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AN ANALYSIS OF A PILOT SURVEY OF THE PROBLEMS OF ELECTRICITY DISTRIBUTION IN DELTA STATE, NIGERIA

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Abstract

This work is a pilot survey that captures some of the problems of electricity distribution in Nigeria. The survey was conducted in Delta State, South-South, Nigeria. This pilot survey is part of a nationwide work on the problems associated with electricity distribution and generation in Nigeria. A well-structure questionnaire was used to collect data from electricity customers in Delta State. Respondents in the pilot survey were made to assign values between 1 and 5 to positive statements bordering on their experience with the distribution company as the service provider. Respondents were also asked to score observed problems on a scale of 0 to 10, depending on the severity of the observed problem. The survey data was analyzed using SPSS Version 23, while further analysis, formatting and presentation of data was done using Microsoft Excel, 2016 Edition. The results of the descriptive statistical analysis are presented in the work.

1.0 Introduction

A pilot survey usually provides researchers with the opportunity to test research items, data, samples and sampling techniques, that can be replicated in a larger study. This pilot survey on problems of electricity distribution in Delta State, Nigeria, was conducted as part of larger study involving the problems bedeviling the distribution and generation of electricity in Nigeria, which is a nationwide study. In order to carry out such an extensive nation-wide survey, the research items and methodological framework are applied to a pilot survey in Delta State, South-South, Nigeria, where the researchers are domiciled.

In this pilot survey a systematic research methodology is used to collect data from electricity users on the plethora of problems associated with electricity distribution in Nigeria. The pilot survey methodology adopted involves the use of structured questionnaires to get responses from respondents as it relates to overall satisfaction with the distribution company (DISCO), quality and reliability of power and reasonableness of bills, The pilot survey also captured users experiences on corporate image of distribution companies (DISCOs) and effectiveness of communication with stakeholders and customer services. Electricity users in this survey, are also asked to rate some observable problems with distribution by scoring the problems on a scale between zero (0) and 10, zero(0) being that the problem is limited and 10 being the highest score indicating that the problem is severe or extreme.

2.0 Literature Review

The problems in the power sector in Nigeria cuts across the three segments of generation, transmission and distribution, of which distribution segment touches electricity customers most and directly. The inadequacies in power supply, consumption patterns, availability of power and lack of power supply led to the reforms in the power sector [1]. The best information on the reliability of the distribution system is likely to come from a customer survey [2]. Carefully designed research instrument can help to provide consistency in the framework from survey respondents [3]. The work of [3] shows that changing a customer's impression about one factor is likely to have some impact on other factors considered in a customer perception research.

Some studies in the literature are concerned with the analysis of availability of electricity and the quality of life, while others enumerate sources of energy and types of appliances used [4], [5]. Distribution challenges in Nigeria have persisted over the years with negative impact on the economy and standard of living [6]. The use of systematic randomized sampling techniques was employed in [7] to collect household data on quality and quantity of electricity distribution in Nigeria. The sordid state of electricity distribution in Nigeria is captured in a report in [8], which covers Delta State, which is the survey

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area of this work. The use of structured questionnaire, descriptive statistics and Pearson's Moment Correlation were employed to analyze data and discuss parameters that have effect on customer satisfaction, The work of [8] cover electricity supply, pricing, metering and electricity billing, customer service, and electricity corruption and theft. A broader scope of performance measure is covered in [3], and some of the surrogates for evaluation are adopted in this work. The presentation in [9] is that of a descriptive study that examines the expectation of the customer juxtaposed with their level of satisfaction.

Among the various areas of application of Mathematical Statistics is in the field of Data Analysis, which may be descriptive or inferential [10]. The use of pilot survey in data analysis may lead us to problems that may be encountered in carrying out a broader study thereby enabling corrective measures. Pilot surveys are especially important for studies involving people or when studying a phenomenon involving their perceptions [11], [12]. A diverse range of data when organized in a coherent and explicit manner can help inform policy decisions of immense societal benefit [13]

3.0 Population, Sample and Sampling Technique

Electricity consumers are scattered all over the 25 local government areas of Delta State, which constitute the population of for the survey. The state is divided into three senatorial districts, which serves as natural delineation areas [14]. Towns within the local government areas are designated as urban and rural towns. The local government headquarters were taken as urban towns while less prominent towns and villages with electricity customers were taken as rural towns. With the designation of each town within the survey population, one urban and one rural town were selected in each of the senatorial district by a random process involving the use of the urn. Thus a systematic random sampling process was adopted for the pilot survey. The questionnaires were administered at random in the selected urban and rural areas. A total of 266 questionnaires were completed for this survey.

4.0 Methodological framework

In this section we describe the instruments for data collection and analysis

4.1 Instrument for Data Collection

The main source of data collection for this survey was the primary source. Data were obtained from the field by trained interviewers, who administered a well-structured questionnaire for the collection of primary data. The questionnaire was divided into three subsections viz: (i) Respondent's Data (i) Customer's Experience with DISCO and (iii) Ratings of Observed Problems with DISCOs.

For the section on respondent's data, the data collected include; *state, town, type of town* (i.e. rural/urban) and *sex*. Also included in the respondent's data was their *highest educational qualification, income bracket, average monthly bill* and *name of distribution company*. The respondents were also to indicate whether they are metered or non-metered customers in addition to stating their billing period (i.e. monthly, quarterly, biannually or irregular), Except for *state, town, average monthly bill* and *name of distribution company*, the respondents were simply to tick(√) available options on the questionnaire. This greatly reduced the time to fill the questionnaires and helped to avoid resentment and apathy on the part of the respondents.

The second section of the questionnaire was the customer's experience section, wherein the respondents scored items on a Likert scale. Some of the items in this section were adopted from surrogates used in [3]. The respondents were presented with a number of unambiguous positive statements and asked to assign values 1 – 5 to the statements. The value 1 was for "strongly disagree", while 2 was assigned to "disagree". 3 was assigned to "uncertain", while 4 and 5 were assigned to "agree" and "strongly agree" respectively.

The questions in the section on customer's experience with DISCOs were in the following areas:

(i) Overall Satisfaction with DISCO (1 question)
(ii) Quality and Reliability of Power from DISCO (2 questions)
(iii) Reasonableness of Bills (1 question)
(iv) Billing System (4 questions)
(v) Corporate Image of DISCO (6 questions)
(vi) Customer Service (5 questions)

In all twenty-two (22) questions were used to collect customer's experience with DISCOs.

The last section of the questionnaire (i.e. section 3) consists of items based on observed problems with services from the DISCOs during the fieldwork. Respondents were expected to rate observed problems on a scale of zero(0) to ten(10) as to the severity of the problem. A score of 0 indicate that he problem is of limited severity while the highest score indicate that the problem is very severe. With this range (i.e. 0 – 10) in mind, the respondents could rate the problems. The problems rated by the respondents include; *low voltage, incessant power outages, load shedding, inadequate number of meters and distribution lines*. Observed problems also rated by the respondents include; *unreasonable price of power, illegal connections, inadequate number of transformers* and *vandalization of distribution facilities*.

4.2 Instrument for Data Analysis

The data for the survey was analyzed by means of two different computer software packages viz: (i) Microsoft Excel, 2016 Edition [15] and SPSS Ver. 23, [16]. At the input stage, after the data collection, input was done via spreadsheet using Microsoft Excel, after which the data was corrected for input errors and exported to SPSS. The SPSS software was used for descriptive and inferential statistical analysis. The output tables generated by SPSS were further formatted using Microsoft Excel. The results of the descriptive statistical analysis on demography and customers' experience with the services of the DISCO are reported in this work.

5.0 Survey Data Analysis

In this section, we present descriptive statistics arising from the statistically analysis using SPSS Ver. 23. For clarity and ease of understanding the underlying data are presented in sections corresponding to the various sections of the questionnaires used for data collection.

5.1 Demographic Analysis

In all 266 electricity customers were interviewed with data collected for 106 rural dwellers and 160 urban dwellers, representing 39.8% and 60.2% for rural and urban dwellers respectively. Of the 266 respondents, 59% of them were females while 41% were males. The highest number of dependents for the respondents was 10 with a frequency of 2 representing 0.8% of the 266 respondents, 47.4% of the respondents do not have dependents indicating that over half of the respondents (52.7%) have dependents to cater for in addition to the expenses of paying electricity bills. On the educational qualification of the respondents, 103(38.7%) had either a B.Sc. or HND degree, 4(1.9%) and 3(1.1%) of the respondents had M.Sc./MA and PhD degrees respectively, 5.6% of the respondents had just Basic Education. Holders of SSCE certificates constitute the highest number of respondents in terms of educational qualification as 97 persons representing 36.5% of the respondents had SSCE certificates as their highest educational qualification.

The meter status of the respondents indicates that about 43.3% (115) of the 266 respondents had no meters, 25.9% and 30.8% had pre-paid and post-paid meters respectively. The sample survey appears to be have sizeable proportion of young electricity customers as 73.7% of the respondents were in the age bracket of 18 – 30 years. Only 2(0.8%) of the respondents were 60 years and above. The next highest distribution of the ages of the respondents fall into the age bracket of 31 – 40 years accounting for 14.7% of the respondents. A large proportion of the electricity customers(i.e. 88.0%) were billed monthly, while 7.9% of the customers were not billed regularly.

A large percentage(72.6%) of the respondents fall within the income group (N18,000 – N50,000) as their average monthly income, while only 2.6% of the respondents fall within the average monthly income group of (N351,000 and above). The remaining proportions were respectively 18%, 6% and 0.8 for the respective income groups; N51,000 – N150,000, N151,000 – N250,000, and N251,000 – N350,000. Interesting the large percentage (72.6%) reported in the lowest income group of this survey compares favorably with a poverty incidence of 71% for Delta State reported in [14].

5.2 Customers' Experience with DISCOs

Electricity customers were asked to rate seven different items indicating their experience with the situation of power distribution with their distribution company. In this survey only one distribution company is involved in Delta State. We present below the analysis of the various items covered under customers' experience with DISCO.

5.2.1 Overall Satisfaction with DISCO

Only one item was used to gather information on the overall experience with DISCO. Respondents were simply asked to rate the positive statement "On the whole I am satisfied with the overall performance of the DISCO". Table 1 Shows the responses for overall satisfaction with DISCO. A large percentage (41.4%) of the respondents chose "Strongly Disagree" and the cumulative percentage of "Strongly Disagree" and "Disagree" is 68.8%. This is an indication that overall, most of the customers in this survey are not satisfied with the services of the DISCO, since only 4.5% appears to be satisfied with the services of the DISCO.

Table 1: Overall Satisfaction with DISCO

Responses	Frequency	Percent	Cumulative Percent
Strongly Disagree	110	41.4	41.4
Disagree	73	27.4	68.8
Uncertain	42	15.8	84.6
Agree	29	10.9	95.5
Strongly Agree	12	4.5	100.0
Total	266	100.0	

5.2.2 Quality and Reliability of Power from DISCO

Two items in the questionnaire were used to get responses from electricity customers about the quality and reliability of power distributed by DISCO, Customers were asked to rate the positive statements:

(i) The quality of power distributed by DISCO is good
(ii) Power distribution by DISCO is reliable;

Table 2 shows the responses by the respondents. The table also shows the average of the two of responses for quality and reliability of power combined.

Table 2: Quality and Reliability of power from DISCO

Quality of Power			**Reliability of Power**		**Average of Quality and Reliability**		
Responses	Frequency	Percent	Frequency	Percent	Frequency	Percent	Cumulative Percent
Strongly Disagree	67	25.2	91	34.2	79	29.7	29.7
Disagree	88	33.1	89	33.5	89	33.3	63.0
Uncertain	47	17.7	37	13.9	42	15.8	78.8
Agree	48	18.0	37	13.9	43	16.0	94.7
Strongly Agree	16	6.0	12	4.5	14	5.3	100.0
Total	266	100.0	266	100.0	266	100.0	

As can be seen from Table 2, ninety-one (91) respondents representing 34.2% "strongly disagree" on the reliability of power, whereas 88 respondents(33.1%) "disagree" that the quality of power is good. The average figures show that there is a cumulative average of 63.0% of responses for "strongly disagree" and "disagree". This is an indication of a very negative perception about the quality and reliability of power supply in this survey.

5.2.3 Billing System

The billing system of DISCO in this survey was evaluated using the four positive statements listed below:

(i) Bills by DISCO are always accurate
(ii) Bills are easy to understand
(iii) Charges are clearly explained on bills
(iv) I am satisfied with bills from DISCO

The responses for the billing system are shown in Table 3a, while calculated average are shown in Table 3b. On the average, 65 of the 266 respondents representing 24.5% "strongly disagree" with the efficacy of the billing system, while 27.3% "disagree" with the billing system of the DISCO. Interestingly the highest percentage of "strongly agree" from this survey is in the responses for the billing system, as 11.3% of respondents appears to be comfortable with the billing system of DISCO

Table 3a: Billing System

Accuracy of Bills			**Bills are Easily Understood**		**Charges are Clearly explained on bills**		**Satisfaction with Bills**	
Responses	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Strongly Disagree	74	27.8	48	18.0	49	18.4	90	33.8
Disagree	79	29.7	75	28.2	67	25.2	69	25.9
Uncertain	69	25.9	55	20.7	56	21.1	49	18.4
Agree	24	9.0	58	21.8	60	22.6	32	12.0
Strongly Agree	20	7.5	30	11.3	34	12.8	26	9.8
Total	266	100.0	266	100.0	266	100.0	266	100.0

Table 3b: Average of Billing System Items

Responses	Frequency	Percent	Cumulative Percent
Strongly Disagree	65	24.5	24.5
Disagree	73	27.3	51.8
Uncertain	57	21.5	73.3
Agree	44	16.4	89.7
Strongly Agree	28	10.3	100.0
Total	266	100.0	

5.2.4 Corporate Image of DISCO

The corporate image of the DISCO is evaluated based on trust, hard work, technical knowhow, customer focus, care for the community and help for customers based on the following positive statements:

(i) DISCO is trustworthy
(ii) DISCO is hardworking
(iii) DISCO has requisite technical knowhow
(iv) DISCO is customer focused
(v) DISCO cares for the community
(vi) DISCO does its best to help customers

The response on the corporate image of DISCO are shown in Table 4a, while the responses for the corporate image of DISCO is shown in Table 4b.

Table 4a: Corporate Image of Disco

Disco is trustworthy				**Disco is hardworking**			**Disco has the requisite technical know-how**		
Responses	Frequency	Percent	Cumulative Percent	Frequency	Percent	Cumulative Percent	Frequency	Percent	Cumulative Percent
Strongly Disagree	89	33.5	33.5	65	24.4	24.4	55	20.7	20.7
Disagree	83	31.2	64.7	70	26.3	50.8	58	21.8	42.5
Uncertain	52	19.5	84.2	73	27.4	78.2	81	30.5	72.9
Agree	28	10.5	94.7	42	15.8	94.0	57	21.4	94.4
Strongly Agree	14	5.3	100.0	16	6.0	100.0	15	5.6	100.0
Total	266	100.0		266	100.0		266	100.0	

Disco is customer focused				**Disco cares for the community**			**Disco does its best to help their customers**		
Responses	Frequency	Percent	Cumulative Percent	Frequency	Percent	Cumulative Percent	Frequency	Percent	Cumulative Percent
Strongly Disagree	71	26.7	26.7	86	32.3	32.3	75	28.2	28.2
Disagree	87	32.7	59.4	86	32.3	64.7	89	33.5	61.7
Uncertain	53	19.9	79.3	40	15.0	79.7	52	19.5	81.2
Agree	39	14.7	94.0	43	16.2	95.9	39	14.7	95.9
Strongly Agree	16	6.0	100.0	11	4.1	100.0	11	4.1	100.0
Total	266	100.0		266	100.0		266	100.0	

Table 4b: Average Items on Corporate Image of Disco

Responses	Frequency	Percent	Cumulative Percent
Strongly Disagree	74	27.6	27.6
Disagree	79	29.6	57.3
Uncertain	59	22.0	79.3
Agree	41	15.5	94.8
Strongly Agree	14	5.2	100.0
Total	266	100.0	

From Table 4a, we see that the highest percentage (33.5%) of "strongly disagree" is for the positive statement on trustworthiness. This is an indication that of many the customers surveyed are of the opinion that the DISCO is not trustworthy. The average of the items on corporate image of DISCO from Table 4b shows that 27.6% of the respondents "strongly disagree" with the corporate image of the DISCO, while only 5.2% of the respondents "strongly agree" with the corporate image of DISCO.

5.2.5 Effectiveness of Communication with Stakeholders

Three positive statements were used to evaluate the effectiveness of DISCO's communication with stakeholders, with focus on their customers. The statements are:

(i) Customer service by DISCO is easy to reach
(ii) DISCO has good feedback system
(iii) DISCO sends regular information to all customers using available media

The responses for these items are shown in Table 5a, while Table 5b shows average figures on effectiveness of communication between the DISCO and their costumers. The highest percentage (33.8%) of "strongly disagree" on effectiveness of communication is on whether DISCO send regular information using available media. As can be seen from Table 5b, 29.6% of the respondents chose to "strongly disagree" with the effectiveness of communication with DISCO. The cumulative percentage of "strongly disagree" and "disagree" is 58.4% indicating that more than half of the respondents are not happy with the effectiveness of communication with the DISCO. Only 7.6% on the average "strongly agree" with the effectiveness of communication with DISCO.

Table 5a Effectiveness of Communication

Customer service by Disco is easy to reach				**Disco has good feedback system**			**Disco sends regular information to all customers using available media**		
Responses	Frequency	Percent	Cumulative Percent	Frequency	Percent	Cumulative Percent	Frequency	Percent	Cumulative Percent
Strongly Disagree	71	26.7	26.7	75	28.2	28.2	90	33.8	33.8
Disagree	79	29.7	56.4	83	31.2	59.4	68	25.6	59.4
Uncertain	51	19.2	75.6	54	20.3	79.7	67	25.2	84.6
Agree	41	15.4	91.0	32	12.0	91.7	26	9.8	94.4
Strongly Agree	24	9.0	100.0	22	8.3	100.0	15	5.6	100.0
Total	266	100.0		266	100.0		266	100.0	

Table 5b Average of Effectiveness of Communication Items

Responses	Frequency	Percent	Cumulative Percent
Strongly Disagree	79	29.6	29.6
Disagree	77	28.8	58.4
Uncertain	57	21.6	79.9
Agree	33	12.4	92.4
Strongly Agree	20	7.6	100.0
Total	266	100.0	

5.2.6 Customer Service

In this pilot survey the customer service of the DISCO was evaluated using the five positive statements listed below:

(i) It is easy to do business with DISCO
(ii) DISCO shows concern and care for customers
(iii) DISCO has courteous employees
(iv) DISCO has knowledgeable employees
(v) DISCO always apologizes for unusually long power outages

The responses on customer service of DISCO are shown on Table 6a, while averages of customer service items are shown on Table 6b.

Table 6a: Customer Service of DISCO

It is easy to do business with disco				**Disco shows concern and care for customers**			**Disco has courteous employees**		
Reponses	Frequency	Percent	Cumulative Percent	Frequency	Percent	Cumulative Percent	Frequency	Percent	Cumulative Percent
Strongly Disagree	65	24.4	24.4	72	27.1	27.1	51	19.2	19.2
Disagree	81	30.5	54.9	87	32.7	59.8	76	28.6	47.7
Uncertain	68	25.6	80.5	59	22.2	82.0	85	32.0	79.7
Agree	36	13.5	94.0	35	13.2	95.1	33	12.4	92.1
Strongly Agree	16	6.0	100.0	13	4.9	100.0	21	7.9	100.0
Total	266	100.0		266	100.0		266	100.0	

Disco has had working employees				**Disco always apologizes for unusually long power outage**		
Responses	Frequency	Percent	Cumulative Percent	Frequency	Percent	Cumulative Percent
Strongly Disagree	62	23.3	23.3	131	49.2	49.2
Disagree	52	19.5	42.9	50	18.8	68.0
Uncertain	75	28.2	71.1	36	13.5	81.6
Agree	56	21.1	92.1	32	12.0	93.6
Strongly Agree	21	7.9	100.0	17	6.4	100.0
Total	266	100.0		266	100.0	

Table 6b : Average of Customer Service of DISCO items

Responses	Frequency	Percent	Cumulative Percent
Strongly Disagree	76	28.6	28.6
Disagree	69	26.0	54.7
Uncertain	65	24.3	78.9
Agree	38	14.4	93.4
Strongly Agree	18	6.6	100.0
Total	266	100.0	

As can be seen from Table 6a of the five items bordering on customer service of DISCO, almost half(49.2%) of the respondents "strongly disagree" that DISCO always apologizes for unusually long power outage. The cumulative average of "strongly disagree" and "disagree" 68.0%, 13,5% are uncertain, while 6.4% "strongly agree" that DISCO always apologizes for unusually long outage. The average figures in Table 6b shows that 28.6% "strongly disagree" with the customer service, while 6.6% "strongly agree", 24.3% are "uncertain". On the average 26.0% "disagree" as opposed to 14.4% that "agree" with the customer service of the DISCO.

6.0 Conclusion

In this paper we have elected to present a descriptive statistical analysis of a pilot survey that is part of a nationwide work on problems of electricity generation and distribution in Nigeria. The nationwide work is still an ongoing endeavor and further work is still being done on the inferential statistical analysis of the pilot survey. A pilot survey like this one may enable us to correct any observed problems in carrying out the broader study [17].The scores assigned by the respondents on the observed problems with electricity distribution in this survey would be presented in a further work. It is hoped that the data and expected results of this research endeavor would assist in proffering solutions to the plethora of problems bedeviling electricity distribution in Nigeria.

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