

Domestic Gas Delivery and Service Satisfaction of Indian Customers

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Abstract: LP Gas is a clean and portable fuel that provides heat and power in rural areas as well as in densely populated urban areas. As it is portable in size so, it is not dependent on transmission lines or pipeline grids. Its most popular use is for cooking and heating in the residential and commercial segments. As this gas is very important for day to day life domestic purposes, so its supply and delivery processes must be perfect to satisfy consumer. Indian households are fully dependent on LPG cylinders. Therefore, attention needs to be diverted towards customers' perception on quality of supply of LPG gases and its related services so that distributors can focus on specific areas of concern to improve customer satisfaction. In this paper, attempt is made for concrete and measurable improvements in the service through an extensive study on customer's perception and various extents of the LPG gas supply. Some suggestions are provided for the improvement in service quality in Indian context.

I. INTRODUCTION

Across the world, LPG industry is continuously facing strong competition all over the world. LPG sector is constantly facing challenges from the market. The systematic delivering and high service quality is to be systemize for maintaining customer allegiance. With these crowded competitive business environment, utilities have to spread his business processes in every areas.. All over the world, gas prices are one of the major issues. The reduced prices in global market can binds the customers. According to Hovland (2007), Some managing parameters like maintenance of service orders, construction work orders, day to day customer service request are getting difficult with the use of old tools of management. Pati et al. (2010) explained that in business environment employees attitude is very much necessary for increasing organizational performances.

In India, for establishing service quality standard of LPG several surveys have to be organised to obtain the problems associated with the service quality evaluation and customer satisfaction of LPG industries for getting cost effective solutions. In some parts of India, performance standard is up to the mark of customer satisfactory level but on other hand there are some places where customers are not satisfied with the LPG industry. Pricing and distribution is the basic problems faced by Indian customers. The gas distribution problem occurs due to the lack of interest among the consumers.

In today's LPG market, complains registration is done through computerised process by the customers and the customers are becoming more sensitive to LPG gas problems. Customers also have the right to select their suppliers of LPG as well as good service quality. For understanding these complex processes and developing tools, factor analysis has been conducted. On the basis of questionerrie survey, service satisfaction of Indian consumers are studied and suggestions are provided to improve service quality.

II. LITERATURE REVIEW

Customer satisfaction is a term which is frequently used in Marketing. This is the Main goal of any organization in the world. An organization progresses only if they can satisfy their customer by the performance of their product. If we see from the customer's point of view then a customer only be satisfied when the product that is bought by the customer has met the expectation of the customer. This expectation can be like low cost, high performance, high resistivity, rigidity etc. A main term Quality has a major role in this customer satisfaction programme. The customer satisfaction plays a major role. But service industries has become very competitive now-a-days. customer satisfaction of an organization can be defined as the percentages of customer are satisfied by the product or the services are provided by the particular organization. All the Organizations are very much concerned about the service delivery. For example Khan et al (2009) have studied and explained regarding the service satisfaction in internet banking in India. A recent study by Ojo (2010) in the telecommunication industry has showed that a positive relationship exists between service quality and customer satisfaction. The same relationship is demonstrated by Oyenyi and Abiodun (2008). Basically many researches are going on utility sectors like electricity, water and gas. Satapathy (2014) has described the level of service dissatisfaction on Indian electricity and has designed a framework for the Industry to enhance the service satisfaction level. But less researches are found on service delivery of LPG gas.

The Liquid Petroleum Gas were discovered by **Dr. Walter Snelling** in 1912. From 1912 to

1920 the developing of lpg has occurred. The first time lpg had helped us to cook in 1912 and to drive a car in 1913. The selling of this LPG gas was started at 1920. Vinayagamoorthy and Shankar (2011) have surveyed on LPG gas to understand the level of service satisfaction in Salem. According to **Priyan and Karthihaiselvi (2010)** have surveyed and found that, in India most of the LPG customers are facing problem in late gas distribution process. The Indian Oil Corporation Limited, one of the Maharatna status companies in India, has their LPG Gas products named Indane. Beside this there are also gasses like Bharat gas and Hp in India.

Service quality can be defined as the comparison between expectation and performance. From this state it is clear that if some industry has that level of performance of the product that meet their customers expectation, then only service quality of that particular industry will call good.

Sandhu and Bala (2011) have discussed that, in today's competitive market the service quality turn in to a highly instrumental co-efficient. **Charoenpong (2003)** has stated the service quality is the measurement factor of Customer Satisfaction. If we perceived the process quality and output quality then service quality is a function of pre purchase customers' expectation. **Parasuraman et al. (1988)** has defined the service quality as the gaps created between the customers' expectation from the service and the service experience of the industry.

According to the **Garnin (1984)**, ESQ can be measured by some parameters like performance, features, reliability, conformance, durability, serviceability, prestige and aesthetics.

In the process of production, when the employees come into the contact with the customers to provide the service, then this Internal Service Quality comes into the picture. Here the human factor forms the key factor of the service quality of the organization as the human, who has presented to the customer for service, reflects the service of the organization. So it is obvious for the service marketers to motivate the employees for a better serve to the customer. Internal Service Quality is thought of the employees regarding their job, colleagues and company. It mainly depends upon the feeling about work life of the employee. It can be measure by benefits, pay, opportunities, openness, job security, pride in work, friendliness and fairness etc..

A. Status of Indian LPG gas

There are four public sector Oil marketing company in India (i.e., Indian Oil Corporation Limited, Hindustan Petroleum Corporation Limited, Bharat Petroleum Corporation Limited and IBP). They distribute

the cylinders to the customers through several distributors in different region. Indane is one of the largest packed LPG brands and it has been coveted 'Consumer Super brand' status by super brand council of India. It has launched in the time of mid 60s. There is also Bharat Gas from Bharat petroleum has been dominating the LPG market since three decades. This Bharat gas has brought some innovative offerings to the customer for customer satisfaction, they are like easy access to consumers including online access, responsively home delivery, LPG supply through pipe line to the mega residential complex, through Rural marketing vehicle they can supply the LPG to the rural areas and the remote areas. Presently in India the LPG market is government dominated and there is quite low competition. There is more domestic uses than non domestic use. The ratio between the domestic and non- domestic user is 9 : 1. Demand of LPG is growing at the rate of 6 % per annum.

Till the date of 1st april of 2005 the no of LPG customers are served about 845 lakh through 9001 LPG distributors of Indian LPG companies. The 1.2 million indene cylinders are delivered per day to the door of 53 million houses. Bharat gas is also serving 25 million houses. The no of retail outlet in India is about 40,819 till the year of 2011. IOCL has the largest retail outlet in India with no of 19,057 till the year of 2011. This no. of retail outlet is continuously increasing. The no of LPG distributor is 9686 till the year of 2010. But still the customer complaints regarding late delivery, dissatisfaction in service is a big headache for distribution company. Many of the places are far away from these services. Still people of these areas are cooking their food by woods and coals. So researches are essential to map the service delivery.

III. RESEARCH METHODOLOGY

Consumer survey is the best method to measure service quality in any service industry. For determining the customer satisfaction with service quality of LPG utility industry, a questionnaire is designed for all type of consumers and a questionnaire survey is conducted. The questionnaire consists of 24 items for investigating the respondents' perception about the service quality of LPG industry and eight questions about demographic profile of customer. Two hundred forty five (245) questionnaires are distributed to many consumers by phone, personal contact and internet. Among them 188 responses are obtained. The response rate is 76.73% and is good for this type of survey. A five point likert scale is designed for each item (1=totally disagree, 2=Somewhat disagree, 3=no reply, 4=Somewhat agree, 5=Totally agree). After collecting the data, an instrument is designed to measure Indian consumers satisfaction on LPG gas service. Then data analysis like factor analysis, regression analysis and correlation analysis is done to validate the instrument.

The item details of questionnaires are given in table1.

TABLE 1: The questionnaires for all type of consumers

S.no.	items	Rank				
		1	2	3	4	5
1.	Customer care centres are available for listening complains	1	2	3	4	5
2.	The bill is paid after accepting money.	1	2	3	4	5
3.	Money is deposited in consumers bank after getting subsidy	1	2	3	4	5
4.	The weight of gas is done at the time of delivery.	1	2	3	4	5
5.	The delivery boys are friendly and good behaved .	1	2	3	4	5
6.	Provide immidiately what ever is promised.	1	2	3	4	5
7.	Gas cylinder and accessories are checked at the time of installation	1	2	3	4	5
8.	No Ques /long lines for applying for connection.	1	2	3	4	5
9.	No extra charges are demanded for home delivery.	1	2	3	4	5
10.	The customer are valued.	1	2	3	4	5
11.	The bill is paid after accepting money	1	2	3	4	5
12.	Immidiata steps are taken after listening the complain/filling up gas.	1	2	3	4	5
13.	The gas is delivered door to door.	1	2	3	4	5
14.	Complains can be given by phone/mail/personal contact.	1	2	3	4	5
15.	Provide Pleasant knowldgeable employes.	1	2	3	4	5
16.	For any case of transfer the deposited money are repayed.	1	2	3	4	5
17.	Special subsidies are provided to all senior citizens.	1	2	3	4	5
18.	Procedures are made easy for the consumers to take gas connection.	1	2	3	4	5
19.	As per the Govt.rules the consumers are not harrassed for identyproof.	1	2	3	4	5
20.	No extra charges are demanded for home delivery.	1	2	3	4	5
21.	As per the Govt rule the money is charged.	1	2	3	4	5
22.	Provide Pleasant knowldgeable employes.	1	2	3	4	5
23.	The clear written manuals are provided for ease of understanding.	1	2	3	4	5
24.	The customers are satisfied with the type of service provided.	1	2	3	4	5

IV. RESULTS AND DISCUSSIONS

To measure the service satisfaction level , the collected data's or responses of LPG gas cylinder consumers are subjected to various statistical analyses such as factor analysis, and Kaiser-Meyer-Olkin (KMO) test. Factor analysis on one hundred eighty eight useful responses has been conducted using principal component method followed by varimax rotation via. SPSS 19.0. Sixteen items were loaded more than 0.5 among twenty four items for measuring customer satisfaction. These sixteen items categorized under eight dimensions as per Granin's service quality measurement model. These eight dimensions are considered as various variables for proposed instrument for measuring the customer satisfaction of LPG gas. The items that fail to get loaded less than 0.5 were not considered for further analysis. They refer to items 1,4,9,15,18,19,21 and 23. Percentage of total variance explained was found to be 76.9% which is an acceptable value for the principal component varimax rotated factor loading procedure (Johnson and Wichern 2002). The internal consistency of the actual survey data were tested by computing the Cronbach's Alpha (α). The value of alpha for each dimension is shown in Table 2, and Table 3 and the value of alpha for

all dimensions is .7884 .which is well above the acceptable value of 0.70 for demonstrating internal consistency of the established scale (Nunnally 1998). The value of Kaiser-Meyer-Olkin (KMO), which is a measure of sampling adequacy, was found to be 0.68 indicating that the factor analysis test has proceeded correctly and the sample used is adequate as the minimum acceptable value of KMO is 0.5 (Othman and Owen 2001). Therefore, it can be concluded that the matrix did not suffer from multicollinearity or singularity. The result of Bartlett test of Sphericity shows that it is highly significant (sig=0.000) which indicates that the factor analysis processes is correct and suitable for testing multidimensionality (Othman and Owen 2001). Therefore, the statistical tests has resulted that the proposed items and all dimensions of instruments are sound enough for analysis. In Table1, 2, the dimensions are named like performance,feature,reliability,conformance,durability,ser vicability,asthetics and prestige according to the character.

Table. 2 Factor analysis

Dimension	Item	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7	Factor8	Chrobanchs alpha
Performance	7	0.666								0.572
	16	0.771								0.711
	20	0.517								0.517
Feature	12		0.726							0.689
	17		0.719							0.719
Reliability	13			0.761						0.714
	3			0.567						0.643
Conformance	11				0.686					0.757
	21				0.825					0.649
Durability	2					0.656				0.632
	6					0.801				0.715
Serviceability	8						0.519			0.720
	14						0.799			0.574
Aesthetics	5							0.505		0.540
	22							0.812		0.719
Prestige	10								-0.864	0.786

Table3 Naming of Constructs

Dimension	Item	Naming of Item
Performance	7	Gas cylinder and accessories are checked at the time of installation.
	16	For any case of transfer the deposited money are repayed.
	20	No extra charges are demanded for home delivery.
Feature	12	Immidiata steps are taken after listening the complain/filling up gas.
	17	Special subsidies are provided to all senior citizens.
Reliability	13	The gas is delivered door to door.
	3	The weight of gas is done at the time of delivery.
Conformance	11	The bill is paid after accepting money.
	21	As per the Govt rule the money is charged.
Durability	2	Customer care centres are available for listening complains
	6	For any case of transfer the deposited money are repayed.
Serviceability	8	No Ques /long lines for applying for connection.
	14	Complains can be given by phone/mail/personal contact.
Aesthetics	5	The delivery boys are friendly and good behaved .
	22	Provide Pleasant knowldgeable employes.
Prestige	10	The customer are valued.

Table 4. Ranking of constructs

Dimension	Commualities variance explained	Rank
Performance	18.7	1
Feature	10.7	2
Reliability	8.2	3
Conformance	7.8	4
Durability	7.5	5
Serviceability	7.1	6
Aesthetics	6.2	7
Prestige	5.9	8

The items under each dimension are shown in Table 3. In Table 4, these dimensions are ranked according to its importance.

After naming the constructs further correlation and regression analysis is done to find the relation between the elements present in the constructs(dimensions) and service quality satisfaction of LPG gas delivery.

V. CORRELATION ANALYSIS

Correlation is a measure of the relation between two or more variables. The measurement scales used should be at least interval scales, but other correlation coefficients are available to handle other types of data. Correlation coefficients can range from -1.00 to +1.00. The value of -1.00 represents a perfect negative correlation while a value of +1.00 represents a perfect positive correlation. A value of 0.00 represents a lack of correlation.

Person correlation was used to describe the strength and direction of the relationship between two variables (Pallant, 2001). The values of the correlation coefficients (r) indicate the strength of the relationship between variables. The computation of the person correlation coefficient was performed to obtain an understanding of the relationship between all variables in the study. The value of the correlation coefficients (r) indicates the strength of the relationship between the variables. The average score of the multi-items for a construct was computed since a single construct in the questionnaire was measured by multiple items, and the score was used in further analysis such as correlation analysis and regression

analysis (Wang and Benbasat, 2007). As cited in Wong and Hiew (2005) the correlation coefficient value (r) range from 0.10 to 0.29 is considered weak, from 0.30 to 0.49 is considered medium and from 0.50 to 1.0 is considered strong. However, according to Field (2005), correlation coefficient should not go beyond 0.8 to avoid multicollinearity. Since the highest correlation coefficient is 0.517 which are less than 0.8, there is no multicollinearity problem in this research .In table 5; it is interesting to observe that highest degree of significant positive correlation exists between constructs responsiveness and compensation. A high degree of significant positive correlation is also observed between dimension Performance and Feature , Feature and Reliability, Reliability and confirms Durability and Servicability and Servicability and Asthetics. It is clear from this, that the Indian customers are satisfied with the constructs like Performance,Feature,Reliability,Confirms,Durability,Serviceability and Astetics as these constructs are having positive relations with each other. Again negative correlations are observed in the last rows containing Prestige and servicability and Asthetics as these correlations are of low degree. From the lowest correlations it is confirm that these constructs are not suitable for India customers and they do not have good relations with each other .

Table 5 correlation Analysis

	Performanc e	Feature	Reliabil ity	Conforman ce	Durabilit y	Servicea bility	Aesthetic s	<i>Prestige</i>
Performan ce	1							
Feature	0.306 0.000	1						
Reliability	0.184 0.029	0.323 0.000	1					
Conforma nce	0.047 0.577	0.250 0.003	0.349 0.000	1				
Durability	-0.043 0.069	0.083 0.329	-0.129 0.127	0.333 0.000	1			
Serviceabi lity	-0.112 0.185	0.059 0.486	-0.062 0.469	-0.055 0.514	0.242 0.004	1		
Aesthetics	<i>0.160</i> <i>0.059</i>	<i>-0.161</i> <i>0.056</i>	<i>-0.003</i> <i>0.972</i>	<i>0.005</i> <i>0.951</i>	<i>0.073</i> <i>0.388</i>	<i>0.310</i> <i>0.000</i>	<i>1</i>	
<i>Prestige</i>	0.064 0.448	0.235 0.005	0.100 0.239	-0.076 0.368	0.048 0.569	0.209 0.013	-0.094 0.266	1

A. The Regression Analysis

To determine the effect of customer satisfaction on LPG gas multiple regression analysis is done .In this type of analysis First of all Variables are detected into two types like dependent variable and independent variable.

Independent Variables: The proposed eight dimensions are treated as the independent variables for the regression equation. They are: Performance, Feature, Reliability ,Conformance, Durability, Servicability, Asthetics and prestige.

Dependent Variable (Y): The customer satisfaction in the quality of LPG cylinder.

The results of regression analysis for customers' perceived online shopping service quality are presented in Table 6. The R² for this model is .678, with F = 5431.029. All independent variables, which are Performance, Feature, Reliability ,Conformance, Durability, Servicability, Asthetics and prestige had statistically significant and positive relationships with the customer satisfaction in LPG gas delivery service, where p≤0.05. The dimension Feature are the most significant independent variable with the largest beta coefficient ($\beta = 0.94820$) at the 0.002 significance level, followed by the dimension Prestige ($\beta = 0.91345$) at the 0.004 significance level, and dimensions Reliability and Servicability are the insignificant variable. . The VIF value of less than 10 for all variables show that the problem of multi-collinearity have not existed.

The mathematical representation of the regression equation is as follows:

$$Y = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + b_7 X_7 + b_8 X_8$$

Where,

b₀ = Constant, Value of dependent variable when value of independent variables are zero.

Table.6 Regression Analysis

	Coefficients	Std. Error Coefficient	T	P
	1.8144	0.6815	1.19	0.023
Performance	-0.00926	0.06636	2.14	0.004
Feature	0.94820	0.07851	1.40	0.002
Reliability	0.09400	0.08252	-1.23	0.130
Conformance	0.06994	0.06695	-0.71	0.007
Durability	0.01219	0.07612	0.079	0.005
Serviceability	0.00524	0.08089	2.27	0.446
Aesthetics	0.06918	0.08114	0.76	0.010
<i>Prestige</i>	0.91345	0.08007	-1.47	0.004

= Also called intercepts, because it determines where the regression line meets the Y-axis.

b₁..... b₈ = Coefficients, that represents the estimated change in mean value of dependent variable for each unit change in the independent variable value.

** . Correlation is significant at the 0.01 level (2-tailed)

* . Correlation is significant at the 0.05 level (2-tailed)

X₁, X₂, X₃, X₄, X₅, X₆, X₇,X₈ are representing the eight constructs found from factorial analysis. Then the regression equation will be in the following form

$$Y = 1.8144 - 0.00926 X_1 + 0.94820 X_2 + 0.09400 X_3 + 0.06994 X_4 + 0.01219 X_5 +$$

$$0.00524X_6 + 0.06918 X_7 + 0.91345X_8$$

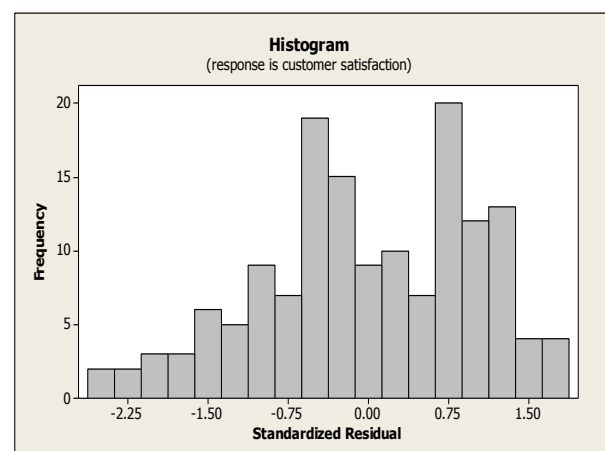


Figure 1 Standardized Residual for customer satisfaction for LPG Gas distribution

VI. CONCLUSION, LIMITATIONS AND FUTURE WORK

For the LPG market of India this is an important competitive time. Like the main LPG companies like Indian Oil Corporation Limited, Hindustan Petroleum Limited, Bharat Petroleum Limited should compete to survive in the market. But there is a big chance for other new LPG companies to get on the field of LPG market. Now service quality is the only key to success. If the customers are satisfied with the company then only a company can survive. This data are collected from the various part of the India. From the result we can see that the LPG customers of India are not fully satisfied with the companies. So It is the time for the existing companies to take some serious and effective steps for better service quality to satisfy their customers. This paper explores the customer satisfaction of LPG gas delivery service in India from customer's perspective. The study has adopted factor analysis to a survey questionnaire specifically designed to capture perception of the customers in LPG gas delivery. The factor analysis with varimax rotation results eight dimensions such as Out of twenty four items, sixteen items are loaded on eight dimensions having factor loading score of 0.5. subjected to various statistical analyses such as factor analysis, and Kaiser-Meyer-Olkin (KMO) test. Factor analysis on one hundred eighty eight useful responses has been conducted using principal component method followed by varimax rotation via SPSS 19.0. Therefore, the statistical tests has resulted the dimensions named like performance, feature, reliability, conformance, durability, serviceability, aesthetics and prestige according to the character.

A high degree of significant positive correlation is also observed between dimension Performance and Feature, Feature and Reliability, Reliability and confirms, Durability and Serviceability and Serviceability and Aesthetics. It is clear from this, that the Indian customers are satisfied with the constructs like Performance, Feature, Reliability, Confirms, Durability, Serviceability and Aesthetics as these constructs are having positive relations with each other. Again negative correlations are observed in the last rows containing Prestige and serviceability and Aesthetics as these correlations are of low degree. From the lowest correlations it is confirm that these constructs are not suitable for Indian customers and they do not have good relations with each other. All independent variables, which are Performance, Feature, Reliability, Conformance, Durability, Serviceability, Aesthetics and prestige had statistically significant and positive relationships with the customer satisfaction in LPG gas delivery service, where $p < 0.05$. The dimension Feature are the most significant independent variable with the largest beta coefficient ($\beta = 0.94820$) at the 0.002 significance level, followed by the dimension Prestige (β

$= 0.91345$) at the 0.004 significance level, and dimensions Reliability and Serviceability are the insignificant variable.

The findings therefore can be generalized to a given period, a pre-defined market, and economic scenarios. A longitudinal study could probably overcome or alleviate this limitation. The study also is confined to the Indian scenario. Geo-demographic could have a great deal of influence on the customer expectations and perceptions. It is also not amiss to mention here that the zone of tolerance could vary from one customer to another. This variation has not been assessed in the current study

In future studies, the customer satisfaction on domestic gas delivery may be evaluated for other countries. Furthermore, a small sample may not be the representative of the whole population and hence, in future, the research can be conducted by taking a large sample to facilitate a robust examination of the service quality of the LPG gas supply. The future study can also be conducted to identify the relative importance of each dimension. Future research should focus on the similar study of factors affecting customer satisfaction in after-sales service in other prominent industries such as automotive, construction and other manufacturing as well as service sectors. By doing this, hopefully we can get a clearer picture on the extended scope of after-sales service of several industries environment, which can be further examined. Eventually, a comparison can be made between the findings of the different industries so that such constructible findings and conclusions can be made to the study.

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