### RESEARCH METHODOLOGY

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>Introduction</td>
</tr>
<tr>
<td>4.2</td>
<td>Objectives of Study</td>
</tr>
<tr>
<td>4.3</td>
<td>Hypothesis of the Study</td>
</tr>
<tr>
<td>4.4</td>
<td>Research Design</td>
</tr>
<tr>
<td>4.5</td>
<td>Sampling and Data Collection</td>
</tr>
<tr>
<td>4.6</td>
<td>Sources of Data Collection</td>
</tr>
<tr>
<td>4.7</td>
<td>Pilot Study</td>
</tr>
<tr>
<td>4.8</td>
<td>Operational Definitions Variables</td>
</tr>
<tr>
<td>4.9</td>
<td>Tools of Analysis</td>
</tr>
<tr>
<td>4.10</td>
<td>Tests for analysis</td>
</tr>
</tbody>
</table>
Chapter IV
RESEARCH METHODOLOGY

4.1 Introduction
The flow of sequence to achieve the direction of study is progressed in a method that first delves on the aims and objectives of the research, defining the envelope to specify the parameters, the underlying thought process that progressively notes the various factors that determine the elements that will impact the questions that arise and need to be unraveled to reach the objective, the study is then designed to incorporate the learnings in the process to facilitate an organized approach.

Initially there is the task undertaken to detail the description of the sample which also includes the tool used to arrive, the procedure followed to collect the data is detailed and is followed by the review process of the sampling techniques. Also listed are the operational definitions of the variables. The chapter concludes with the techniques of analysis used in the study.

The investment policies of companies depend on various factors that contribute to the growth of company business like,

- Government policies in the country of operation,
- New and unexplored areas of business,
- Need and opportunity for providing new technology for cost effective implementation and thereby increasing benefits to customer and company allowing for greater scale of business and profit margins,
- Competition existing in the sector,
- Spending / purchase power and the taste of the customers.

This study compiles data on these parameters and analyses with appropriate statistical tools to arrive a suitable model.

The research is limited to the telecom operations in the country, with the view that the basic telephone connection is a necessity like electricity and water and does not extend...
to the study of other elements of information technology like the internet which fairly overlaps in being central to the uplift of the populous and contributing to narrowing the large divide between urban and rural India.

The study limits itself to villages that already have electricity (96%), and does not envelope the cost of penetration, arising from captive power generation.

The research briefly studies the cost advantages of internet telephony and the technology available, the study is restricted due to the already low per call pricing in India making internet telephony more suitable to those with larger incomes and having access to computers. It also endeavours to compare policies and business opportunities for the sector in other countries that are developing or have developed and have successful comparative penetration of telecom.

4.2 Objectives of Study
The studies established that the shying away of telecom service providers from rural areas is mainly the return on investment, arising from the scale of usage in the more sparsely populated areas, where the density does not justify the investment due to scale of economies.

Advancements in telecom devices and technology has contributed largely to reducing the cost of establishing infrastructure for providing the connectivity; most of the growth in telecom today is in the mobile sector, where the comparatives of cost vs spread are significantly advantageous.

While cost has been a driver for the fast spread, especially with the advent of mobile telephony, there has been significant movement from the very onset of the government realisation of the need for communication spread. Even in the fixed line era, with adoption of smaller and more robust exchanges initiated by Department of Telecommunication (DoT).

India has adopted many models of success in telecom spread from the world over to its advantage and even customised many models to suit the local need, there is however
periods of lag in adopting technologies, like the acceptance of the 2G technology need, although the 3G followed in quick succession.

To capture the relevance of the flow of events it is important to map the attributes responsible for telecom growth and diffusion and arrive a model for the future, the objectives of the study are therefore follows as:

1. To establish the relationship between economic growth and telecom growth.

2. To establish the impact of various telecom policies on Tele-density growth.

3. To provide a viable and sustainable model for the service providers for rural consumers to promote mobile penetration in rural areas. In terms of the monthly mobile spend

4. To identify the factors that the rural consumers find important for selection of service providers.

5. To understand the perception of service providers that has resulted in a marginalised growth in the rural areas, which could open up substantial growth opportunities.

The objectives are translated into the following broad hypothesis:

4.3 Hypothesis of the Study

\( H_0: \) There is no significant relationship between telecom growth and economic growth

\( H_{01}: \) There is significant relationship between telecom growth and economic growth (the telecom growth leads to economic growth)

\( H_{02}: \) Government Policies have no significant impact on telecom growth

\( H_{02a}: \) Government Policies have significant impact on telecom growth
Ho3: The set of independent variables i.e. Usage (7), Demographic(5) and Economic variables(7) do not affect monthly telecom spend of rural consumers.

Ho3a: At least one variable (of 19 variables) affects monthly telecom spend of rural consumers.

Ho4: no factors exists in the data (i.e. there are no correlations among the variables)

Ho4a: there are multiple factors that customer consider while selecting Service providers

4.4 Research Design

The research design forms a blue print of the conducted research. It explains the different methods of data collections and the rational for selecting these methods.

Existing literature has indicated that there is a significant relationship between telecom growth and economic growth. This helped to hypothesize relationships between the same and further test them.

The research covers the India strategies of companies in the telecom business mapping the growth of existing companies operating in India on various platforms of telecom business. The extent of investment made by the businesses, policies adopted and segments catered to.

The research is a combination of descriptive and causal studies.

The study was conducted in two stages:

Stage: A

Opinion Survey by the users of telephone in rural India comprising of
  a. The criteria of preferred use by the rural consumer for type of service enabling insight into a model of service that will promote widely acceptable usage
  b. Establish the extent of use and purposes for which a larger share of the telephony was used by the rural populace
c. Differentiate or establish the existence of preference use parameters by demographics

d. Compare from life enrichment data the extent of prosperity after the advent of telephones in rural area

e. Understand if limitation of use was consequent to the ability of the facility to be available in the local languages

Opinion survey was done on the users of telephone in the rural areas

Stage : B

Service Provider Opinion Study to help evaluate

a. Requirements of the service providers, the delivery of which will prompt an accelerated entry of private players in rural area

b. Fair and encouraging government policy to support the penetration in rural area differential from the existing policy scenario

c. Understand if the current business trend in telecom for merging smaller companies into larger holdings thus enhancing capacity and the thrust towards sharing of resources like towers was adequate to promote the viability of telecom in the rural sector

d. Analyse responses to understand a proposed alternative for the Universal Service Obligation (USO) levy usage

e. Usefulness of fast moving technology improvement servicing value added service usage in urban areas consequently freeing obsolete technology for basic communication requirements of rural area

f. Establish the leanings of service providers towards partnering public sector companies for rural penetration alternatively lease/rent their facilities to enhance the opportunity for more lucrative rural business proposal

Opinion Survey was done on senior executive working in mobile service Provider Company willing to explore the rural sector for their expansion or those which are already present in the rural area.

Secondary Data Study

Secondary Data Study is conducted to evaluate factors that foster rural telecom growth

a. Understand the relationship between telecom growth and economic growth
b. Find the effect of various government policies / events in telecom sector on the telecom growth using event study methodology

c. Review the collection under USO obligation and the spends for the intended use

The impact of different government policies are studied using secondary data. The growth of the region after telephone penetration can be measured by parameters like, GDP from the region, GDP / capita income of the region, life expectancy, literacy rate, Infant mortality, Daily calorie intake, Birth rate, Death rate etc.

4.5 Sampling and Data Collection

The data is collected in three stages.
The initial foray into the sampling was preceded by a pilot study to understand the clarity provided by the questionnaire itself in capturing the objectives of the data collection, further fine-tuning and refinement to iron out minor confusions was incorporated to ease the flow of response.

Stage: A

Objective of the study was, to provide a viable and sustainable model for the service providers for rural consumers to promote mobile penetration in rural areas. For the purpose, an opinion survey was conducted on purposively selected users of telephones in the rural area. The rural area, selected for survey, was divided into four major groups namely:

- Very Small Village (with population <500)
- Small Village (with population between 500 – 1,000)
- Medium Village (with population between 1,001 – 2000)
- Large Village (with population >2000)

The above segmentation of villages is adopted from (http://censusindia.gov.in/Metadata/Metada.htm) Government of India

The methodology adhered was using a structured questionnaire seeking information from adult household heads and other household members in randomly selected rural communities from the above group of villages. The sampling unit was rural consumer of
telephone (fixed line and mobile phone). The questionnaire was attempted in various regions with over 1200 respondents out of which only 568 opted to respond.

The sampling method used is cluster sampling, where the geographic clusters are made for the sampling. Primarily four clusters were studied in four zones (north, east, west and south) from five different states namely,

- Uttar Pradesh (North)
- West Bengal (East)
- Gujarat (west)
- Maharashtra (west)
- Karnataka (South)

Using multistage cluster analysis, the villages in the states were selected randomly. The data is collected from 67 different villages of above states. The process of data collection took over eight months of time.

Following Table illustrates the number of questionnaires filled from each of the above types of villages Table-1):

<table>
<thead>
<tr>
<th>Village Type</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Small Village</td>
<td>13</td>
<td>2.3</td>
</tr>
<tr>
<td>Small Village</td>
<td>114</td>
<td>20.1</td>
</tr>
<tr>
<td>Medium Village</td>
<td>165</td>
<td>29.0</td>
</tr>
<tr>
<td>Large Village</td>
<td>276</td>
<td>48.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>568</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

The questionnaire was designed to understand the needs, requirements and perceptions of the rural consumers towards telephone communication. The data received from the consumers will be helpful to understand their perception about their current service providers, their spend pattern and current usage of telephone. In addition, the questionnaire collected the demographic information and other information about the
village in which telephone consumers were living. The aim of the questionnaire was thus to correlate economic development with telecomm penetration in the rural consumers.

Classification of the sample

The sample population was heterogeneous comprising male, female, students, farmers, labour and white collar workers etc. The classification of the sample was arrived at through a filter and the classification of the respondents was made in terms of age, annual income of the house hold, gender, education etc. Broad classification of the respondents is described in Table-1 and could be understood by the descriptive analysis of the following key variables.

<table>
<thead>
<tr>
<th>Variables</th>
<th>N</th>
<th>Mean</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>568</td>
<td>36.45</td>
<td>0.51</td>
</tr>
<tr>
<td>No of People in Household</td>
<td>567</td>
<td>4.95</td>
<td>0.07</td>
</tr>
<tr>
<td>Adults in the Household</td>
<td>567</td>
<td>3.84</td>
<td>0.06</td>
</tr>
<tr>
<td>No of people living in other city/town/village</td>
<td>432</td>
<td>0.46</td>
<td>0.05</td>
</tr>
<tr>
<td>How many people in the house have mobiles</td>
<td>565</td>
<td>2.24</td>
<td>0.05</td>
</tr>
<tr>
<td>How many years since first mobile phone at home</td>
<td>564</td>
<td>4.86</td>
<td>0.11</td>
</tr>
<tr>
<td>How many years are you using phone</td>
<td>553</td>
<td>3.98</td>
<td>0.1</td>
</tr>
<tr>
<td>Spend on mobile phone</td>
<td>564</td>
<td>242.43</td>
<td>11.21</td>
</tr>
<tr>
<td>spend on fixed phone</td>
<td>101</td>
<td>252.23</td>
<td>25.52</td>
</tr>
<tr>
<td>spend on roaming</td>
<td>415</td>
<td>19.96</td>
<td>3.77</td>
</tr>
<tr>
<td>Annual Income</td>
<td>519</td>
<td>182159</td>
<td>9267.71</td>
</tr>
</tbody>
</table>
Stage: B

Telecom Industry Survey was done on purposively selected operators willing to explore the rural sector for their further expansion or those which are already operating in the rural areas.

The initial questionnaire was floated at the regional offices of service providers in the metropolis of Mumbai, however great hesitation was encountered due to the range of financial data related to the company operations incorporated in the questionnaire, largely because many of the central operations were through diverse offices across India. Also the functionaries at these locations not necessarily operational team heads for most service providers.

It was then decided to procure the financial data for the service providers through the published data. And secure opinions through the electronic transmittals to relevant controlling offices at the required spread for sampling.

The methodology adhered was using a structured questionnaire seeking information from senior management executive in the telecom industry. The results of first stage were incorporated while constructing the questionnaire for the second stage.

The objective of the survey was to arrive at a consideration for the regulating authorities, the observed reasons for the hesitation of the private players to sprint ahead in capturing the huge unexplored territories in the rural segment. Prompting from the extensive and continuous debate opinions on favourable conditions for rural operation and segregating the licence specific opinions from the overall technical and commercial inputs.

The sample size was 52 and the sampling unit was senior management executive in the telecom industry

Table 4.3 illustrates the company wise distribution of the respondents.
Table 4.3 Distribution of service providers responses

<table>
<thead>
<tr>
<th>Telecom Service Provider</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aircel</td>
<td>3</td>
<td>5.8</td>
</tr>
<tr>
<td>Bharti Airtel</td>
<td>7</td>
<td>13.5</td>
</tr>
<tr>
<td>Idea</td>
<td>7</td>
<td>13.5</td>
</tr>
<tr>
<td>Loop Mob</td>
<td>2</td>
<td>3.8</td>
</tr>
<tr>
<td>MTNL/BSNL/ GOV</td>
<td>10</td>
<td>19.2</td>
</tr>
<tr>
<td>Quadrant Televenture</td>
<td>2</td>
<td>3.8</td>
</tr>
<tr>
<td>Reliance</td>
<td>3</td>
<td>5.8</td>
</tr>
<tr>
<td>Sistema (MTS)</td>
<td>2</td>
<td>3.8</td>
</tr>
<tr>
<td>Tata com/ Indicom / DOCOMO</td>
<td>2</td>
<td>3.8</td>
</tr>
<tr>
<td>UNINOR</td>
<td>2</td>
<td>3.8</td>
</tr>
<tr>
<td>Videocon</td>
<td>2</td>
<td>3.8</td>
</tr>
<tr>
<td>Vodafone</td>
<td>10</td>
<td>19.2</td>
</tr>
<tr>
<td>Total</td>
<td>52</td>
<td>100.0</td>
</tr>
</tbody>
</table>

The financial data of different service providers was collected through audited and published data available in the electronic media (Captiline Software)

Stage : C
The impact of telecom on economic growth is studied using secondary data. The economic growth of the region after telephone penetration measured by parameters like, GDP from the region, GDP / capita income of the region, life expectancy, literacy rate, Infant mortality, Daily calorie intake, Birth rate, Death rate etc. The secondary data is also used to assess the impact of different policies on tele-density, and measure the targeted achievements over the years over the actual achieved.

4.6 Sources of Data Collection
The data is collected from various government and non-government sources. A detailed list of the sources is given below.

**Department of Telecommunication**

- Universal Service Obligation Fund ([http://usof.gov.in/usof-cms/home.jsp](http://usof.gov.in/usof-cms/home.jsp))
- Telecom Regulations ([http://www.dot.gov.in/content/telecom-policies](http://www.dot.gov.in/content/telecom-policies))

**Telephone Regulatory Authority of India**
- Consultation Papers ([http://www.trai.gov.in/Content/TelDis/49_1_0%20.aspx](http://www.trai.gov.in/Content/TelDis/49_1_0%20.aspx))
- Regulations ([http://www.trai.gov.in/Content/Regulation/1_0_RegulationUser.aspx](http://www.trai.gov.in/Content/Regulation/1_0_RegulationUser.aspx))

**World Bank**
- World Bank Development Data for India
- Tele-density Data
- Telecom Expenditure Data
- Telecom Income data
- CLIC Database ([http://webcdm.ceicdata.com](http://webcdm.ceicdata.com))
- Monthly Subscriber Data
- GDP Data
- Tele-density Data

**4.7 Pilot Study**
The pilot study was conducted for primary data collection of both stage A and Stage B. This was done to access the reliability and validity of the questionnaire. The questionnaire contained most questions that were direct rather than abstract measures (constructs). The two constructs were used by the researcher for two abstract measures namely, Influence of telecom on rural consumers and benefits perceived by rural consumers of the telecom. These set of questions were used before by Dr. Rekha Jain for the research sponsored by WTO (World Trade Organisation) on rural consumers in Gujarat. The researcher picked up the questions and created these two scales. There were no scales available before to understand these two aspects. The pilot study was
conducted to find the validity and reliability of these scales. The measure used was Cronbach's Alpha and Guttman Split-Half reliability. The pilot study was done on 26 respondents selected from two villages of Maharashtra.

Table 4.4 Reliability Statistics (Cronbach Alpha) for Influence : Pilot Study

<table>
<thead>
<tr>
<th>Cronbach's Alpha</th>
<th>Cronbach's Alpha Based on Standardized Items</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>.829</td>
<td>.821</td>
<td>9</td>
</tr>
</tbody>
</table>

The 9-item scale “Influence” had Cronbach’s alpha reliability as 0.829, above the acceptable value of 0.7. The Guttman Split-Half reliability for “Influence” was found to be 0.751, above the acceptable value of 0.7.

Table 4.5 Reliability Statistics (Split Half) for Influence : Pilot Study

<table>
<thead>
<tr>
<th>Cronbach's Alpha</th>
<th>Part 1 Value</th>
<th>Part 2 Value</th>
<th>N of Items</th>
<th>Total N of Items</th>
<th>Correlation Between Forms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Part 1 Value</td>
<td>Part 2 Value</td>
<td>N of Items</td>
<td>Total N of Items</td>
<td>Correlation Between Forms</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.809</td>
<td>.874</td>
<td>5</td>
<td>4</td>
<td>.660</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spearman-Brown Coefficient</td>
<td>Equal Length</td>
<td>Unequal Length</td>
<td>.768</td>
<td>.770</td>
<td>.751</td>
</tr>
</tbody>
</table>

The other statistics like ANOVA and Item total statistics, and inter Item correlation matrix are given in the Appendix-2.

Since the reliability was within acceptable range, the scale was used in the final study. The reliability of all responses of the final study was calculated using Cronbach’s Alpha and was found to be 0.857, above the acceptable level of 0.7.
Table 4.6 Reliability Statistics (Cronbach Alpha) for Influence : Complete Data

<table>
<thead>
<tr>
<th>Cronbach's Alpha</th>
<th>Cronbach's Alpha Based on Standardized Items</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>.857</td>
<td>.852</td>
<td>9</td>
</tr>
</tbody>
</table>

The other statistics are given in Appendix - 2

The 25 item scale “Benefits” had Cronbach’s alpha reliability as 0.912, above the acceptable value of 0.7. The Guttman Split-Half reliability for “Benefits” was found to be 0.703, above the acceptable value of 0.7.

Table 4.7 Reliability Statistics (Cronbach Alpha) for Benefits : Pilot Study

<table>
<thead>
<tr>
<th>Cronbach's Alpha</th>
<th>Cronbach's Alpha Based on Standardized Items</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>.912</td>
<td>.916</td>
<td>25</td>
</tr>
</tbody>
</table>

The final reliability statistics for the entire data is given below

Table 4.8 Reliability Statistics (Split Half) for Benefits : Pilot Study

<table>
<thead>
<tr>
<th>Cronbach's Alpha</th>
<th>Part 1 Value</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>13&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Part 2 Value</td>
<td>.905</td>
</tr>
<tr>
<td></td>
<td>N of Items</td>
<td>12&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Total N of Items</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Correlation Between Forms</td>
<td>.636</td>
</tr>
</tbody>
</table>

Spearman-Brown Coefficient

| Equal Length | .712 |
| Unequal Length | .724 |
| Guttman Split-Half Coefficient | .703 |
The other statistics like ANOVA and Item total statistics, and inter Item correlation matrix are given in the Appendix-3.

Since the reliability was within acceptable range, the scale was used in the final study. The reliability of all responses of the final study was calculated using Cronbach’s Alpha and was found to be 0.885, above the acceptable level of 0.7.

**Table 4.9 Reliability Statistics**

Reliability Statistics (Cronbach Alpha) for Benefits:

<table>
<thead>
<tr>
<th>Cronbach's Alpha</th>
<th>Cronbach's Alpha Based on Standardized Items</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>.885</td>
<td>.881</td>
<td>25</td>
</tr>
</tbody>
</table>

The other findings of the pilot study were: questions which were perceived vague by the respondents like “Monthly Spend”, where they were not sure if the spend was for one mobile phone or for all phones of the family (this confusion was particularly as the question “How many of those living in your house have mobile phones?” just few questions before the monthly spend question) adequate precaution was taken while collecting the final data.

Other than these two scales, other items in the questionnaire were direct and needed no scales. The reliability of such items was assessed using pre-test, post-test method. In pre-test, post-test method the questionnaire was administered to a set of people twice with a gap of around two months. The scales “Influence” and “Benefits” were not considered for the test.

A set of five people belonging to a single family from a village (Sikroda) in Maharashtra were selected. This was done to ensure the respondents will be available after the given period. The same questionnaire was administered to them after a gap of around two months. The results of pre-test and post-test were assessed for the reliability and validity of the questionnaire. The measure used was Pearson’s correlation between the two sets.

Table 4.10 depicts the results:
The detailed results are given in the Appendix - 1
There was very high correlation between the pre-test and post-test responses of all five respondents. The high correlation values hint that the questions were more or less direct and the questionnaire had the required reliability. The reliability index is considered to be a measure of validity (Garret 1981).

The statistical validity is assessed along with the statistical tests that were carried out.

The service provider questionnaire was generic in nature and the data was collected from each existing service provider.

Since the service provider survey is an exploratory study having lesser sample size, a pilot study was conducted on four respondents. The study gave important insight that the respondents were either not comfortable disclosing financial details of the company, or did not know the financial data. The questionnaire was then adjusted and the financial data was collected from the audited balance sheets and other published financial reports.

Stage C data was secondary and was collected form highly reliable sources and the data from two different sources was validated to ensure accuracy of the data.

**4.8 Operational Definitions Variables**

This section gives operational definitions of the major variables used in the study

**Telecom Growth**

Telecom growth indicates overall growth of telecommunication users which includes mobile and landline users. Growth rate is calculated as percentage increase over previous period (generally month).
**Tele-density**
Telephone density or teledensity is the number of telephone connections for every hundred individuals living within an area. It varies widely across the nations and also between urban and rural areas within a country.

**Economic Growth**
Economic growth is the increase in the market value of the goods and services produced by an economy over time. It is conventionally measured as the percent rate of increase in real gross domestic product, or real GDP.

**GDP**
Gross domestic product (GDP) is the market value of all officially recognized final goods and services produced within a country in a year, or other given period of time. GDP per capita is often considered an indicator of a country's standard of living. GDP is related to national accounts, a subject in macroeconomics. GDP is not to be confused with gross national product (GNP) which allocates production based on ownership.

**Per Capita GDP**
GDP per capita is not a measure of personal income (See Standard of living and GDP). Under economic theory, GDP per capita exactly equals the gross domestic income (GDI) per capita (See Gross domestic income).

**Village Size**
For the study the villages were divided into following categories

- Very Small Village (with population <500)
- Small Village (with population between 500 – 1,000)
- Medium Village (with population between 1,001 – 2000)
- Large Village (with population >2000)

The above segmentation of villages is adopted from (http://censusindia.gov.in/Metadata/Metadata.htm) Government of India
**Development Indicators**

Development indicators are defined by World Bank. Some of the development indicators are, number of people below poverty line, Literacy Rates, Electricity, etc.

**ARPU**

Average revenue per user (sometimes known as average revenue per unit), usually abbreviated to ARPU, is a measure used primarily by consumer communications and networking companies, defined as the total revenue divided by the number of subscribers.

**Monthly Telecom Spend**

Monthly telecom spend is defined as average monthly bill paid by the rural subscribers on mobiles per subscription.

**Benefit**

The 25 item summated scale ‘Benefit’ was used to understand how the rural telecom users perceive that the telecom penetration benefits them. This construct helps in understanding the orientation of rural consumers of telecom users towards this technology. This is important as majority of the rural consumers are illiterate and unless they feel the telecom technology is beneficial to them they will not use the technology. This scale was used before by Dr. Rekha Jain for the research sponsored by WTO (World Trade Organisation) on rural consumers in Gujarat.

**Influence**

The 9 item summated scale ‘Influence’ was used to are influenced by the telecom technology. This construct helps in understanding the orientation of rural consumers of telecom users towards this technology. This is important as majority of the rural consumers are illiterate and it is important to measure the influence of the technology in their lives. This scale was used before by Dr. Rekha Jain for the research sponsored by WTO (World Trade Organisation) on rural consumers in Gujarat.

**4.9 Tools of Analysis**
Following tools and techniques were applied for analysing purpose:

**Factor Analysis**
Factor analysis was used to study the underlying factors rural consumers perceive to be important for selecting the mobile service providers.
It was also used to understand the factors that contribute the accelerated business opportunity for telecom through the opinions of executives of telecom service providers.

**Correlation Analysis**
Correlation analysis is used for finding association between two quantitative variables. The secondary data is assessed for the association using this tool. A t-test is used for testing significance of the correlations.

**Regression Analysis**
Regression Analysis on Rural Consumer Data is done to find the different significant variable that are responsible for the monthly mobile spend. The monthly spending on mobile phones is an important variable to be considered for rural telecom. The current issue in rural sector is that the number of consumers and their monthly spending on mobiles is too small for rural telephony to be profitable for service providers.

The method of regression used was stepwise regression. In stepwise multiple regression analysis, the monthly expenditure of individual customers is analysed by considering the dependent variable as the expenditure for month and arriving through the data collation the various independent variables that are responsible for the monthly spend. The stepwise regression was done as it keeps only significant variables in the final model and the insignificant variables are thrown out from the model.

**Proposed Model**
The model proposed for the analysis is given in Figure 4.1 and 4.2.
Figure 4.1 The proposed model for the regression analysis

Figure 4.2 Independent Variables in the Proposed Model

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Usage</th>
<th>Economic Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years</td>
<td>Years phone use</td>
<td>No of years of electricity</td>
</tr>
<tr>
<td>No. Of years of education</td>
<td>No of years of landline</td>
<td>No of years of protected water</td>
</tr>
<tr>
<td>No. Of people in household</td>
<td>How many years of mobile services started in village</td>
<td>No of years of television</td>
</tr>
<tr>
<td>Income (Monthly)</td>
<td>Summated raring of service provider</td>
<td>No of years of fridge</td>
</tr>
<tr>
<td>Is agriculture</td>
<td></td>
<td>No of years of microwave</td>
</tr>
<tr>
<td>Is business</td>
<td></td>
<td>No of years of computer</td>
</tr>
<tr>
<td>Gender (Dummy)</td>
<td></td>
<td>No of years of bike</td>
</tr>
</tbody>
</table>

An attempt was made to investigate linkages between different economic variables with tele-density. The economic parameters incorporated were GDP growth, number of people below poverty line, Literacy Rates, Electricity, etc. of the states with the tele-density growth of the states. It was found that there is significant positive correlation between tele-density growth and GDP growth, significant negative correlation between tele-density and number of people below poverty line, significant positive correlation between tele-density growth and Literacy rates and significant positive correlation between tele-density growth and Electricity.
A regression model was used to understand the extent of impact tele-density has on the Indian economy. Growth in Tele-density was considered as an independent variable and growth in GDP was considered as dependent variable.

**Event Study**
An Event study is a statistical method to assess the impact of an event. The basic idea is to find the abnormal results attributable to the event being studied by adjusting for the dependent variable

Event studies are common to various research areas, such as accounting and finance, management, economics, marketing, information technology, law, and political science. This methodology was used to understand the impact of government policies on telecom growth.

To find the Impact of Government Telecom policies on Telecom Growth, Event study methodology was used. An Event study is a statistical method to assess the impact of an event. The basic idea is to find the abnormal results attributable to the event being studied by adjusting for the dependent variable

Event studies are common to various research areas, such as accounting and finance, management, economics, marketing, information technology, law, and political science. This methodology was used to understand the impact of government policies on telecom growth.

The Impact of various Government policies on telecom diffusion were studied through the secondary data collected mainly through DoT website and CMIC Database, using Event Study Methodology. The logic behind the event study methodology is explained in Warren-Boulton and Dalkir (2001). The general event study methodology is explained in, MacKinlay (1997) or Mitchell and Netter (1994). It is important to note that short-horizon event studies are more reliable than long-horizon event studies as the latter have many limitations.

The most common model for normal returns is the 'market model' (MacKinlay 1997). Following this model, the analysis implies to use an estimation window (6 months) prior
to the event to derive the typical relationship between the dependent variable and a reference index through a regression analysis. Based on the regression coefficients, the normal estimates are then projected and used to calculate the abnormal estimates. These actual and estimates were tested using paired t test for significant difference.

Trend analysis was done on Growth rate of mobile subscribers. Any positive significant difference would mean positive effect of the policy and any negative significant effect would mean negative effect of the policy. No significant effect would mean no effect of the policy.

Ten events were considered for event study.

4.10 Tests for analysis
Hypotheses developed have been tested using the t test or ANOVA for continuous variables and tests of association (chi-square) for categorical variables. T test and ANOVA is also used with regression analysis and correlation analysis to test the significance of the regression and correlation coefficients.