CHAPTER III

METHOD OF THE STUDY
METHODE OF THE STUDY

In the previous chapters, a theoretical framework of variables, significance of the problem, development and description of the various tools were discussed. The present chapter has been devoted to the method of study, which focuses around the tools used, the samples, design of the study, procedure and the statistical techniques used for the purpose of the data analysis.

TOOLS USED

The following tools were used for collecting data:

- **Questionnaire of the Computer and Internet Usage in Academic Transactions by Faculty Teachers**
  (Developed and validated by the investigator):
  - Background characteristics (part I),
  - Reasons of university teachers for not usage computer technology as much as they could or should (part II),
  - Attitude about Internet technology in higher education (for teachers) (part III),
  - Computer technology use in teaching (part IV),
  - Computer technology use in research (part V),
  - Computer technology use in extension activities (part VI).

- **A Multiple-Choice Test for Knowledge and Application in Computers for Students Learning Outcomes**
  (Developed and validated by the investigator):
  - General information about the Computer (part I),
  - Operations involved in Microsoft Word (part II),
  - Operations involved in Microsoft Excel (part III),
  - Operations involved in Microsoft PowerPoint (part IV),
  - Operations involved in Internet (part V).

- **Scale of Attitude Towards Internet Technology for Postgraduate Students**
  (Developed and validated by the investigator).
Method of the Study

SAMPLE

Sampling is an important aspect of life in general and enquiry in particular we make judgments about people, places, and things on the basis of fragmentary evidence (Edwards, 1968; Smith, 1975; Garrett, 1981; Ebel, 1991; Lomax, 2001). The adequacy of a sample i.e. its lack of bias, depends upon our knowledge of the population as well as the method used in drawing the sample. Population refers to all cases under investigation and a sample is an actual subset of observations drawn at random from a population (Calfee, 1975). A population is the theoretical set of all possible observations for particular experiment (Calfee, 1975). If the observations are numbers, then the population is described by the distribution function of the observations, which gives the probability of occurrence for each possible numerical value. In statistical terminology, the items that make up a test constitute a sample from a much larger collection, or population of items that might have been used in that test (Ebel, 1991).

The sample can thus be described by a distribution of proportions propelling the probability distribution of function. The sampling distribution can be thought of as the result of repeating a sampling operation many times with a fixed sample size, and calculating a statistic like mean from each sample. At the same time, the sampling distribution of statistics gives us a way of relating the sample estimate to the population parameter. It provides a way of determining the significance level of a given result under the null hypothesis (Garrett, 1981; Ebel, 1991; and Lomax, 2001).

The size of the population places an upper limit on the size of the sample that can be drawn from it (Ebel, 1991). The sample cannot be larger than the population (Calfee, 1975; Garrett, 1981; Ebel, 1991; and Robson, 1996). The large the population, the more likely it is to be heterogeneous, i.e. to include diverse and semi-independent areas of knowledge or ability. In order to achieve equally accurate results, a somewhat larger sample is required in a heterogeneous than in a homogeneous domain (Robson, 1996).
A large sample will always yield a sample statistics closer to the population parameter than a more limited sample (Garrett, 1981). The large the sample, the smaller the sampling errors are likely to be and such errors are not caused by mistakes in sampling (Ebel, 1991).

A sampling procedure is representative if every sub-class eventually occurs with the same proportion in the sample as in the general population (Garrett, 1981). In probability sampling, statistical inferences about the population can be made from the respondents of the sample. It is therefore sometimes referred to as the representative sampling (Robson, 1996) where the sample is taken as a representative of the population (Garrett, 1981).

Various techniques have been devised for obtaining a sample, which are representative of its population. Most commonly used sampling techniques are:

- Random sampling
- Stratified or quota sampling
- Incidental sampling, and
- Purposive sampling.

The descriptive term random is often misunderstood. It does not mean that the sample has been chosen in an offhand, careless and haphazard fashion (Garrett, 1981). Random sampling means that we rely upon a certain technique of selection called random to provide an unbiased cross section from the larger group or population. This involves selection of the required number of persons or cases from the sample. Random selection assures that the observations will be representative of the performance of the appropriate reference group and free of systematic bias. In random assignment, selection of the subjects is done in such a way that every subject in the population is equally likely to be selected and assigned to a particular experimental group. Thus, random sampling:

- Yields samples that are representative of the population and that are free of systematic bias,
- Avoidance of systematic bias, which generally occurs when there is a noon random selection procedure (i.e. a person is assigned to be in a condition depending on his particular characteristics).
Method of the Study

• Ensures that for any sample of subjects, there is no bias in assigning any person to any particular treatment group.

The criteria for randomness are met when:
• Every individual in the population or supply has the same chance of being chosen for the sample,
• The selection of one individual or thing in no way influences the choice of another.

Thus, randomness in a sample is assured when we draw similar and well shaken up slips out of a hat or numbers in a lottery or a hand from a carefully shuffled deck of cards. In each of these cases, selection is made in terms of some mechanical processes and is not subject to the whims or biases of the experimenter.

Stratified sampling is a technique designed to ensure representativeness and avoid bias by use of modified random sampling method. It is applicable when the population is composed of sub-groups or strata of different sizes so that a representative sample must contain individuals drawn from each category or stratum in accordance with the sizes of the sub-groups. Within each stratum or sub-group, the sampling is random or as nearly as possible. This involves dividing the population into a number of groups or strata where members of a particular group share a particular characteristic.

Incidental sampling is sometimes referred to as accidental sampling. It is applied to those groups, which are used chiefly because they are easily or readily obtainable. School children, college students are readily available. And laboratory animals are also readily available at all times in numbers and under conditions none of which may be of the experimenter’s choice. Such casual groups rarely contribute random samples of any definable population.

In purposive sampling, a sample is built up which enables the investigator to satisfy his specific needs in the project. The principle of selection in purposive sampling is the investigator’s judgment of the typicality of his interest. A sample may then be expressly chosen because in the light of the available evidence, it mirrors some larger groups with reference to a given characteristic (Stodola and Storodahl, 1967; and Garrett, 1981).

The sample in the present investigation was drawn at two levels:
• The university teachers sample,
• Sample of postgraduate students who were related to these teachers.
THE UNIVERSITY TEACHERS SAMPLE

The university teachers were selected from faculty of science, social science and commerce in both modes of instruction, regular and distance departments, Panjab University, Chandigarh. The lists of the university teachers of the departments were collected from their respective offices. Thus, names of the teachers listed according to their rank and gender for each department, were noted down. It was a purposive sample and a care was taken that there is a representation of faculty on each of the following criteria:

- **Age:**
  - Up to 30 years
  - 31-40 years
  - 41-50 years
  - 51 years and above.

- **Gender:**
  - Male
  - Female.

- **Mode of Instruction:**
  - Regular
  - Distance.

- **Rank:**
  - Professor
  - Reader
  - Lecturer.

- **Subject area:**
  - Science
  - Social science
  - Commerce.

- **Research experience:**
  - Up to 10 years
  - 11-20 years
  - 21-30 years
  - 31 years and above.
Method of the Study

- Level of use of computers:
  - Users
  - Non-users.

The required numbers of university teachers were selected randomly from each department. The specifications of the university teachers’ sample have been given in the table 3.1.

Table 3.1
Distribution of the University Teachers Sample (Age, Gender, Mode of Instruction, Rank, Subject area, Research Experience, and User-Non user Wise).

<table>
<thead>
<tr>
<th>Criteria of selection</th>
<th>Categories</th>
<th>No. of university teachers initially selected</th>
<th>No. of university teachers left at the final stage of collecting data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Up to 30 years</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>31-40 years</td>
<td>69</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td>41-50 years</td>
<td>85</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>51 years and above</td>
<td>96</td>
<td>89</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>260</td>
<td>238</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>150</td>
<td>136</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>110</td>
<td>102</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>260</td>
<td>238</td>
</tr>
<tr>
<td>Mode of Instruction</td>
<td>Regular</td>
<td>210</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>Distance</td>
<td>50</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>260</td>
<td>238</td>
</tr>
<tr>
<td>Ranks of Faculty</td>
<td>Professor</td>
<td>75</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>Reader</td>
<td>99</td>
<td>89</td>
</tr>
<tr>
<td></td>
<td>Lecturer</td>
<td>86</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>260</td>
<td>238</td>
</tr>
<tr>
<td>Subject area</td>
<td>Science</td>
<td>110</td>
<td>105</td>
</tr>
<tr>
<td></td>
<td>Social Science</td>
<td>126</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td>Commerce</td>
<td>24</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>260</td>
<td>238</td>
</tr>
<tr>
<td>Research experience</td>
<td>1-10 years</td>
<td>90</td>
<td>84</td>
</tr>
<tr>
<td></td>
<td>11-20 years</td>
<td>78</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>21-30 years</td>
<td>68</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td>31 years and above</td>
<td>24</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>260</td>
<td>238</td>
</tr>
<tr>
<td>Level of use</td>
<td>User</td>
<td>165</td>
<td>158</td>
</tr>
<tr>
<td></td>
<td>Non user</td>
<td>95</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>260</td>
<td>238</td>
</tr>
</tbody>
</table>
Method of the Study

The initial sample consisted of 260 university teachers but at the final stage only 238 university teachers were left, rest of the teachers who did not respond on tools properly, were dropped out at the time of analysis.

- **SAMPLE OF POSTGRADUATE STUDENTS**

  The study also employed a sample of 500 postgraduate students of faculty of science, social science, and commerce, Panjab University, Chandigarh. The sample at this stage was also a purposive sample because only those students were chosen who were associated with the Faculty Teachers, selected for the present investigation. The distributions of the sample of postgraduate students have been given in the table 3.2.

  **Table 3.2**
  
  **Final Distribution of the Sample of Postgraduate Students Associated with User and Non-User Faculty Members**

<table>
<thead>
<tr>
<th>Students</th>
<th>Subject</th>
<th>No. of postgraduate students initially selected</th>
<th>No. of students left at the final stage of collecting data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>Science</td>
<td>106</td>
<td>101</td>
</tr>
<tr>
<td></td>
<td>Social Science</td>
<td>174</td>
<td>167</td>
</tr>
<tr>
<td></td>
<td>Commerce</td>
<td>20</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>300</strong></td>
<td><strong>287</strong></td>
</tr>
<tr>
<td>Group II</td>
<td>Science</td>
<td>57</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>Social Science</td>
<td>143</td>
<td>124</td>
</tr>
<tr>
<td></td>
<td>Commerce</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>200</strong></td>
<td><strong>168</strong></td>
</tr>
</tbody>
</table>

  - Group I was comprised of students who were associated with university teachers who were included in the university teacher sample and who used network communications (Computer and Internet technology) in academic transactions.
  
  - Group II consisted of students who were associated with university teachers selected in the investigation but, those teachers did not use network communications (Computer and Internet technology) in academic transactions.

  The initial sample consisted of 500 postgraduate students but at the final stage only 455 postgraduate students were left, rest were dropped at the time of analysis. These students had not responded on the tools, genuinely.
DESIGN OF THE STUDY

A research design is the plan, structure, and strategy of investigation conceived so as to obtain answers to research questions and to control variance (Lindquist, 1956).

Winer (1971) has compared the design of an experiment to an architect’s plan for the structure of a building. The designer of experiment performs a role similar to that of the architecture. The design is the general structure of the experiment, not its specific content (Myers, 1980). The designer of an experiment has to do the planning of the experiment so that the experiment, on completion fulfils the objectives of the research (Brooter, 1999). Educational research is therefore described as experimental if and when the researcher has:

• Firstly, specified the finite set of researchable hypotheses, and
• Secondly has established a systematic programme of data gathering, under precisely defined conditions in an effort to test these hypotheses (Ingersoll, 1982). A good experimental designer should provide some information with respect to all the objectives of the experiment (Winer, 1971) and be kept as simple as possible (Montgomery, 1994).

The present research was designed to study Use of network communications in academic transactions by university teachers and its impact on learning outcomes of postgraduate students. For the purpose of present investigation an exploratory ex-post facto design was employed. Use of the network communications was an independent variable and learning outcomes of students was a dependent variable. Learning outcomes of the students were studied at two levels:

• Knowledge and application in computers areas, and
• Attitude Towards Internet Technology.

Use of the network communications by university teachers in the area of academic transactions were explored with regard to the following:

➢ Age of Faculty members (up to 30 years, between 31-40 years, between 41-50 years, and 50 and above years).
➢ Gender (Male/ Female).
➢ Mode of instruction (Regular/ Distance).
➢ Ranks of Faculty members (Professor/ Reader/ Lecturer).
➢ Discipline (Science/ Social science/ Commerce), and
➢ Research experience (1 to 10 years, 11-20 years, 21-30 years, 30 and above years).
Method of the Study

The layout of the design has been presented in figures 3.1.

**Figure 3.1**

*Schematic Layout of the Experimental Design*

**LEARNING OUTCOMES OF STUDENTS:**

- **Knowledge and Application in Computers Area:**
  - General Information About Computer.
  - Operations Involved in Microsoft Word.
  - Operations Involved in Microsoft Excel.
  - Operations Involved in Microsoft Power Point.
  - Operations Involved in Internet.

- **Attitude Towards Internet Technology.**

User Faculty Teachers:
(Use of network communications in teaching, research, extension)

- Age of faculty members.
- Gender.
- Mode of instruction.
- Rank of faculty members.
- Area of specialization.
- Research experience.

Non-user Faculty Teachers:
(No-use of network communications in teaching, research, extension)

- Age of faculty members.
- Gender.
- Mode of instruction.
- Rank of faculty members.
- Area of specialization.
- Research experience.
PROCEDURE OF THE STUDY

The study was conducted in two stages viz:

- Selecting the sample, and
- Collecting data.

STAGE I: SELECTING THE SAMPLE

The sample was selected at two levels:

- The university teachers; and
- The postgraduate students associated with them.

The procedures adopted for the selection of sample have already been discussed under the heading sample.

STAGE II: THE COLLECTION OF DATA WAS DONE IN TWO PHASES:

Phase I: Study of use of the network communications by university teachers in academic transactions:

After preparing and validating the related tools, the investigator prepared a list of faculty members of the departments included in the study. The list was used to categorise the faculty members according to various criteria, already decided, for studying use or no-use of network communications by them. On each criterion the faculty members of each department were identified and approached by the investigator. In fact this was a huge task to be accomplished by the investigator who personally went to individual teachers. The departments from where the data was collected were identified on the criterion of:

- Mode of instruction, and
- Nature of subject (Science, Social Science and Commerce). With these faculties a huge number of science departments were there as were the social science departments. Out of science faculty, basic science departments were selected. The second category of science subject consisted of allied science subjects like Biochemistry, Biotechnology etc. The faculty teachers were picked up not only from PCM or PCB. Similarly from social science faculty, basic subjects and their allied branches were chosen.

The investigator explained the purpose of his visit and gave to the teachers the related tools as well as requested them to cooperate with the investigator. In most of the
cases the faculty members fixed a particular time for the investigator who approached them again on that time and personally sat with the faculty members. The information/clarification was given wherever required. Though the instructions were given on the tools, the investigator repeated the instructions and explained to the teachers who needed more information. The investigator also talked informally with them and noted anything that was peculiar and unique. The computer and Internet technology facilities of the departments and the study rooms of the teachers were also observed by the investigator, personally.

The teachers filled up all the tools that the investigator had presented personally on those occasions. The investigator collected the tools on a particular time if any teacher opted to do it later. This time was two days gap to one-month gap. This was done for all the identified faculty members, from all the faculty members chosen for the study.

Hence the tools pertaining to the use of the network communications by university teachers in academic transactions were administered and collected back during the first phase of the study. The time-schedule of collecting data from the faculty teachers has been given in the following table.

Table 3.3

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Mode of Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Regular</strong></td>
</tr>
</tbody>
</table>
Phase II: To study use of network communications in academic transactions by university teachers and its impact on learning outcomes of postgraduate students:

The second phase of the study focused around students. After preparing the related tools, the investigator selected required number of the students who were associated with the university teachers under study. He contacted them in their classes, personally. The investigator explained the purpose of his visit and gave to the students the related tools, as well as requested them to cooperate with the investigator. After filling up the tools by the students, the tools were collected by the investigator. The time schedule of collecting students’ data has been given in the following table.

**Table 3.4**
The Date-wise of Collecting Data from the Students

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Mode of Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Regular</td>
</tr>
<tr>
<td>Commerce</td>
<td>From 01.03.2002 To 10.03.2002.</td>
</tr>
</tbody>
</table>

Hence the tools pertaining to the learning outcomes of the students administered during the second phase of the study were collected back. All the tools were then scored according to the prescribed keys and the data were subjected to the statistics techniques.

**STATISTICAL TECHNIQUES USED**

The following statistical techniques were employed for the purpose of the analysis:

- Descriptive research techniques.
- Means and standard deviations wherever required.
- Non-parametric statistics, X² test.
- Parametric statistics, t-ratios.