CHAPTER THREE

RESEARCH METHODOLOGY

3.1 NEED FOR THE STUDY
3.2 STATEMENT OF THE PROBLEM
3.3 OPERATIONAL DEFINITIONS
3.4 RESEARCH QUESTIONS
3.5 RESEARCH HYPOTHESES
3.6 RESEARCH DESIGN
3.7 POPULATION AND SAMPLE
3.8 DATA COLLECTION METHOD
   3.8.1 QUESTIONNAIRE: DESIGN AND MODIFICATION
   3.8.2 ADMINISTERING RESEARCH QUESTIONNAIRE
3.9 ANALYSIS AND INTERPRETATION OF DATA
   3.9.1 ANALYSIS OF DATA
   3.9.2 STATISTICAL PROCEDURES FOR INTERPRETING DATA
3.10 LIMITATIONS OF STUDY
In this chapter different aspect of research methodology in connection with the study is presented. This chapter is discussed under the following sections and sub-sections beginning with the need for the study followed by; the statement of the problem; operational definitions; research questions; research hypotheses; research design; population and sample; data collection method; analysis and interpretation of data; and limitation of the study.

3.1 NEED FOR THE STUDY

India is going through information revolution thus making the information system a subsystem of a larger organisation. The computer is increasingly becoming an integral part of Indian corporate life - despite the infra-structural deficiencies that are a reality in India. To enhance the effectiveness of information system is to improve the skills of the systems users, specially those members of the organisation who are non information system personnel. These non computer professionals using computers
are called end-users.

The need of end-users, for increased level of skills, to do their jobs more effectively presents a challenge for training and development (T&D) professionals today. In organisational development literature, the importance of training and education is recognized for preparing an organisation for a change or in realizing the change itself. According to R.R. Nelson and P.H. Cheney, training is crucial to system integration. Many others like J.F. Rockart finds user education and training to be a critical function of MIS department. L. Mohan and S. Belardo asserts that planned training methodology played a vital role in the successful adaptation of information technology by end-users. L.E. Raho, J.A. Belohlav, & K.D. Fiedler found a positive correlation between successful assimilating PC technology and overall level of educational activity undertaken by the firm. J.D. Lees, found a similar relationship between training and successful implementation of small business information systems.

One major problem with the existing information systems, is the lack of training and the quality of training. Out of approximately five thousand computer training
institutes in India, majority of them have no contact with the needs of the market.\textsuperscript{11} "This aspect of the industry's need, not matching the skills learned at the institute, is an issue that has been dogging the information technology industry for a while."\textsuperscript{12} Despite the importance of training of end-users, there has been little empirical research in this area. Therefore, it is necessary to understand the new emerging roles of end-users in terms of numbers and training needs (qualitative aspect).\textsuperscript{13}

It is the positive correlation between assimilation of PC technology and educational activity undertaken by the firm that has motivated the researcher to take up this study. After detailed literature survey and discussions with experts in the area, it was found that there is a need to evaluate how the end-users are being trained, and how they are participating in training and development (T&D) activities. This is because the level of participation of end-users in training and development (T&D) activities have a direct bearing on the success of information system. Further, this also augments self-directed learning in business and industry that is becoming a common place in the changed information age.\textsuperscript{14}
3.2 STATEMENT OF THE PROBLEM

This study addresses to the lack of research, on training and development (T&D) activities, among the current populations of end-users. With the rapid changes in the information systems, the information systems professionals in the corporation are now clearly in minority, surrounded and outnumbered by end-users. For successful assimilation of information technology there is a need for end-users to expand their existing knowledge base constantly. This wider access of technology to the end-users is increasing the demand for training. Making it difficult for information system specialists to carry the entire burden of the end-users training and development (T&D) activity.

An element that further complicates the problem is the high turnover among information systems professionals.\textsuperscript{15} Further, due to shortage of computer professionals the organisations are not always willing to relieve them for training and development activities. With information system support request backlog and dramatic rise in the acquisition and use of computers, it implies that end-users employ a variety of learning techniques to meet their literacy demand. One alternative to overcome this problem is to
develop trainers from within the end-users. According to Parker "One common training objective is to concentrate efforts on identifying and teaching functional support personnel - enthusiastic and computer-literate end-users who are likely to assist other end-users."

Information systems professional should concentrate on training end-users in the tools and techniques so they can pinpoint and solve their own problems. To achieve this objective the Information systems professionals have to involve end-users in training and development activities. This is because the professionals are strong on technological and software product knowledge but most of them do not have the functional and application knowledge that is a main concern for the end-users.

Before embarking on this innovative training method, it is important for industries and trainers to understand where they are currently. After detail literature examination and discussions with the experts in the area, it emerged that there is a need to collecting information on:

a) end-users extent of involvement in training and development programmes

b) their perception about the role that they play in
training and development activities, and

c) the level of satisfaction that the end-users derive from training and development programmes organised by the organisation time to time.

d) Most preferred mode of learning.

These are some factors that may directly affect the success of developing trainers from the end-users. It also will help in identifying the most potential group of end-users who may act as trainers.

3.3 OPERATIONAL DEFINITIONS

For this study the following terms used are defined as follows.

1) Training - those activities that are designed to improve knowledge, skills and attitude and, thus equip the individual to be more effective in their present job or prepare him for a future assignment. Or in other words teaching users to use software to do a particular job

2) Development - a long term educational process
utilising a systematic and organised procedure by which managerial personnel learn conceptual and theoretical knowledge for general purpose. Or in other words teaching users to use computers so that they can apply the technology to the area in which they have expertise.

3) **Management Information System** - is used throughout this dissertation to include the following, usually more specific terms: Information System (IS), Computer Based Information System (CBIS), Computer Information System (CIS), Electronic Data Processing (EDP) System, Decision Support System (DSS), Executive Support System (ESS), Information Reporting System (IRS), Transaction Processing System (TPS) and other information systems used by employees in organisations.

4) **End-user** - connotes anyone who uses a system for a specific purpose. End-users include executives, managers, professional staff, secretaries, office workers, and others.

5) **End-user Type** - is based on classification scheme
developed by Rockart and Flannery. In which end-users are classified on the basis of computer skill, method of computer use, application focus, education and training requirements, and in needed support. The three types are:

a) Menu driven end-users (Type 1) - imply those types of end-users who use someone else's software through a pre-established procedures or menus. They do not generate programs nor use report generators and fall in the category of non-skilled end-users.

b) Command level end-users (Type 2) - imply those types of end-users who are able to generate simple inquiries, perform calculations and create simple reports and documents. They can manipulate information by using report generators and fall in the category of semi-skilled end-users.

c) Programming end-users (Type 3) - imply those types of end-users using both command and procedural languages. They develop their own applications to be used by themselves or by others and fall in the category of skilled end-users.

6) **End-user Computing** - direct, hands-on use of computers by end-users not indirect use through
systems professionals on data processing staff.

7) **Attitude and Involvement** - In this dissertation attitude refers to a mental state of users, i.e., their attitude or outlook toward training and development and the extent of their involvement in training and development activities. Involvement on the other hand refers to the observable or noticeable behaviour of users in training and development activities.

### 3.4 Research Questions

The above scenario lead to the following questions meriting research:

1. What is the extent of involvement of end-users in T&D activities in terms of:
   a) initiating the programmes;
   b) evaluating programmes feasibility;
   c) justifying programmes expenditure;
   d) identifying training needs;
   e) setting programmes objectives;
   f) identifying potential problems;
   g) determining the content of training;
h) scheduling the training session;  
i) training and instructing others;  
j) preparing reading material;  
k) working as a support person;  
l) evaluating training effectiveness.

2. What is the perceived usefulness of the role that end-users play in T&D activities?

3. What is the level of satisfaction with the quality of T&D programmes organised by the organisation from time to time?

4. Which mode of learning do end-users prefer?:
   * Formal classes;
   * Computer tutors;
   * Reference manuals/textbooks/workbooks;
   * Peers;
   * Experimentation/trial and error.

5. What are the factors that effect the extent of involvement?

6. What is the most preferred type of relationship...
between trainer and learner?

3.5 **RESEARCH HYPOTHESES**

**Hypothesis 1:** There is no significant difference in the extent of involvement among three types of end-users in T&D activities.

**Hypothesis 2:** There is no significant difference in the extent of involvement in T & D activities among end-users in different functional area.

**Hypothesis 3:** There is no significant relationship between the extent of involvement in T&D activities and number of computer related training programme attended, for each of the three types of end-users.

**Hypothesis 4:** There is no significant relationship between the extent of involvement in T & D activities and number of hours spent on computer per week, for each of the three types of end-users.

**Hypothesis 5:** There is no significant relationship between the extent of involvement in T & D activities and number of
hours spent on self learning of computer skill, for each of the three types of end-users.

**Hypothesis 6:** There is no significant relationship between the extent of involvement in T & D activities and perceived usefulness with involvement in T & D activities, for each of the three types of end-users.

**Hypothesis 7:** There is no significant relationship between the extent of involvement in T & D activities and the satisfaction with T & D programmes attended, for each of the three types of end-users.

**Hypothesis 8:** There is no significant relationship between the extent of involvement in T & D activities and number of years of computer experience, for each of the three types of end-users.

**Hypothesis 9:** There is no significant relationship between level of satisfaction with training programmes and number of years of computer experience, for each of the three types of end-users.
3.6 RESEARCH DESIGN

In this study survey research was used, as it has high potential to solve theoretical and applied educational problems.24 Descriptive cross sectional study was adopted - a good method to identify characteristics of a particular group, measure their attitude and describe their behavioral pattern.25

3.7 POPULATION AND SAMPLE

To find extent of end-users involvement in T&D activities, satisfaction from T&D programmes and perception about the role that the end-user play in T&D activities, both service and non - service companies were contacted personally. The letter was handed over to them explaining the purpose and contribution of the study. A request was made to the organisation to furnish the researcher with the names of their employees using computers.

Sixty organisations in and around Delhi were contacted. Other companies in different regions in India were not surveyed because of access limitations. It is reasonable to conclude, however, that since population consisted of
managers, executives, professional staff, secretaries, office workers, and others that perform the same function as end-users the results represented end-users in general.

Of the sixty organisations contacted fifty one responded positively. In all, these organisations provided names of three hundred and seventy three personnel to the researcher. Out of the three hundred and seventy three names suggested, three hundred and fifty nine of them were contacted. Request was made to them to participate in the research by initially furnishing the following information:

a) The type of computer they use
b) Number of hours they spend on computers per week to solve their problems,
c) Number of computer training programs they attended in the last two years.
d) and finally, the category of end-user in which they fall.

Out of three hundred and fifty nine, two hundred and seventy agreed to participate. Ninety nine were from menu driven end-user's (Type 1), followed by eighty nine from command level (Type 2) and eighty two from programme level (Type3) end-users.
Finally, eighty respondents were selected from each of the above category, for primary data collection, on the basis of computer usage and number of training programme attended. Since primary variables of interest to this dissertation concerned the behaviour and attitudes of individual information system users, this research was conducted at individual level of analysis.

Based on the research of Rockart and Flannery, the population of end-users were classified into three types. The different types of end-users were not mutually exclusive. If any end-user, performed more than one type he was put in the higher category of end-users indicating his level of skill. The sample size of eighty was found sufficiently big as most of the researches, in education, are done using small nonrandom samples.\(^\text{26}\)

To avoid high cost and difficulty in execution, quota sampling was preferred over random samples.\(^\text{27}\) In quota (or quota control) sample, representativeness is achieved by assigning quotas to interviewers.
3.8 DATA COLLECTION METHOD

3.8.1 Questionnaire: design and modification

Self administered questionnaire was used which rely on efficiency of written words rather than on interviewer. The questions used in the questionnaire were developed on the bases of reviewing previous literature, to find questions that were used previously. Suggestions were received from my associates and colleagues regarding difficulties with questions wording, problems with leading questions and bias due to order.

Once the initial questionnaire was developed, it was pre-tested to iron out fundamental problems in the instructions or questionnaire design. Verbal and written comments were received and changes incorporated.

To measure reliability of the questionnaire test-retest approach was adopted. This is a common approach in such areas as educational testing. In this approach we apply the same measure to the same subjects at two different points in time and compare the two measures to see they match each other. The correlation was found to be 0.761 falling in the
acceptable range.

3.8.2 Administering research questionnaire

Over a period of a few months, the end-users were contacted and interviews held. To increase response rate it was ensured that
a) Covering letter accompanied the questionnaire
b) Interesting questions were added
c) Follow-up was done
d) Anonymity of respondents was maintained

3.9 ANALYSIS AND INTERPRETATION OF DATA

3.9.1 Analysis of data

The data analysis was conducted in two separate phases. Demographic variables were analysed in the first phase of the study. The demographic data evaluated were: 1) Age; 2) Sex; 3) Education level; 4) Formal degree; 5) Functional area; 6) Position in the company; 7) No. of hours spent on the computer per week; 7) End-user type; 8) No. of training programmes attended; 9) Type of computer used; and 10) Number of years of computer experience.
In phase two, these variables, were analysed in relationship to the extent of involvement of end-users in T&D activities, the level of satisfaction with the extent of involvement in T&D activities and the perception of end-users regarding the quality of T&D programmes organised by the organisation.

Analysis of each hypothesis, in phase two was done as follows:

Analysis of variance (ANOVA) was used for testing Hypothesis 1 and Hypothesis 2. ANOVA was preferred over t-test because ANOVA does not compound the probability of committing a Type 1 error. Later, Tukey's method of multiple comparisons and Scheffe's method of multiple comparisons were used respectively for finding out which of the population means were not equal.

Spearman rho was used for testing the hypothesis 3 to 9. The subjects were ranked in order of their score. Each subject was assigned a rank from 1 to 80. The highest score was ranked as one while duplicate ranking was averaged. This resulted in the correlation between -1.00 and +1.00. Spearman rho was preferred over Pearson correlation.
coefficient because Pearson correlation coefficient is based on strong assumptions such as linearity and normality being particularly significant.  

All data were entered in a Spreadsheet program, Microsoft Excel (version 4). Statistical Analyses and Cross Tabulation were done through Microsoft Excel. Tool box of Microsoft Excel was also used, for generating descriptive statistics, performing F-Test and plotting graphs. Models were developed on Microsoft Excel to use Tukey's and Scheffe's method of multiple comparisons and Spearman rho correlation.

3.9.2 **Statistical procedures for interpreting data**

The following is a capsule summary of the statistical procedures used for interpreting the result.

**Analysis of Variance (ANOVA):** "Analysis of variance is a statistical procedure which, as its name implies, is used to examine population variance to determine whether the population means are equal." It examines the variability in the samples that in turn helps in determining whether the population means are unequal or not.
In the population there are two estimates of the variability: mean square within (MSW) and mean square between (MSB). The mean square within is based on how many observations within each groups vary. The mean square between is based on how much the group means vary among themselves. If the null hypothesis is true (that is, all means are equal), MSW and MSB are expected to be nearly equal.

The Statistical test for the null hypothesis that all the groups have the same mean in the population is based on computing a F-statistics. Obtained by dividing MSB by MSW as shown in the following formula:

\[
F = \frac{\text{Mean Square Between}}{\text{Mean Square Within}}
\]

*Tukey's Method of multiple comparisons.* Tukey's method of multiple comparison finds out which population means are not equal once the analysis of variance leads to the rejection of the null hypothesis of equal population means.

Method involves establishing a T range, which is defined as

\[
T \text{ range} = T \sqrt{\text{MSW}}
\]
where:

\[ T = \frac{1}{\sqrt{n}} q \]

q = value from the studentized range table given \( \alpha \) and \( D_1 = k \) and \( D_2 = N-k \) degree of freedom.

n = common sample size

If the absolute difference of any pair of sample mean, \(|X_i - X_j|\) is greater than T range we conclude that the population means are not equal.

This method does not compound the \( \alpha \) level, but only applies when the sample sizes are equal.

Scheffe's method of multiple comparisons Like Tukey's method, Scheffe's method also determines which means are different once the analysis of variance leads to rejection of the null hypothesis of equal means. But unlike Tukey's method this method allows comparisons when the sample sizes are unequal.

This method involves establishing of S range, which is defined as
\[ S \text{ Range} = S \sigma \]

where; 
\[ S = \sqrt{(k-1)(F_i, D_i = k-1, D_i = N-K)} \]

\[ \sigma = \sqrt{(1/n_i + 1/n_j)(MSW)} \]

If the absolute difference of any pair of sample mean, \(|X_i - X_j|\), is greater than S range we conclude that the population means are not equal.

**Spearman Rank Correlation Coefficient** Spearman rho correlation, denoted by \( r \), is a measure of closeness of relationship between two variables when their distribution is not known. Spearman's rank correlation coefficient computes the correlation between two sets of rankings using the following formula,

\[ r = 1 - \frac{6 \sum d^2}{n(n^2 - 1)} \]

where; 
\( d \) = number of places that an object differ in two rankings
\( n \) = number of objects ranked.

The result is a correlation between -1.00 and +1.00
3.10 LIMITATIONS OF STUDY

1. This study was restricted to computer end-users in medium and small size organizations. Thus, generalisation to big industrial houses may not be appropriate.

2. Approximately sixty organisations situated in and around Delhi were contacted. Other companies in different regions in India were not surveyed because of time and access limitations. It is reasonable to conclude, however, that since population consisted of managers, executives, professional staff, secretaries, office workers, and others that perform the same function as end-users. The results represented end-users in general. But still generalisations to other geographic locations may not be possible.

3. This study was limited to computer end-users who were using primarily micro computers. Therefore generalisations to end-users using other types of computers may not be correct.
4. The technique of self reporting was used for collecting information, generally considered the weakest. Therefore, external check was incorporated to reduce inaccuracy and bias. The final eighty respondents were selected from each of the above category, based on the number of training programs attended and the total time that they spend on computers.
REFERENCES


Chapter Three: Research Methodology


11. Subramanyam, L., "The trainers and the trained", P.C Quest, December, 1992, pp. 120.


17. ibid.


27. ibid.


33. ibid.
