Chapter-4

Research Methodology

4.1 Introduction

Research methodology is a way to systemically solve the research problem. It may be understood as a science of studying how research is done scientifically. Here the researcher not only takes of research methods but also consider the logic behind the methods. So, the research results are capable of being evaluated.\(^{23}\)

4.2 Objectives of the Study

4.2.1 The Main Objective

The main objective of the study is to evaluate customers’ satisfaction/dissatisfaction of the users of different cell phone companies in the selected districts of South Gujarat region.

4.2.2 The Specific Objectives

1. To know the most affective factors on service quality, service features, customers satisfaction, customers loyalty and recommendation.
2. To know district wise customer satisfaction level.
3. To know company wise customer satisfaction level.
4. To know the most important dimension from service quality and service features.
5. To know the most popular cell phone services provided by cell phone service providers.
6. To know the most effective source to attract the customers.
7. To know the most important purpose to use cell phone.
8. To know the effect of demographic factors on service quality dimensions, service features dimensions and customers satisfaction.
9. To know the gender’s perception towards sources for selection of the service provider, purpose of cell phone usage and usage of services offered by various cell phone service providers.
10. To provide useful suggestions for cell phone service providers in light of the customers’ changing preferences.
4.3 Hypothesis of the Study

To define the main objective of the study, hypothesis has been constructed as follows:

$H_0$: Customers are not satisfied or neutral with the services of cell phone companies in South Gujarat region

$H_1$: Customers are satisfied or neutral with the services of cell phone companies in South Gujarat region

4.4 Research Design

Research design can be classified into two parts.

4.4.1 Exploratory Research

Exploratory research as it name implies (means), aims at exploring the possibility of doing research on a certain subject where due to lack of existing knowledge framing and testing of hypothesis are difficult\(^{24}\). When the information about the subject is insufficient, the study becomes automatically exploratory. The main purpose with explorative studies is to collect as much knowledge about a certain problem area as possible. This designates that the problem is analysed from a number of different points of view. This type of study can serve as basis for further research.

4.4.2 Descriptive Research

If a problem area already contains so much information that developed theory about the problem exists, it may be advantageous to use a describing study, and this is called the descriptive method. In a descriptive study only the essential aspects of the phenomenon are investigated. The descriptions of these aspects

\(^{24}\) Tripathi P.C. (2003), ”A Texbook of Research Methodology in Social Science”, 4\(^{th}\) edition, New Delhi, Sultan Chand and Sons, P. no 8
are detailed and fundamental.

This study has significant combination of all two: Exploratory and descriptive purposes. Firstly, in this study, the researcher wanted to explore the relative importance of services in South Gujarat cell phone telecom market. So it is exploratory. Secondly, the researcher wanted to describe a reality regarding customers’ satisfaction with services and to better understand those services dimensions that customers are satisfied or dissatisfied with, so it is descriptive.

4.5 Research Approach

The selection of which research approach is appropriate in a given study should be based upon the problem of interest, resources available and the skills. It may be either quantitative or qualitative.

4.5.1 Quantitative

Quantitative research is an inquiry into an identified problem, based on testing a theory, measured with numbers, and analyzed using statistical techniques. The goal of quantitative methods is to determine whether the predictive generalizations of a theory hold true.

It is the systematic scientific investigation of quantitative properties and phenomena and their relationships. In quantitative research your aim is to determine the relationship between one thing (an independent variable) and another (a dependent or outcome variable) in a population.

4.5.2 Qualitative

Qualitative research is often a broad term that describes research focusing on
how individuals and groups view and understand the world and construct meanings out of their experiences. It essentially is narrative-oriented and uses content analysis methods on selected levels of communication content. Some researchers consider it simply to be research whose goal is not to estimate statistical parameters but to generate hypotheses that can be tested quantitatively. It is a set of research techniques, used in marketing and the social sciences, in which data are obtained from a relatively small group of respondents and not analyzed with statistical techniques.

The main purpose of this research is to identify the influencing factor related to customers’ satisfaction and calculate the level of importance of each determinate on the final one which is customer satisfaction. Based on the describe facts, this research is quantitative by the nature.

4.6 Data Collection Methods

The reliability of managerial decisions depends on the quality of data. The quality of data can be expressed in terms of its representative features of the reality which can be ensured by the usage of a fitting data collection method\(^25\).

4.6.1 Secondary Data

Secondary data are collected from resources which have been already created for the purpose of first-time use and future uses. The secondary data collection involves less cost, time and effort. Sometime more accurate data can be obtained only from secondary data. The sources of secondary data are classified as internal sources and external sources. Internal sources of

secondary data for making applications are sales records, marketing activity, cost information, distributor reports/feedback and customer feedback. Various external sources of secondary data are government publications, foreign government publications, journals, publications of trade associations, books,

4.6.2 Primary Data

The data which are collected from the field under the control and supervision is known as primary data. Primary data can be collected either through experiment or through survey. If the researcher conducts an experiment, he/she observes some quantitative measurements. But in the case of survey, data can be collected by one or more of the ways like by observation, through personal interview, questionnaire, through schedule, through telephonic interview etc. magazines, newspapers, annual reports, research reports in universities, publications of statistics department, census data, India agricultural statistics, index number of wholesale prices in India, reserve bank of India bulletin, etc.

In this research, Secondary data has been collected from the external sources like annual reports, articles and journals.

To capture consumers’ satisfaction/dissatisfaction about Cell Phone Service Providers, primary data has been collected by framing a structured questionnaire. The data have been collected in the month of January 2011 to March 2011.

A preliminary version of the questionnaire has been developed in English. The instrument has been then translated next into local language (Gujarati) as the
data has been collected from South Gujarat. A variety of measurement scales (nominal, interval and ratio) has been included in a structured format to examine the relationships between selected variables. Some questions are open-ended because analysis and interpretation of such questions can be complex and subjective. Open-ended question has been used only to find suggestions from the subscribers that are included in the recommendation part. As such, the questionnaire has been divided into four sections

Section A covers the demographic features of the respondents such as gender, age, marital status, academic qualification, annual household income, reasons for using mobile etc. It also covers the questions regarding customers’ view regarding the company and their services.

Section B covers the statements related to service quality.

Section C covers the statements related to service features.

Section D involves the questions related to customer satisfaction, customer loyalty and recommendation.

In this study, all the questions of section B, C and D have been evaluated by using the rating of a five-point Likert and verbal scale. Before the finalization a questionnaire, a pilot survey has been conducted and all the problems andquires which were found during the survey have been eliminated.

4.7 Pilot Testing

Saunders et al (2000); Donald R. et al. (2006); and Malhotra et al. (2007) agree that in any research, it is expedient as a matter of reliability and validity check
that the questionnaire should be pre-tested before final administration. This small size is guided by the suggestion by Fink (2003b in Saunders et al., 2007) that the minimum of 10 members for pre-testing is adequate.

A primary draft of a questionnaire was given to focus group to test clarity and meaningfulness of the questions. 30 subscribers were selected by simple random method. Each of them was told the purpose of the questionnaire. All the problems and queries which were found during the survey have been eliminated. This procedure was done during the month of December 2010.

4.8 Response Rate

Response rate is important because, the lower a response rate, the more questions are likely to be raised about the responsiveness of the achieved sample. In this research, district wise and company wise response rate has been calculated. The detail of response rate has been mentioned in table no.4.1

<table>
<thead>
<tr>
<th>No</th>
<th>Name of the Company</th>
<th>Questionnaire</th>
<th>Selected Districts of South Gujarat</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Surat</td>
<td>Valsad</td>
</tr>
<tr>
<td>1.</td>
<td>Vodafone</td>
<td>Distributed</td>
<td>280</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Return(Valid)</td>
<td>258</td>
<td>75</td>
</tr>
<tr>
<td>2.</td>
<td>Reliance</td>
<td>Distributed</td>
<td>150</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Return(Valid)</td>
<td>135</td>
<td>42</td>
</tr>
<tr>
<td>3.</td>
<td>Idea</td>
<td>Distributed</td>
<td>140</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Return(Valid)</td>
<td>126</td>
<td>36</td>
</tr>
<tr>
<td>4.</td>
<td>Bharti</td>
<td>Distributed</td>
<td>135</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Return(Valid)</td>
<td>115</td>
<td>34</td>
</tr>
<tr>
<td>5.</td>
<td>BSNL</td>
<td>Distributed</td>
<td>90</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Return(Valid)</td>
<td>74</td>
<td>26</td>
</tr>
<tr>
<td>6.</td>
<td>Tata</td>
<td>Distributed</td>
<td>80</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Return(Valid)</td>
<td>63</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>Distributed</strong></td>
<td><strong>875</strong></td>
<td><strong>275</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Return(Valid)</strong></td>
<td><strong>771</strong></td>
<td><strong>235</strong></td>
</tr>
</tbody>
</table>

\[\text{Response Rate} = \frac{\text{No. of Return Questionnaire}}{\text{No of Distributed Questionnaire}} \times 100\]
### Table No. 4.2 Response rate

<table>
<thead>
<tr>
<th>No</th>
<th>Name of the Company</th>
<th>Surat</th>
<th>Valsad</th>
<th>Bharuch</th>
<th>Navsari</th>
<th>Tapi</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Vodafone</td>
<td>92.14%</td>
<td>98.23%</td>
<td>85.00%</td>
<td>82.86%</td>
<td>80.00%</td>
<td><strong>88.39%</strong></td>
</tr>
<tr>
<td>2.</td>
<td>Reliance</td>
<td>90.00%</td>
<td>84.00%</td>
<td>80.00%</td>
<td>80.00%</td>
<td>80.00%</td>
<td><strong>85.48%</strong></td>
</tr>
<tr>
<td>3.</td>
<td>Idea</td>
<td>90.00%</td>
<td>80.00%</td>
<td>87.50%</td>
<td>75.00%</td>
<td>76.00%</td>
<td><strong>84.83%</strong></td>
</tr>
<tr>
<td>4.</td>
<td>Bharti</td>
<td>85.18%</td>
<td>85.00%</td>
<td>80.00%</td>
<td>82.50%</td>
<td>85.00%</td>
<td><strong>84.00%</strong></td>
</tr>
<tr>
<td>5.</td>
<td>BSNL</td>
<td>82.22%</td>
<td>86.67%</td>
<td>80.00%</td>
<td>72.00%</td>
<td>73.33%</td>
<td><strong>80.53%</strong></td>
</tr>
<tr>
<td>6.</td>
<td>Tata</td>
<td>78.75%</td>
<td>88.00%</td>
<td>72.00%</td>
<td>75.00%</td>
<td>66.67%</td>
<td><strong>77.57%</strong></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td><strong>88.11%</strong></td>
<td><strong>85.45%</strong></td>
<td><strong>81.92%</strong></td>
<td><strong>79.15%</strong></td>
<td><strong>77.93%</strong></td>
<td><strong>84.80%</strong></td>
</tr>
</tbody>
</table>

### 4.9 Data Sampling

The sampling process is as follows

#### 4.9.1 Defining Target Population

The first question related to sampling concerns identifying the Target population, that is, the complete group of specific population elements relevant to the researcher project.\(^{27}\) To be complete, a population must be very explicitly defined in terms of elements, sampling units, extent and time.

In this study, cell phone customers of selected District of South Gujarat is target population.

#### 4.9.2 Select Sample Frame

The physical materials from which sample are chosen is called a frame. A map, a telephone directory, a list of debtors, a card file, a list of business establishment, a list of license plates issued to owners of car, census records are the examples of the frame.

In this study, Census Record of January 2011 as well as Market share of service provider on 2011 has been chosen to formulate the sample size.

---

4.9.3 Sample Unit

The sample unit is the basic unit containing the elements of population to be sampled. It may be the element itself.

The sample units of this study are the respondents below the forty years of age.

4.9.4 Sampling Method

All the items under consideration in any field of inquiry constitute a “Universe” or “Population”. A complete record of all the items in the population is known as census inquiry. But in practice, the census inquiry may not be possible. Hence a few items from the population are selected for the study purpose. There are several alternative ways of taking a sample. The major alternative sampling plans may be either probable samples or non-probable samples.

4.9.4.1 Probable Samples

The method in which each member of the population has got an equal probability of being selected is called probability samples. The various types of probability samples are like Simple Random Sampling, Systematic Random Sampling, Stratified Random Sampling, Multi-Stage Random Sampling, Cluster/Group Sampling, Sequential Sampling, and Replicated Sampling.

4.9.4.2 Non-Probable Samples

Non-probable samples are those in which the probability of unit selection is unknown at any stage of the selection process and the selection of the units is based on the judgment of the researcher rather than on randomness. The various types of non-probability samples are like Purposive Sampling, Quota Sampling, and Convenience Sampling.
Because the researcher has been taken the entire sample by his own judgment, Non-probability samples is considered. Moreover the researcher took the sample as per respondents’ as well as his own convenience; the convenience sampling method has been applied.

4.9.5 Determination of Sample Size

The decision about sample size is not an easy one. It depends on a number of considerations and there is no definitive answer. A larger sample cannot guarantee accuracy. An important component of any decision about sample size should be how much sampling error one is prepared to tolerate. The less sampling error one is prepared to tolerate, the larger a sample will need to be.

Consideration of sampling size are likely to be profoundly affected by matters of time and cost. Here, the researcher tries to select those samples which are truly representative. The number of sample size has been decided by applying a self developed statistical formula. Hence the numbers of subscribers are very less in Narmada and Dang districts, these two districts have been omitted from the sample. Moreover, number of subscribers of Uninor, Videocon, Aircel and Sistema are also very less hence these cell phone companies have been omitted from the sample. The procedure to frame sample size is as follows.

1. First step:

   The ratio of number of subscribers has been found by dividing number of subscribers with 1 lakh to reduce the size.

2. Second Step:

   The ratio of population of district has been found by dividing number of
population with 1 lakh to reduce the size.

3. **Third Step:**

In the third step, following formula has been applied to find the number of sample size.

\[
\text{Sample Size} = \text{Subscriber Ratio} \times \text{Population Ratio} \times 3\%
\]

**First Step:** Number and Ratio of subscribers

<table>
<thead>
<tr>
<th>Name of the Company</th>
<th>Vodafone Subscriber</th>
<th>Reliance Communication Limited</th>
<th>Idea Cellular Limited</th>
<th>Bharti Airtel</th>
<th>Bharat Sanchar Nigam Limited</th>
<th>Tata Indicom</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>13929246</td>
<td>7237275</td>
<td>6632034</td>
<td>6270078</td>
<td>3896196</td>
<td>3303938</td>
</tr>
<tr>
<td>Ratio</td>
<td>139.29</td>
<td>72.37</td>
<td>66.32</td>
<td>62.70</td>
<td>38.96</td>
<td>33.04</td>
</tr>
</tbody>
</table>

**Source:** Telecom Regulatory Authority of India, New Delhi, 4th March 2011, Website: www.trai.gov.in  
**Ratio** = Subscribers / 1 lakh

**Second Step:** Population and Ratio of District

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ratio</td>
<td>60.79</td>
<td>17.03</td>
<td>15.50</td>
<td>13.30</td>
<td>8.06</td>
</tr>
</tbody>
</table>

**Source:** As per Census-2011, http://gujaratvibrant.com  
**Ratio** = Number of Subscribers / 1 lakh

**Third Step:** Statistics of Sample Size

<table>
<thead>
<tr>
<th>No</th>
<th>Name of the Company</th>
<th>Number of subscriber</th>
<th>Surat Rn × C4 × 3%</th>
<th>Valsad Rn × C5 × 3%</th>
<th>Bharuch Rn × C6 × 3%</th>
<th>Navsari Rn × C7 × 3%</th>
<th>Tapi Rn × C8 × 3%</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vodafone</td>
<td>139.29</td>
<td>254</td>
<td>71</td>
<td>65</td>
<td>56</td>
<td>34</td>
<td>480</td>
</tr>
<tr>
<td>2</td>
<td>Reliance</td>
<td>72.37</td>
<td>132</td>
<td>37</td>
<td>34</td>
<td>29</td>
<td>18</td>
<td>250</td>
</tr>
<tr>
<td>3</td>
<td>Idea</td>
<td>66.32</td>
<td>121</td>
<td>34</td>
<td>31</td>
<td>26</td>
<td>16</td>
<td>228</td>
</tr>
<tr>
<td>4</td>
<td>Bharti</td>
<td>62.70</td>
<td>114</td>
<td>32</td>
<td>29</td>
<td>25</td>
<td>15</td>
<td>215</td>
</tr>
<tr>
<td>5</td>
<td>BSNL</td>
<td>38.96</td>
<td>71</td>
<td>20</td>
<td>18</td>
<td>16</td>
<td>9</td>
<td>134</td>
</tr>
<tr>
<td>6</td>
<td>Tata</td>
<td>33.04</td>
<td>60</td>
<td>17</td>
<td>15</td>
<td>13</td>
<td>8</td>
<td>113</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>752</td>
<td>211</td>
<td>192</td>
<td>165</td>
<td>100</td>
<td>1420</td>
<td></td>
</tr>
</tbody>
</table>

85
4.10 Method of Data Analysis

Data analysis comes after the data has been collected (Field, 2009) to make sense of the study and reach certain findings. This section presents the different techniques used for data analysis by the researcher.

4.10.1 Factor Analysis

One of the major uses of factor analysis is to summarize the data to be more manageable without losing any of the important information therefore making it easier to test theories. There are three main reasons for using factor analysis (Field, 2009): first to develop a scale to measure an underlying theme such as service quality, second to reduce the variables to a manageable size and third to have a better understanding of the variables.

According to Cooper and Schindler (2008), factor analysis is a technique used for specific computational techniques. These factors, also called latent variables, aim to measure things that are usually hard to measure directly, such as attitudes and feelings. This is a way to explain the relationships among variables by combining them into smaller factors. The scales usually start with many questions, and then by using factor analysis are reduced to a smaller number. These reduced results are then used for other analysis such as multiple regression analysis (Pallant, 2007).

There are two methods of factor analysis observed by Kinnear and Gray (2010), the exploratory factor analysis and the confirmatory factor analysis. The purpose of the exploratory factor analysis is to find the number of factors
that explain the correlations; while in the confirmatory factor analysis the researcher predicts the number of factors with specific loading. Another important point to consider when performing factor analysis is factor loadings. Factor loadings are the correlation of the variable with the factor. When the loading is clear then the interpretations of the factors become easier. Some variables have a loading or correlation with more than one factor. The mathematical technique for simplifying the results of the factor analysis results is called factor rotation (Zikmund et al., 2010).

The most common method of factor analysis is the principal component and the most common method of factor rotation is the varimax rotation (Kinnear & Gray, 2010; Zikmund et al., 2010). Principal component technique looks at the correlation of different variables to reveal the relationship between them, and then reduces the variables by empirically summarising them or combining them into a small number of factors under common themes (Tabachnick and Fidell, 2007b). Factor rotation is used as a method to interpret the factors by showing the variables that group together (Pallant, 2007). Two tests are performed to ensure that the data is suitable for factor analysis, the Kaiser-Meyer-Olkin (KMO) measure for sampling adequacy and the Bartlett’s test of sphericity (Pallant, 2007). The KMO value is low if it is between 0.5 and 0.7 and excellent if it is above 0.90 (Field, 2009). Factors with an eigenvalue of 1 or greater are usually retained (Field, 2009).

In this research, exploratory factor analysis has been applied by using principal component analysis with varimax rotation to reduce and to analyse the data.
4.10.2 Reliability and Validity Test

Reliability and validity are very important for obtaining meaningful results.

4.10.2.1 Reliability Test

Reliability is the degree to which measures are free from error and therefore yield consistent result. It refers to consistency of a measure of concept. It may be internal reliability or external reliability. Furthermore, reliability is more important when the questionnaire is a Likert type because there are many variables testing the concept. A questionnaire is considered reliable if it gives similar results when repeated (Hair, 2003).

In this study, internal reliability has been considered. Bryman et al. (2003) suggested that a multiple-item measure in which each answers to each questions are aggregated to form an overall score, we need to be sure that all our indicators are related to each other. It can be test use Cronbach’s alpha method. The result of 0.7 and above implies an acceptable level of internal reliability.

4.10.2.2 Validity Test

Validity is concerned with whether the findings are really about what they appear to be about validity defined as the extent to which data collection method or methods accurately measure what they were intended to measure (Saunders et al.2003). Copper et al. (2003) believe that validity refers to the extent to which a test measures what the researchers actually wish to measure. Validity may be internal or external.
For the present study, the content validity of the instrument has been ensured as all the dimensions has been identified from the literature and were thoroughly reviewed by professionals and academicians. Numbers of different steps were taken to ensure the validity of the study as follows:

1. Data has been collected from the reliable sources.
2. Before finalize the questionnaire, pilot survey has been conducted to ensure the validity of the result.

4.10.3 Normality Test

Here, the researcher wants to apply t-test, Anova test, correlation, regression etc. and before doing these tests, it is very necessary that the data should be normally distributed. By doing so, normality test has been run for twenty two statements of service quality and nineteen statements of service features. The results will be analyzed on the base of guideline of Kline (1998). As per Kline guideline, all variables in the analysis for univariate skewness and kurtosis are satisfactory within conventional criteria for normality. He suggests that the value of Skewness between -3 to 3 indicates that the data are normal. Moreover, he says that the value of Kurtosis between -10 to 10 also indicates the normality of data. Multivariate normality (the combination of two or more variables) means that the individual variable is normal in a univariate sense and that their combinations are also normal (Hair et al. 2003).

4.10.4 t-Test

4.10.4.1 One Sample t-test

One sample t-test has been used to evaluate the satisfaction level of customers’
of south Gujarat. It has been also used to evaluate the purpose of cell phone usage. The procedure to run this test is as follows:

A. Hypothesis

\[ H_0: \mu < 3 \]
\[ H_1: \mu \leq 3 \]

B. Cut off value: 3

C. Statistical test and significance level:

One sample t-test, significant at 0.05

D. Calculated: t-value

E. Critical Value: p-value

F. Decision rule:

Null hypothesis should be rejected if p-value is less than 0.05 and alternate hypothesis should be accepted.

4.10.4.2 Independent t-test

Independent sample t-test has been applied to measure the significant difference between male and female towards three attributes viz. 1. cell phone service usage, 2. reason for need of cell phone and 3. usage of different mobile services

A. Hypothesis

\[ H_0: \text{Gender has no influence on above three attributes} \]
\[ H_1: \text{Gender has influence on above three attributes} \]

B. Calculated: t-value

C. Critical Value: p-value

D. Decision rule:

Null hypothesis should be rejected if p-value is less than 0.05 and alternate hypothesis should be accepted.
4.10.5 One-Way Anova

A one-way Anova has been run. To check the equality of variance among the group, Levene statistics has been found. If its value remains above 0.05, it indicates that this test is good fit for analysis. To find out the equality of means among the districts or companies, Anova F value has been found. And if the significant value of F is greater than 0.05 indicates the acceptance of null hypothesis. To identify the structure of the difference, mean plot of mean differences for overall customer satisfaction has been carried out. To know is this difference significant? Scheffe post-hoc test has been run

A. District/Company Wise Mean

B. Test of Homogeneity of Variances

\[ H_0: \text{Group variances are significantly equal} \]
\[ H_1: \text{Group Variances are significantly not equal} \]

C. ANOVA for F-value

\[ H_0: \text{Customer satisfaction level among cell phone service providers remains same} \]
\[ (\mu_1 = \mu_2 = \mu_3 = \mu_4 \ldots \ldots = \mu_n) \]

\[ H_1: \text{Customer satisfaction level among cell phone service providers do not remains same} \]
\[ (\mu_1 \neq \mu_2 \neq \mu_3 \neq \mu_4 \ldots \ldots \neq \mu_n) \]

D. Mean Plot of Mean Difference

4.10.6 Correlation

Correlation is used to measure an association between variables. It is different from, regression analysis. It shows the strength between two continuous of the
variables. It is carried out before regression analysis to rule out strong relationships between the independent variables.

A. The strength of correlation

The strength of correlation is shown in table no. 4.6

<table>
<thead>
<tr>
<th>Range</th>
<th>Strength of association</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.81-1.00</td>
<td>Strong</td>
</tr>
<tr>
<td>0.61-0.80</td>
<td>Moderate</td>
</tr>
<tr>
<td>0.41-0.60</td>
<td>Weak</td>
</tr>
<tr>
<td>0.21-0.40</td>
<td>Very weak</td>
</tr>
<tr>
<td>0.00-0.20</td>
<td>None</td>
</tr>
</tbody>
</table>

B. Structure of Correlation

The structure of correlation is shown in table no. 4.7

<table>
<thead>
<tr>
<th>Correlations</th>
<th>Overall Service Quality</th>
<th>Overall Service Features</th>
<th>Customer Satisfaction</th>
<th>Customer Loyalty</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Service</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality</td>
<td>Pearson Correlation</td>
<td>1</td>
<td>?</td>
<td>.000**</td>
<td>.000**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.000**</td>
<td>.000**</td>
<td></td>
<td>.000**</td>
</tr>
<tr>
<td>Overall Service</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Features</td>
<td>Pearson Correlation</td>
<td>1</td>
<td>?</td>
<td>.000**</td>
<td>.000**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.000**</td>
<td>.000**</td>
<td></td>
<td>.000**</td>
</tr>
<tr>
<td>Customer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfaction</td>
<td>Pearson Correlation</td>
<td>1</td>
<td>?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.000**</td>
<td>.000**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer Loyalty</td>
<td>Pearson Correlation</td>
<td>1</td>
<td>?</td>
<td>.000**</td>
<td>.000**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.000**</td>
<td>.000**</td>
<td></td>
<td>.000**</td>
</tr>
<tr>
<td>Recommendation</td>
<td>Pearson Correlation</td>
<td>1</td>
<td>?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.000**</td>
<td>.000**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

3.10.7 Regression

Regression analysis is used to find the relationship between one dependent variable and one or more independent variables and has become popular in many research areas. Regression is another way to determine the association between variables; this is similar to bivariate correlation as it assumes that there is a link between the dependent and independent variable (Zikmund, 2003).
Regression analysis is called simple regression analysis when there is only one independent variable and is called multiple regressions when there is more than one independent variable (Robson, Pemberton & McGrane, 2008). Multiple regression analysis is more complex than correlation and is used to find the ability of a set of independent variables in predicting the dependent variable (Pallant, 2007).

In this study multiple regression analysis has been used because there is more than one independent variable. To know how good the estimated regression equation is, $R^2$ has been found, which simply the square of correlation coefficient. This measure is also called the coefficient of determination of a regression equation and it takes value between 0 and 1 (both values inclusive). It indicates the exploratory power of the regression model. The test for the significance of $R^2$ is carried out using the F statistics as indicated by the p value (0.00) from Anova table. Then t value has been found with standardized coefficients beta. Following step / process has been done for multiple regression analysis.

A. Exploratory Power of Model Summary

$H_0$: $R^2=0$

$H_1$: $R^2>0$

B. Anova for F Value

$H_0$: Independent variables collectively do not affect dependent variable

$H_1$: Independent variables collectively affects dependent variable
If p value is less than 0.05, null hypothesis is rejected and alternative hypothesis is accepted.

C. Estimated Beta Coefficients

\[ H_0: \beta_1 = 0, \beta_2 = 0 \ldots \ldots \beta_n = 0 \]
\[ H_1: \beta_1 \neq 0, \beta_2 \neq 0 \ldots \ldots \beta_n \neq 0 \]

Seven separate regression analysis have been performed which are mentioned as under.

Regression Model - I

To find out the relation between overall service quality as a dependent variable and tangible, reliability, responsiveness, assurance and empathy as independent variables

\[ y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + e \]

Where, \( y \) = the dependent variable overall service quality, \( \alpha \) is the y intercept which means the value of y when all the x values are zero, \( x_1 \) = tangible, \( x_2 \) = reliability, \( x_3 \) = responsiveness, \( x_4 \) = assurance, \( x_5 \) = empathy, \( \beta \) = the coefficient of the independent variable, \( e \) = error

Regression Model - II

To find out the relation between overall service features as a dependent variable and market reputation, value offered, price network quality and value added services independent variables

\[ y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + e \]

Where, \( y \) = the dependent variable overall service features, \( \alpha \) is the y intercept which means the value of y when all the x values are zero, \( x_1 \) = market reputation, \( x_2 \) = value offered, \( x_3 \) = price, \( x_4 \) = network quality, \( x_5 \) = value added
services, $\beta$ = the coefficient of the independent variable, $e$ = error

**Regression Model - III**

To find out the relation between customer satisfaction as a dependent variable and tangible, reliability, responsiveness, assurance and empathy as independent variables

$$y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + e$$

Where, $y$ = the dependent variable customer satisfaction $\alpha$ is the y intercept which means the value of $y$ when all the $x$ values are zero $x_1$ = tangible, $x_2$ = reliability, $x_3$ = responsiveness, $x_4$ = assurance, $x_5$ = empathy, $\beta$ = the coefficient of the independent variable, $e$ = error

**Regression Model - IV**

To find out the relation between customer satisfaction as a dependent variable and market reputation, value offered, price network quality and value added services independent variables

$$y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + e$$

Where, $y$ = the dependent variable customer satisfaction $\alpha$ is the y intercept which means the value of $y$ when all the $x$ values are zero $x_1$ = market reputation, $x_2$ = value offered, $x_3$ = price, $x_4$ = network quality, $x_5$ = value added services, $\beta$ = the coefficient of the independent variable, $e$ = error

**Regression Model - V**

To find out the relation between customer satisfaction as a dependent variable and overall service quality and overall service feature as independent variables

$$y = \alpha + \beta_1 x_1 + \beta_2 x_2 + e$$
Where, \(y\) is the dependent variable customer satisfaction, \(\alpha\) is the \(y\) intercept which means the value of \(y\) when all the \(x\) values are zero, \(x_1\) = overall service quality, \(x_2\) = overall service features, \(\beta\) = the coefficient of the independent variable, \(e\) = error

**Regression Model - VI**

To find out the relation between customer loyalty as a dependent variable and overall service quality, overall service features and customer satisfaction as independent variables

\[ Y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + e \]

Where, \(y\) is the dependent variable, \(\alpha\) is the \(y\) intercept which means the value of \(y\) when all the \(x\) values are zero, \(x_1\) = overall service quality, \(x_2\) = overall service features, \(x_3\) = customer satisfaction, \(\beta\) = the coefficient of the independent variable, \(e\) = error

**Regression Model - VII**

To find out the relation between recommendation as a dependent variable and overall service quality, overall service features, customer satisfaction and customer loyalty as independent variables

\[ y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + e \]

Where, \(y\) is the dependent variable, \(\alpha\) is the \(y\) intercept which means the value of \(y\) when all the \(x\) values are zero, \(x_1\) = overall service quality, \(x_2\) = overall service features, \(x_3\) = customer satisfaction, \(x_4\) = customer loyalty, \(\beta\) = the coefficient of the independent variable, \(e\) = error
4.11 Limitations

Limitations are matters and occurrences that arise in an experiment which are totally out of the researcher’s control. They limit the extensity that a study can go to, sometimes affecting the end result of the investigation. The limitations of this study are as follows:

1. The study has been conducted in the south Gujarat region which can not be generate for other part of country.

2. The limitations of statistical methods applied for analysis would also apply to this study.

3. During the study, the data and information furnished by respondents are based on their perception in this field and have to rely on it.

4. Inherent limitation of secondary data should be taken into consideration.

5. The subscriber who has being used the cell phone service for minimum period of one year are taken into consideration.