# CHAPTER II

## RESEARCH METHODOLOGY

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CHAPTER II
RESEARCH METHODOLOGY

2.1 Introduction

Research is a search for knowledge. Once can also define research as a scientific and systematic search for pertinent information on a specific topic. In fact, research is an art of scientific investigation. The Advanced Learner’s Dictionary of Current English defines the meaning of research as “a careful investigation or inquiry especially through search for new facts in any branch of knowledge.” (Oxford Dictionary, 1952) Redman and Mory define research as a “systematized effort to gain new knowledge. (Mory, 1923)” Research is an academic activity and as such the term should be used in a technical sense. According to Clifford Woody research comprises defining and redefining problems, formulating hypothesis or suggested solutions; collecting, organising and evaluating data; making deductions and reaching conclusions; and at last carefully testing the conclusions to determine whether they fit the formulating hypothesis. D. Slesinger and M. Stephenson in the Encyclopaedia of Social Sciences define research as “the manipulation of things, concepts or symbols for the purpose of generalising to extend, correct or verify knowledge, whether that knowledge aids in construction of theory or in the practice of an art.” (Sciences Encyclopaedia of Social, 1930).

According to Clifford Woody research comprises defining and redefining problems, formulating hypothesis or suggested, solutions, collecting, organizing and evaluating data, making deductions and reaching conclusions, and reaching conclusions to determine whether they fit the formulating hypothesis. (Kumar, 2008).

2.2 RESEARCH DESIGN:

In any research design the overall plan of research is given. Research design is a blue print for carrying out the research and for avoiding guidance in taking various steps for undertaking a research study. The fundamental objective of a research design is to develop a set of methods and procedures that will answer
the research questions or test of research hypothesis with high degree of confidence.

Research that tests the adequacy of research methods does not prove which technique is better; it simply provides evidence relating to the potential strengths and limitations of each approach. *(G., 1985)*.

Research method refers to “overall strategy followed in collecting, analysing data; this strategy is referred as the research design. *(Morse, 1994)* Research Design denotes procedural details of the study by which data is collected. It aims to develop the set of methods and procedures which help to test the research hypothesis with the high degree of confidence. *(Gray, 1992)*

The research design can be of several types. Some of the important designs are: Descriptive, Correlational, Casual Comparative and Experimental. *(Airasian., 2000)*.

1) **Descriptive Research Design:**
   
   The Descriptive Research Design involves collection of data in order to test the hypothesis or to answer questions about the opinion of people on particular issue. It is called a survey design.

2) **Co-relational Research Design:**
   
   The Co-relational Research Design involves collection of data to determine whether and to what degree a relationship exists between two or more tables. The degree of relationship is expressed as a correlation coefficient.

3) **Casual Comparative Research Design:**
   
   The Casual Comparative Research Design involves selection of tow groups differing on some independent variables and comparing them on some dependent variables. These two groups are known as the experimental and control groups.

4) **Experimental Research Design:**
   
   The Experimental Research Design involves an experimental study in which at least one independent variable manipulated other relevant variables are controlled and the effect is observed on one or more dependent variables.

This is Descriptive and Exploratory study; the researcher had planned for a systematic study of the situations, problems and phenomenon and had attempted to find out the relationship between various aspects of the study. Descriptive
study aims to describe the phenomena about the about the variables being studied. Exploratory study used to find out the cause and effect relationship among the variables in the study. Proper research methodology was helpful in carrying out the research. A structured approach was used in this study. Research methodology used for research plays very important role in the outcome of the research and hence needs to be planned carefully. This study explores the consumers’ buying behaviour and their responses towards the use of solar equipments in Maharashtra state.

2.3 Objectives:

The study has following objectives-

- To study the consumers’ buying behaviour and perceptions about solar energy equipments.
- To know and analyse the causes of poor response to solar equipments.
- To study the marketing efforts of the organizations to attract the consumers.
- To make suggestions for enhancing the use of solar equipments.
- To study the reasons of failure of marketing communication by various agencies.

2.4 Hypotheses of the study:

A hypothesis is a statement of tentative supposition or a possible solution to a problem based on judgment and/or documentary evidence. As these tests are conducted based on evidence thrown up by a sample, errors cannot be totally eliminated.

For this study following hypotheses are set-

- The initial investment in the solar systems is the key criteria while selecting the solar equipments.
- The effective marketing communication of the organization has impact on buying behaviour of the customers of solar equipments.
• The social status of the consumer has impact on buying behaviour of the consumers of solar equipments.
• Despite of knowing the benefits of solar equipments customers are not willing to buy solar equipments.

2.5 Research Methodology

Research is conscientious and structured analysis or investigation on the topic in order to find out a change of fact, application, and theories. Methodology is the arrangement of methods used by particular order thus research methodology is - the way how we conduct our research.

Research methodology is a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically. In it we study the various steps that are generally adopted by a researcher in studying his research problem along with the logic behind them. Research methodology is the detailed arrangement of research study. Research methodology guides the flow of research.

2.6 Data collection

The study is based on the survey of the respondent. The data required for the research purpose was obtained from both primary and secondary sources. Primary data is the first hand information collected by the researcher based on the variable required for the research study. Secondary data refers to the information collected by the researcher from the existing sources.

2.6.1 The Primary Data

The primary data is the first hand information obtained from the respondents which is not recorded earlier. The researcher had gathered primary data with various techniques like questionnaires, interviews. Separate questionnaires were designed for the different groups of respondents like domestic users and institutional users. The feedback from the respondents is the major source of information. This can be collected by using-
a) Questionnaire-
Structured separate questionnaire was prepared for each category of the respondents and information (data) was collected. Questionnaire comprised of both demographic and functional variables related to the study. Proper scaling technique applied in this instrument. Instrument is the only source which decides the reliability and validity. Suitable scaling techniques were applied to get response from the respondents. Questionnaire was issued to the individual household in the Maharashtra state. Questionnaire was circulated to ten major cities in Maharashtra state.

b) Personal Interviews
Personal interviews of respondents, who were actively involved in the various promotional programmes belonging to either private or govt. aided organisations, were conducted for data collection. Personal interview were conducted to industries (both rural and urban), hospitals (both public and private sector) and hostel in various category. Interview schedule were prepared with open-ended questions.

c) Pre testing of questionnaire
Questionnaire prepared were tested by conducting a small survey of 50 respondents. During this process researcher found the need to modify questions, language and sequence. This helped researcher to design proper research plan for field operation.

2.6.2 The Secondary Data
Renewable energy is on the international agenda and has become the priority in the country; various reports on renewable energy, non-conventional energy will be of use to get secondary data. Various other sources of information are-

- Newspapers and Magazines
- Company Literatures
- Reports and Publications of National and International organisations.
- Reports of Government and NGOs.
Various Research Journals & Periodicals.

Various web sites on Internet.

E journals and reports available on Internet.

The secondary data had been collected from:

1. Government published magazines, publications of MEDA, IREDA / associations, institutions. Reports published by various committees, Bureau of statistics etc.

2. Research papers published in various journal in print or online on the subject were studied.

3. The Journals, Magazine were used.

4. The researcher had reviewed necessary literature from various libraries; researcher had visited the following -
   i. Jaykar Library, University of Pune
   ii. M.G.V. IMR - Research Centre, Panchavai Nashik.

### 2.6.3 Sampling Units

Selection of a research sample has important consequences for validity of findings. (Vaus, 2001). The major purpose of conducting the research is to conclude and make a claim about the larger population. Therefore, it is essential to choose a sample that enables to generalise findings to that larger population. Selection for sampling is usually performed in different ways. Random selection is a basic requirement to get better and comparatively accurate information. (Babbie, 2001).

For the study the sample selected were as follows –

**Individual houses** those who have already installed solar systems and are using them (users) and those who are not using solar equipments (non users).
Institutional and Industrial customers those who are using various Non-Conventional Renewable Energy Sources and Solar Equipments, such as Hospitals and Hostels.

2.6.4 Sampling technique

Groups are formed by using stratified random sampling method. Stratified random sampling is the representative sampling. Strata were constructed on the nature of the population viz., Individual household, Industries, hospitals and hostels. Beside the each strata, individual household data were collected by using proportionate stratified random sampling technique (sample size distributed to the population in each city), hospitals, industries, and hostel data collected by using snowball sampling method. Snowball sampling is the reference sampling.

2.6.5 Sample Size

Various sampling units were defined based on the categories and approx. sample size of each category is explained in Table No- 2.1.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Category</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Individual houses. (Distributed all over state)</td>
<td>1000</td>
</tr>
<tr>
<td>2</td>
<td>Industries (urban &amp; rural)</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>Hostels of various categories</td>
<td>50</td>
</tr>
<tr>
<td>4</td>
<td>Hospitals (Govt. &amp; Private)</td>
<td>100</td>
</tr>
</tbody>
</table>

Pilot study was conducted with the trial sample of 50 individual household for this research study. Trial sample estimates the standard deviation of the population is .649. It is used to determine the sample size in 95% of confidence
level and 5% of significance level is 996.8. So, researcher decided to collect 1000 sample in individual household.

Table No -2.2 gives the clear idea of the sample size from 10 major cities in Maharashtra state. These cities were selected on the basis of no of responses received from the respondents. Non inclusion of other cities from other parts of state does not necessarily mean that there is no user of solar equipments in that region.

**Table-2.2**

*Individual household distribution to the major cities in Maharashtra*

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Large cities of Maharashtra</th>
<th>Population</th>
<th>% of population to the total population of cities</th>
<th>Req. Sample</th>
<th>Actual sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mumbai (Municipal Corporation)</td>
<td>1,24,78,447</td>
<td>47.35</td>
<td>473.51</td>
<td>470</td>
</tr>
<tr>
<td>2</td>
<td>Pune (Municipal Corporation)</td>
<td>31,15,431</td>
<td>11.82</td>
<td>118.22</td>
<td>120</td>
</tr>
<tr>
<td>3</td>
<td>Nagpur (Municipal Corporation)</td>
<td>24,05,421</td>
<td>9.13</td>
<td>91.28</td>
<td>90</td>
</tr>
<tr>
<td>4</td>
<td>Thane (Municipal Corporation)</td>
<td>18,18,872</td>
<td>6.90</td>
<td>69.02</td>
<td>70</td>
</tr>
<tr>
<td>5</td>
<td>Pimpri and Chinchwad (Municipal Corporation)</td>
<td>17,29,359</td>
<td>6.56</td>
<td>65.62</td>
<td>70</td>
</tr>
<tr>
<td>6</td>
<td>Nashik (Municipal Corporation)</td>
<td>14,86,973</td>
<td>5.64</td>
<td>56.43</td>
<td>60</td>
</tr>
<tr>
<td>7</td>
<td>Aurangabad (Municipal Corporation)</td>
<td>11,71,330</td>
<td>4.44</td>
<td>44.45</td>
<td>40</td>
</tr>
<tr>
<td>8</td>
<td>Solapur (Municipal Corporation)</td>
<td>9,51,118</td>
<td>3.61</td>
<td>36.09</td>
<td>40</td>
</tr>
<tr>
<td>9</td>
<td>Amravati (Municipal Corporation)</td>
<td>6,46,801</td>
<td>2.45</td>
<td>24.54</td>
<td>20</td>
</tr>
<tr>
<td>10</td>
<td>Kolhapur (Municipal Corporation)</td>
<td>5,49,283</td>
<td>2.08</td>
<td>20.84</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2,63,53,035</td>
<td>100.00</td>
<td>1000.00</td>
<td>1000</td>
</tr>
</tbody>
</table>
Hospitals, hotels and industrial respondents of 200 respondents were collected on the basis of convenient of researcher.

2.7 Data Analysis

In a research study when the process of data collection is completed, the next step generally involves the analysis of the data. The choice of the analytical procedures depends on several factors, including the type of research question / hypotheses that are developed and the characteristics of collected data. (R.J.Casey., 1982).

The percentage distribution is the simplest form of representing findings of the research work. Therefore, important tables on the questions were prepared with its respective percentage. In order to test the validity of the hypotheses, a well known Chi – Square Test were used. On the basis of the tests all the null hypothesis were tested.

Chi – Square Test:

The Chi – Square Test is the simplest and the most useful statistical method. It is very effective tool to test the existence of relationship between the dependent and independent variables of a hypothesis. Chi square is used most frequently to test the statistical significance of results reported in bivariate tables, and interpreting bivariate tables is integral to interpreting the results of a chi square test.

Formula of Chi Square Test:

\[ \chi^2 = \sum \frac{(f_0 - f_1)^2}{f_1} \]

where,

- \( f_0 \) = Observed frequency
- \( f_1 \) = Theoretical value

After application of Chi-Square, the calculated results are compared with the tabulated results, to find out the Degree of Freedom. If the calculated value is higher than the tabulated value then the Null Hypothesis is rejected and the working hypothesis is accepted.
**Degree of Freedom:**
In order to calculate the value of Chi-Square value from the contingency table, the number of degree of freedom must also be known, before the table is used. After finding the value of the table, the value of Chi-Square for particular level of significance, was note and compared with the calculated value of the Chi-Square for 0.05 level of significance

Formula of Degree of Freedom (df)

$$df = (r - 1) \times (c - 1)$$

where,

- $r$ = number of rows; and
- $c$ = number of columns

Researcher had systematically coded the data, processed, classified, tabulated and analyzed it. After tabulation of data; analysis and interpretation was done. For analysis percentage method, Chi-Square test, charts and graphs are used. Researcher had taken help of computers for the purpose of data processing and codification.

**2.8 Scope of the study:**

The topic entitled “A Study On Consumers’ Buying Behaviour For Solar Energy Equipments And Responses Towards Use Of Solar Energy Equipments In Maharashtra” has vast scope at the national and state level. It is very clear from the survey carried out by various nodal agencies like MEDA, IREDA and Government through MNES and MNRE that India has a vast potential of using solar energy but it is not being used to that extent.

The findings through this study will help State Government and Manufacturers & Dealers of the solar equipments to understand consumer procurement behaviour pattern and details for poor response towards the solar equipments. This will help everyone in contributing towards energy conservation and setting.
2.9 Limitations of the study:

The subject designates wide physical spread and national priority therefore it is bound to have some limitation on investigation by an individual. Therefore the scope of the subject is restricted to selected sample size of respondents and their categories. If there is any alteration in location and sample size, results may or may not vary.

Due to wide geographic feast of Maharashtra, researcher had gathered the primary data from ten major cities where there is a scope for utilization of solar energy. Rural area is not enclosed in terms of the separate houses but covered in case any industry or group uses Non-Conventional Energy Resources. In rural area max energy is used for agriculture purpose anywhere energy is obligatory for irrigation. SPV Water pump is the only product in solar group which at this stage is very costly and cannot be afforded by Farmers. Due to its very incomplete scope this is not considered by the researcher in while choosing sample category.
References:


Mory, L. R. (1923). The Romance of Research. 10.


