29 (0.00)
	Courtesy	2.584	4.525	-1.940	-57.03 (0.00)
	Credibility	2.525	4.472	-1.948	-58.05 (0.00)
	Competence	2.668	4.515	-1.847	-55.61 (0.00)
	Accessibility	2.612	4.502	-1.889	-57.89 (0.00)

Note: Level of Significance 0.05

Table 11: Differences in UHBVN and DHBVN customer expectation and perception by using independent sample t-test.

	Dimension	Name of Company	Mean	SD	t-value (Sig. value)
Expectation	Tangibility	UHBVN	4.608	0.382	1.451 (0.147)
		DHBVN	4.583	0.389	
	Empathy	UHBVN	4.555	0.397	2.496 (0.013)
		DHBVN	4.508	0.472	
	Responsiveness	UHBVN	4.565	0.388	-0.298 (0.766)
		DHBVN	4.570	0.400	
	Reliability	UHBVN	4.542	0.405	2.835 (0.005)
		DHBVN	4.490	0.433	
	Communication	UHBVN	4.479	0.407	0.893 (0.372)
		DHBVN	4.463	0.420	
	Security	UHBVN	4.514	0.388	-0.020 (0.984)
		DHBVN	4.515	0.403	
	Courtesy	UHBVN	4.461	0.397	-3.701 (0.000)
		DHBVN	4.525	0.403	
	Credibility	UHBVN	4.414	0.428	-3.221 (0.001)
		DHBVN	4.473	0.415	
Competence	UHBVN	4.487	0.373	-1.671 (0.095)	
	DHBVN	4.515	0.414		
Accessibility	UHBVN	4.467	0.392	-2.025 (0.043)	
	DHBVN	4.502	0.393		
Perception	Tangibility	UHBVN	3.181	1.044	13.565 (0.000)
		DHBVN	2.579	1.004	
	Empathy	UHBVN	3.146	0.968	13.602 (0.000)
		DHBVN	2.603	0.871	
	Responsiveness	UHBVN	3.175	1.018	13.268 (0.000)
		DHBVN	2.606	0.960	
	Reliability	UHBVN	3.128	0.963	12.350 (0.000)
		DHBVN	2.601	1.009	
	Communication	UHBVN	3.383	1.066	14.585 (0.000)
		DHBVN	2.727	1.008	
	Security	UHBVN	3.027	0.927	10.443 (0.000)
		DHBVN	2.579	1.058	
	Courtesy	UHBVN	2.922	0.935	7.880 (0.000)
		DHBVN	2.584	1.044	
	Credibility	UHBVN	2.929	0.946	9.616 (0.000)
		DHBVN	2.525	1.001	
Competence	UHBVN	3.101	0.985	10.138 (0.000)	
	DHBVN	2.668	0.984		
Accessibility	UHBVN	3.273	1.038	14.897 (0.000)	
	DHBVN	2.612	1.010		

Note: Level of Significance 0.05

The results of paired sample t-test (i.e., $p < 0.05$) prove that there is significant difference between the perception and expectation of customers. Similar findings about significance value are observed in both DISCOMs. This finding shows that there is SERVQUAL gap in both the DISCOMs. However, the SERVQUAL gap in DHBVN is slightly higher than that in UHBVN. This is because of the fact that customers of DHBVN are having lower perceptions as compared to UHBVN customers. This fact aggravates the problem of high SERVQUAL gap. As it can be inferred from Table 9, the overall perception for DHBVN is significantly lower than that of UHBVN by 0.518. But, there is no statistically significant difference between expectations from DHBVN and UHBVN. Table 10 shows the mean perception and mean expectation of ten dimensions of

service quality along with SERVQUAL gap on each dimension for both UHBVN and DHBVN. The difference between perception and expectation on each dimension is found to be statistically significant for both the DISCOMs. In UHBVN, SERVQUAL gap varies from -1.095 for the dimension communication to -1.538 for the dimension courtesy. On the other hand, the SERVQUAL gap in DHBVN varies from -1.735 for the dimension communication to -2.004 for the dimension tangibility. Findings of Table 8 and 10 rejects the null hypothesis assumed in this work. It can be observed that the expectations of UHBVN and DHBVN customers on all the dimensions are more or less similar. Unlike expectations, the perceptions of the customers of UHBVN for all the dimensions are higher than that of DHBVN. This results in higher SERVQUAL gap for

DHBVN compared with UHBVN on each dimension. Table 11 presents the results of independent sample t-test which are used to check the statistically significant difference in expectation as well as perception between UHBVN and DHBVN for each dimension. As it can be visualized, the expectations on the dimensions, namely, empathy, reliability, courtesy, credibility and accessibility, significantly differ between UHBVN and DHBVN customers. On the other hand, the perceptions

on all the dimensions significantly differ between UHBVN and DHBVN at 95 per cent level of confidence. Table 12 comprises of the results of independent sample t-test to check whether there is any statistically significant difference in the SERVQUAL gap on each dimension between UHBVN and DHBVN. As evident from Table 12, SERVQUAL gap on each dimension is significantly higher in DHBVN compared with UHBVN.

Table 12: Difference in service quality gap of UHBVN and DHBVN by using independent sample t-test.

Dimension	Company	Service Quality Gap	SD	t-value (Sig. – two tailed)
Tangibility	UHBVN	-1.427	1.108	12.25 (0.000)
	DHBVN	-2.004	1.068	
Empathy	UHBVN	-1.409	1.038	11.29 (0.000)
	DHBVN	-1.905	0.989	
Responsiveness	UHBVN	-1.390	1.0557	12.83 (0.000)
	DHBVN	-1.964	1.009	
Reliability	UHBVN	-1.414	1.021	10.39 (0.000)
	DHBVN	-1.889	1.094	
Communication	UHBVN	-1.096	1.085	13.59 (0.000)
	DHBVN	-1.736	1.090	
Security	UHBVN	-1.487	1.001	9.84 (0.000)
	DHBVN	-1.936	1.108	
Courtesy	UHBVN	-1.539	1.023	8.76 (0.000)
	DHBVN	-1.940	1.096	
Credibility	UHBVN	-1.484	1.060	10.01 (0.000)
	DHBVN	-1.948	1.081	
Competence	UHBVN	-1.387	1.062	9.98 (0.000)
	DHBVN	-1.847	1.070	
Accessibility	UHBVN	-1.194	1.074	15.10 (0.000)
	DHBVN	-1.889	1.051	

Note: Level of Significance 0.05

V. CONCLUSION AND IMPLICATIONS

The present study found the considerable gap between the expected and perceived services of DISCOMs which emphasizes that company's service quality is not meeting the customers' expectations. The gap is showing how much the company's service quality lags behind the customers' expectations. The expectations of UHBVN and DHBVN customers are higher than their perceived service quality resulting into a significant value of gap between both. In case of UHBVN service quality, the dimension of courtesy has the highest gap of -1.54 and the dimension of communication has the smallest gap of -1.09. In other words, company's services performs the poorest with respect to courtesy with the customers, and performs comparatively well with respect to communication with the customers.

Similarly, in case of DHBVN, the comparatively better services are with regard to communication dimension of service quality. Least performance is in tangibility dimension of service quality. This shows that there is low service quality of DHBVN in respect to maintenance of records, transmission lines, other equipment, offices etc. If the service quality of both utility companies are compared with each other in terms of gap between customers' expectations and perceptions towards different dimensions of services, UHBVN wins over DHBVN. For every dimension of services, gap is lesser in case of UHBVN. This comparative analysis using mean values of customers' expectations, perceptions

and the gap between two shows better service quality of UHBVN in electricity distribution and meeting the customer's expectations. If the overall performance of utility companies in Haryana is pondered, there is large gap between customer's expectations and perceptions. This finding focusses on the need of improvement in quality of services offered by both DISCOMs in Haryana.

Findings of this work deliver new insights in service quality analysis of DISCOMs by demonstrating the customer's viewpoint about their expectations from company's service quality and their perceptions about the company's service quality depending on their experiences. This work can help the DISCOMs to study the customers' expectations and perceptions on different dimensions. This study provides the clear view of what items customers expect the most and what items they expect the least from the company. The analysis facilitates the company to explore about the weakest dimension and also provides the clear vision of estimates about how much the company is lagging on different dimensions. Table 13 and Table 14 list the aspects of service quality of UHBVN and DHBVN respectively where the service quality is having the highest gap. More the value of mean score, more improvement is required by DISCOM with respect to these aspects. These particular items demand urgent attention to improve the perceptions of customers towards the DISCOMs. Thus, it would help in deciding the management strategies which could aim the

minimum gap between customers' expectations and the company's services. Also, the company can prioritize

their efforts first towards their weakest dimensions of service quality.

Table 13: Top ten items in descending order of gap score in service quality of UHBVN.

Statements	Mean score	Statements	Mean score
Employees show ID proof while visiting to customer premises (for meter reading etc.).	-2.17	Company gives information in advance for power cuts	-1.71
Electricity bills are provided by the company at the time of meter reading.	-2.04	Employees personally attend the customers for their queries and complaints	-1.68
Expertise staff is available to properly deal with physically challenged (deaf, dumb, blind) customers.	-1.83	Forms (for new connections, load change etc.) are simply written in regional languages.	-1.66
Supply lines are far from the reach of customers.	-1.79	Employees quickly respond to customers' complaints	-1.65
Customers have secured toll free number/online facility to report against employees.	-1.71	Major equipments (like transformer) are replaced without any delay.	-1.61

Table 14: Top ten items in descending order of gap score in service quality of DHBVN.

Statements	Mean score	Statements	Mean score
Electricity bills are provided by the company at the time of meter reading.	-2.34	Bill correction procedures are easy for customers.	-2.1
Major equipments (like transformer) are replaced without any delay.	-2.19	Company gives information in advance for power cuts.	-2.1
Wires are well organized on electric poles.	-2.17	Employees are available in any emergency conditions.	-2.08
Prior information about due date of bill is given to customers through phone.	-2.12	Customers get full voltage all the time.	-2.06
Employees show ID proof while visiting to customer premises (for meter reading etc.).	-2.1	Expertise staff is available to properly deal with physically challenged (deaf, dumb, blind) customers.	-2.04

VI. LIMITATIONS AND FUTURE RESEARCH

This study can also be extended to other DISCOMs so that performance of different distribution companies can be compared with respect to different dimensions. Analysis over the complete State can bring out the dimensions on which all the DISCOMs in the State need to be worked upon to improve their service quality. Another facet of this work can be the study of effect of different dimensions of service quality on the customer satisfaction and the effect of gap on the customer satisfaction. Future work can address these limitations and can be pursued with the exploratory investigations in field of DISCOMs.

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