CHAPTER 3.
RESEARCH METHODOLOGY
Chapter 3

Research Methodology

The research type was exploratory and descriptive in nature, the study was based on primary and secondary data. The random sampling technique is used as a tool for sampling.

The primary data was collected by conducting survey of Software developers, Hospitals, Hospital administrative staff etc. and from the questionnaires, interviews, discussions with the doctors, software professionals, hospital managers and patients of the hospitals.

Secondary data was collected from the various magazines of government and private organizations, software and hospital management and computer journals, software, text books and publications, news bulletins and articles published in the newspapers. The reputed WEB sites are visited to get the statistical data, Figures, Charts and Tables etc. as supporting facts.

3.1 Sampling Frame:

A pilot survey was carried out before sample selection. Also information was collected from Internet which contributed in finding out sufficient number of general hospitals selected for this study. The researcher has visited hospitals across Pune city. The random sample of 40 hospitals from sample frame of 120 hospitals was chosen for the survey.

There are 120 registered hospitals in Pune. The researcher has surveyed 40 hospitals which were selected by simple random sampling method. The sampling method used was justified and purposive random sampling technique, hospitals using HIS were purposively selected and hospitals were categorized on the basis of size of the hospital and size was determined on the number of beds the hospital contained. The selected hospitals and the HIS they were using were studied. The software industries who were developing HIS was the criteria for selecting them, 30 Hospital Information System Software were studied. In all the total respondents were 380. The hospitals were divided into 4 categories based on the number of beds
available in the hospital. Large (more than 300 beds), medium in two sizes (100 to 200 beds) and (200 to 300 beds) and small hospitals is (less than 100 beds). 8 large hospitals, 20 medium sized hospitals and 12 small hospitals were part of the survey. 12 hospitals had no computerization and were dropped from the analysis. The hospitals which were not ready to reveal information were not included in the survey.

3.2 Sample Design:
Data was collected from the following groups:
- Software Professionals (Developers).
- Top Management of Hospitals.
- Doctors of Hospitals.
- Patients of Hospitals.
- The Users of the Software in the Hospitals.

On the sample units separate questionnaires were administered. On selected groups observations were made and interviews were conducted. Representative sample of hospitals, doctors was taken in the sample using random sampling methods.

3.3 Collection of Data:
In order to attain the above-mentioned objectives both primary and secondary data was collected for the research.

3.4 Primary Data:
1) The primary data was collected by conducting survey of various software houses and hospitals in Pune.
2) Features of the already existing software of hospital management in the market were studied.

Secondary data:
Secondary data was collected from following sources:
1. Books, Periodicals & newspapers from various libraries in Pune Viz., Jaykar, Sinhgad Institute of Management, British Council, Yashda, NIBM, Gokhale, NITIE, Vaikunth Mehta Inst. etc.
2. Internet websites and database of international and national journals viz., Proquest, Science direct, EBSCO, Google, MSN and Yahoo search engines were visited and relevant data was downloaded.

3. Research papers and articles on computerization of hospitals from national and international journals and magazines was collected.

4. Newspapers containing articles and write ups and news related to research area were included in the study.

5. The software houses who were the main respondents of questionnaire provided software brochures which became an integral part of the study.

3.5 Questionnaires & Observations:
Designing and using five separate structured questionnaires the researcher collected information from:

i) Software Professionals (Developers).

ii) Top Management of Hospitals.

iii) Doctors of Hospitals.

iv) Patients of Hospitals.

v) The Users of the Software in the Hospitals.

<table>
<thead>
<tr>
<th>Respondents</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Management</td>
<td>40</td>
</tr>
<tr>
<td>Doctors</td>
<td>70</td>
</tr>
<tr>
<td>Users of Software</td>
<td>120</td>
</tr>
<tr>
<td>Patients</td>
<td>120</td>
</tr>
<tr>
<td>Software Professionals</td>
<td>30</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>380</strong></td>
</tr>
</tbody>
</table>

The questionnaire was filled by the respondents, which focused on the study of hospital management processes, awareness of operation of computer technology by medical staff, training details given to the users, modules available in the software, other features in the software.
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a) Interviews:
The researcher also collected primary data by conducting interviews of experts in the hospital management field. Similarly the interviews of following personnel were conducted.

- Software Professionals (Developers).
- Top Management of Hospitals.
- Doctors of Hospitals.
- Patients of Hospitals.
- The end users of the Software in the Hospitals.

3.6. Research Methodology
The researcher surveyed hospitals in the Pune region which vary in bed size and facilities from 30 to 300 beds. The sample size was restricted to 40 considering sample frame of a 120 hospitals, which included hospitals of different sizes and facilities and specializations offered. The doctors, para medical staff, hospital administrative staff, and software professionals of 30 software houses were interviewed through discussions as well as through questionnaires. The researcher talked to 380 professionals, for purpose of clarity for Primary data collection, fact finding techniques like Interview, Questionnaires and Observation method etc were generally used. Secondary data was collected based on the review of Books, Magazines, News bulletins, internet sites etc.

3.7 Statistical Tools Used
The various findings from the survey are displayed graphically for clarity of output hence following Graphical Representations are used.

3.7.1 Pie Chart
A pie chart is a circular diagram which is used for depicting the components of a single factor. The circle is divided into segments which are in proportion to the size of the components. They are shown by different patterns or colors to make them attractive.
3.7.2 Multiple bar Diagram
A bar diagram represents the magnitude of a single factor according to time periods, places, items etc. To depict a number of related factors for comparison in various years or at a number of places multiple bar diagram are preferable. In a Multiple bar diagram, adjoining bars are drawn according to the number of factors and their heights in proportion to the values of the factors in the same order for each period or place. Each bar of a group is shown by different patterns or colors to make them easily distinguishable and this pattern is retained in all the groups. A constant distance is maintained between groups of bars drawn for periods or places. Such a diagram is known as multiple or compound bar diagram. Kothari72 (2005).

3.7.3 Subdivided Bar Diagram
When the magnitude of a single factor is given with its sub-factors, each bar is further sub-divided into components in proportion to the magnitude of the sum-factors. Such a diagram is known as sub-divided bar diagram.

3.7.4 Line diagram
A line diagram is a one-dimensional diagram in which the height if the line represents the frequency corresponding to the value of the item or a factor.

3.7.5 Arithmetic Mean
Describes an entire set of observations with a single value representing the center of the data.

Definition:
The mean (arithmetic average) is the sum of all the observations divided by the number of observations.

\[ \text{i.e. Arithmetic Mean } (\bar{X}) = \frac{\sum X_i}{n} \]

3.7.6 Standard Deviation
The most common measure of dispersion, or how spread out the data are, about the mean.

72 Research Methodology by Kothari 2005.
Definition: The positive square root of mean of squares of the deviations taken from arithmetic mean is called as standard deviation.

\[
S.D. = \sqrt{\frac{\sum_{i=0}^{n} [X_i - AM(X)]^2}{n}}
\]

3.8 Presentation of Data:
The above said data is tabulated in suitable form. Observations are compared to prove or disprove the hypotheses.

3.9 Collection of Data
The research was an exploratory type. Two surveys were carried out one for the software companies that were developing Hospital Information Systems. The software companies are catering to the computerization of hospitals, some of them have standard software available whereas some of them are having tailor made facilities.

The pilot study revealed a set of modules most ideally an HIS should have which are as follows.

- Registration.
- OPD Management.
- Casualty (Emergency).
- Appointment, scheduling.
- IP Billing.
- Ward transaction.
- ICU management.
- Auto Discharge/Transfer.
- Operation Theatre.
- Patient care management.
- Clinical Support.
- Store Management.
- Financial Accounting.
- General Administration.
- Doctor Accounting.
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- HR Management.
- Decision Support System (MIS) report.
- Interfacing eg. EPBAX, Web-enabled report

A criteria was set to study the software parameters and the study of software was done on a standard basis where in addition to the modules certain other parameters of software like 1) Securities - Logical (Software lock, Password authentication, 2) Access right. Physical: (Hardware Lock, Security Guard, Card reader, Biometric, Fire wall, 3) Recovery and Backup Scheduling .4) Annual Maintenance Contract (AMC) 5) Training. 6) Software up gradation. 7) User Training 8) Software Integration with the existing legacy software of the hospital. 9) Flexibility, to the changing needs of customers. 10) Software Portability. 11) Meeting Deadlines. 12) Unique Features of software. 13) Forward & Backward scalability. 14) Hardware & Software requirement, were studied in detail, of individual software and then a comparative analysis was done statistically to derive certain features of these software.

The second survey was that of the hospitals in Pune. A questionnaire for four people viz, Top Management, Doctors, end users of software and patients was filled up by the concerned people in the hospitals visited.

3.10. Sample Size Estimation:
The pilot survey was carried out before sample selection. Also information collected from Internet was contributed to find out sufficient number of general hospitals selected for this study. Justified and purposive random sampling was used. The random sample of 40 hospitals was chosen for the survey, the respondents measured to be about 380.

3.11 Data Analysis and Interpretation:
In order to enable to make valid conclusions different statistical tools and other research tools were applied to analyze the data available in SPSS software.
3.12. OBJECTIVE AND HYPOTHESIS OF THE STUDY

OBJECTIVE
1. To study the existing software and their features, which are available in the market for the computerization of hospitals.
2. To study whether all five functions of the hospital viz. prevention, diagnosis, treatment, rehabilitation and information are computerized.
3. To study whether required training of hospital management software has been made available to the staff and doctors.
4. Whether Hospital Information System is providing required reports to management at different levels, aiding them in decision making.

HYPOTHESIS
1. The software available in the market for computerization of hospitals are covering most of the transaction processing functions required for computerization.
2. The degree of computerization is proportionate to the size of hospital.
3. Training of employees to use the hospital management software contributes effectively to increased level of efficiency.
4. The Hospital Information Systems provide most of the reports of transaction processing required by hospital management at different levels making decision making effective.

Testing of Hypotheses
Chi-Square Test:
The chi square tests used are Pearson Chi Square test and chi square test for independence of variables.
The test is applied when you have two categorical variables from a single population. It is used to determine whether there is a significant association between the two variables.
The test procedure described in this lesson is appropriate when the following conditions are met:
The sampling method is simple random sampling.

Each population is at least 10 times as large as its respective sample.

The variables under study are each categorical.

If sample data are displayed in a contingency table the expected frequency count for each cell of the table is at least 5. (Likert's scale).

This approach consists of four steps: (1) state the hypotheses, (2) formulate an analysis plan, (3) analyze sample data, and (4) interpret results.

3.13. UTILITY AND SIGNIFICANCE OF THE RESEARCH

a) The objective of providing services to the patient, curing him, rehabilitating him, is no doubt that of a noble one. Many a times it is of a situation where it may concern the life of a patient. Under such a trying situation the computer would be a boon for the doctor and his team.

b) The output of the survey and study of hospitals would be of immense help to hospitals, software houses and students as well.

c) All the five functions of hospitals viz. i) Diagnosis ii) Treatment iii) Prevention iv) Post discharge guidance & Rehabilitation. v) Information, would be carried out to the optimum enabling doctors and their hospital team to serve patients better.

d) As a comprehensive study was done to study the available software in the market designed for hospital management, the comparative analysis is very enlightening for the software development companies as well as hospital staff to know the features of each software and the market study would also be valuable for the software houses to know of other related products and their features in order to improvise their own product, and they could price their product economically enabling the smaller hospitals to avail of their services.

e) The Patient relationship management will become easier because of the availability of the patient database.

f) The electronic medical records and also other data which is available in electronic format makes clinical research and all other medical and non medical research on all aspects of hospitals a lot more easier.
3.14. LIMITATIONS OF THE STUDY

1. The research is carried out in software industry and also hospitals since the researcher is not a doctor by profession but is an academician hence some purely medical processes become a technical barrier, for a non medical person.

2. The study is time bound as technology develops very rapidly and new features are added very frequently.

3. In the hospital related survey, the response rate was very low. The respondents being highly specialized people made the survey all the more difficult to be carried out. The researcher required to take an appointment with hospital representatives, doctors and employees to carry out the survey process, and many a times they were tied up in emergency situations as is the case normally in hospitals. The hospital representatives, doctors were not easily available to give any information about hospitals. Availability of people from TOP management, doctors is taken in to account at the time of conducting survey but contacting them was very difficult.

4. The computerization of transaction processing is done in the prevalent study. The other non transactional and purely medical processes like Medical Imaging, RFID can be an interesting as well as important part of the survey.

5. The survey of software is time bound, new technology enters market very frequently by the time the thesis is published a lot of new technology would have entered the market.

6. Before completion of the research the right to information act has been implemented by the government which was not implemented earlier and patients convenience to know treatment related information, was stated as the primary need of the study.

7. The number of hospitals have grown in large numbers recently, expanding the sample frame so the survey had to be restricted in number of hospitals in the sample size.

3.15 PERIOD OF STUDY.

August 2008 to August 2012.
3.16. CHAPTER SCHEME.

Chapter 1 : Introduction.
Chapter 2 : Review of Literature.
Chapter 3 : Research Methodology.
Chapter 4 : Data Analysis.
Chapter 5 : Findings And Suggestions.

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