

CHAPTER- IV
RESEARCH METHODOLOGY

4.1. Introduction

This chapter presents the research method used for the study which includes the research design, population, sample and strategies for sampling, research tools and data analysis techniques. Besides this, it has included the procedures of data collection and ethical principles followed in due process of data collection.

4.2. Research Methodology

A research method is the logic that links the population, sample, tools, data to be collected and approaches of analysing and reporting the data. It logically links the data, analysis, findings and the conclusions to be drawn in line with the objectives and research questions formulated for the study. This study attempted to explicitly adopt a judicious mixture of both quantitative and qualitative approaches deemed as the most appropriate one. This is because by its very nature it allowed the researcher to develop an understanding of the availability, utilization and prevalent challenges of the ICT implementation in the target universities with a triangulation of the responses.

Literature on research methods discusses about two general logical reasoning approaches in order to arrive at conclusions. These methods of logical reasoning are deductive and inductive methods. Deductive reasoning begins with an expected pattern that is tested against observations, whereas inductive reason begins with observations and seeks to find a pattern within them (Babbie, 2014). These conclusions and theories are subject to further confirmation based on subsequent evidence. In this study, the researcher started from deductive reasoning considering the already-established ICT theories and conclusions for the development of the research design. On the other hand, it has collected basic facts and figures in the inductive phase to be analyzed for the development of a generalization or conclusion.

There are two prominent research approaches that are presented in many research books as qualitative research and quantitative research. Qualitative research focuses on collection of detailed amounts of primary data from relatively small samples of subjects by asking questions or observing behaviours (Hair et al., 2003). It mainly includes ethnographic research, case study, phenomenological research, grounded theory, participatory research, clinical research, and focus groups (Mertens, 2009).

This approach normally requires reasoning from induction, gathering data and drawing conclusions from a multiplicity of interpretations and perceptions, beginning with observation, rather than a single, objective truth or rationality (Mertens, 2009, Neuman, 1997).

Quantitative approaches are generally based on the logic of deduction, beginning from accepted theories or premises and testing them rationally. Science in quantitative approaches is associated with objective truth, while qualitative research tends to focus on subjective experience (Neuman, 1997; Mertens, 2009). Quantitative research places heavy emphasis on using formalized standard questions and pre-determined response options in the questionnaires or surveys administered to large number of respondents. Quantitative research methods are directly related to descriptive research designs (Hair et al., 2003).

By harmonizing the two methods (qualitative and quantitative), a mixed approach has emerged. This approach includes both qualitative and quantitative features in the design, data collection, and analysis (Mertens, 2009). According to Mertens (2009), the investigator in mixed approach collects and analyzes data, integrates the findings, and draws inferences using both qualitative and quantitative approaches in a single research study. Having this critical presupposition, the researcher of this study has followed a mixed approach for collecting both quantitative and qualitative data about ICT and its utilization in the respective target universities.

4.3. Research Design

The research design is the blueprint of the research and describes the methods used for collection, measurement and analysis of data. According to Kerlinger (1986), research design is the plan and structure of investigation conceived as to obtain answers to research questions. The plan is the overall scheme or program of the research. It includes what the investigator will do from writing hypothesis and their operational implications to the final analysis of data. A research design expresses both the structure of the research problem and the plan of investigation used to obtain empirical evidence on the relations of the problem (Kerlinger, 1986).

This study employs a descriptive research design using survey method. This is marked by a clear statement of the problem, specific hypothesis and detailed information needs (Malhotra, 1999). The study uses survey-based research method and is structured with clearly-stated hypothesis and investigative questions. Cross sectional design is used in the present study as the information from any given sample of population element is collected only once.

The term “survey” usually refers to a study that is used to investigate a representative sample. Punch (2005) defined a survey as a kind of research which is based on collecting data from sample respondents. According to Miller and Brewer (2003: 23b), a survey relies on statistical generalization. The basic idea of the quantitative survey in this research was a fact-finding exercise to find out the availability of ICT facilities in each university and utilisation among students, teachers and ICT experts and administrators. This survey allowed the researcher to analyse the status quo of the existing situation of ICT usage within the higher education sector of Assam.

Thus, surveys can identify common relationships which can be generalised to represent an entire population; and are also suitable for measuring behavioural indicators and attitudinal attributes (Chu & Ju, 1993). Survey is often used to gather data from organisations about their attitudes, views, beliefs, and practices (Babbie, 1990; Galliers, 1985; 1992; Jenkins, 1985; Vogel & Wetherbe, 1984). It may be mentioned that some interpretive research methods (such as action research, field study and ethnography); require the involvement of the researcher and interaction between the researcher and the subject. But the role of the researcher in survey is more neutral, in that one “does not manipulate any independent variable or apply control conditions to the subject under study” (Adams & Schvaneveldt, 1985). For this research a survey method was selected because this approach provides a far higher ability to generalise set of results, upon which further and more in-depth research can be based (Galliers, 1992).

Advantages of using surveys to collect data are: they can be easily administered, they are structured to avoid side tracking, they are less expensive, and relatively quick to administer.

The disadvantages of surveys are: they are so common that respondent may discard without opening, they may be used incorrectly to elicit participant's wishes not needs, they may be too broad and general to be of use, or they may be too long and respondent won't respond (Witkin & Altschuld, 1995). While there are many surveys available as models, it may be of greater value to create one that speaks directly about assessing readiness for implementation of ICT and needs assessment in higher education institutions. This research is a survey study using quantitative methods which seeks to explore needs and readiness for implementation of ICT among faculty members and students and ICT experts and administration in universities of Assam.

In the study, the researcher tries to generate data from different sources, via different tools and triangulate them. Johnson and Christensen (2008) defined 'triangulation' as "... a term given when the researcher seeks convergence and corroboration of results from different methods studying the same phenomenon" (p.451). It means using more than one data collection method (Denscombe, 1999; Neuman, 1997; Stake, 1995). Combining multiple data collection methods (Denscombe, 1999; Denzin & Lincoln, 2000; Neuman, 1997; Pickard, 2007; Stake, 1995), the researcher overcame the weaknesses or intrinsic biases and problems that might arise from using a single data collection method. Neuman (2011) stated that "... looking at something from multiple points of view improves accuracy" (p.164).

Within-method type of triangulation could be used for multiple complementary methods are used (Hussein, 2009). In this research the multiple data collection methods were - interviews, and a qualitative survey. The researcher used such methods within the qualitative paradigm towards increasing credibility, completeness and to confirm of findings through convergence of different perspectives. Use of multiple data collection methods can be used for completeness of purposes (Hussein, 2009). In addition, the researcher aimed to achieve validity of findings by adopting the triangulation method.

4.4. Population and Sample of the study

Population is the aggregate of all the elements that share some common set of characteristics and that comprise the universe for the purpose of the research problem (Malhotra, 1999). In the present study, population is finite and comprises four universities of Assam. They are - Tezpur University (TU), Assam University (AU), Gauhati University (GU) and Dibrugarh University (DU). Out of these, Tezpur University (TU) and Assam University (AU) are central universities and Gauhati University (GU) and Dibrugarh University (DU) are state universities. The researcher took all of the universities and targeted the population of these universities who are directly linked with ICT facilities, including teachers, students, ICT experts and administrators.

Determining an effective sample size is not an easy matter. Krejcie and Morgan (1970), quoted in Cavana, Delahaye, and Sekaran (2000), greatly simplified the sample size decision by providing a table which ensures a good decision model.

This formula is the one used by Krejcie & Morgan in their article “Determining Sample Size for Research Activities” (1970).

Table 4.1: Sample size table of Krejcie & Morgan (1970)

Required Sample Size [†]								
Population Size	Confidence = 95%				Confidence = 99%			
	Margin of Error				Margin of Error			
	5.0%	3.5%	2.5%	1.0%	5.0%	3.5%	2.5%	1.0%
10	10	10	10	10	10	10	10	10
20	19	20	20	20	19	20	20	20
30	28	29	29	30	29	29	30	30
50	44	47	48	50	47	48	49	50
75	63	69	72	74	67	71	73	75
100	80	89	94	99	87	93	96	99
150	108	126	137	148	122	135	142	149
200	132	160	177	196	154	174	186	198
250	152	190	215	244	182	211	229	246
300	169	217	251	291	207	246	270	295
400	196	265	318	384	250	309	348	391
500	217	306	377	475	285	365	421	485
600	234	340	432	565	315	416	490	579
700	248	370	481	653	341	462	554	672
800	260	396	526	739	363	503	615	763
1,000	278	440	606	906	399	575	727	943
1,200	291	474	674	1067	427	636	827	1119
1,500	306	515	759	1297	460	712	959	1376
2,000	322	563	869	1655	498	808	1141	1785
2,500	333	597	952	1984	524	879	1288	2173
3,500	346	641	1068	2565	558	977	1510	2890
5,000	357	678	1147	3288	586	1066	1734	3842
7,500	365	710	1275	4211	610	1147	1960	5165
10,000	370	727	1332	4899	622	1193	2098	6239
25,000	378	760	1448	6939	646	1285	2399	9972
50,000	381	772	1491	8056	655	1318	2520	12455
75,000	382	776	1506	8514	658	1330	2563	13583
100,000	383	778	1513	8762	659	1336	2585	14227
250,000	384	782	1527	9248	662	1347	2626	15555
500,000	384	783	1532	9423	663	1350	2640	16055
1,000,000	384	783	1534	9512	663	1352	2647	16317
2,500,000	384	784	1536	9567	663	1353	2651	16478
10,000,000	384	784	1536	9594	663	1354	2653	16560
100,000,000	384	784	1537	9603	663	1354	2654	16584
300,000,000	384	784	1537	9603	663	1354	2654	16586

In the four universities, a total population of 17034 was found in the 2016 academic year as shown in the Table 4.2 (GU, 2016; AU, 2016; DU, 2016; TU, 2016).

Table 4.2: Population of the study

Target respondents	Universities				
	AU	DU	GU	TU	Total
Students	3,420	4,396	4,908	3,059	15,783
Teachers	314	316	328	213	1,171
ICT experts and administrators	16	18	27	23	84
Total	3750	4730	5263	3295	17,038

Based on the above formula in Table 4.1, the total population of students (15,783) as shown in Table 4.2 falls under the category of 25,000 which leads to a sample of 378 students and the population of teachers (1,171) will falls under the category of 1200 which leads to a total sample of 291. These samples were distributed proportionately for each university as per the size of the population. It was calculated as (population of the specific University x total determined sample size) / total population of all Universities). The ICT experts and Administrators were selected purposively based on their position and significance to the research. Thus, the overall sample of the population is portrayed in Table 4.4.

Table 4.3: Determined sample size

Target respondents	Universities				
	AU	DU	GU	TU	Total
Students	82	105	118	73	378
Teachers	78	79	81	53	291
ICT experts and administrators	10	10	10	10	40
Total	170	194	209	136	709

To this end, data were collected from students (378) and teachers (291) by means of questionnaires (both open and close ended nature). The questionnaires were designed and randomly distributed to students to get a rough representation of different departments, years and programmes. The faculty questionnaire was distributed in their respective departments.

Accordingly, the respondents returned the filled questionnaire which comprises total of 482 (326 students and 156 teachers). However, 52 of the students and 123 teachers were not reachable during the time of collection of the questionnaires and some of them did not return the questionnaires. Among those returned ones, 26 were rejected because of lack of address, and other relevant data. Finally, the researcher considered the feedbacks of total 500 respondents consisting of 320 students, 140 teachers and 40 ICT experts / administrators.

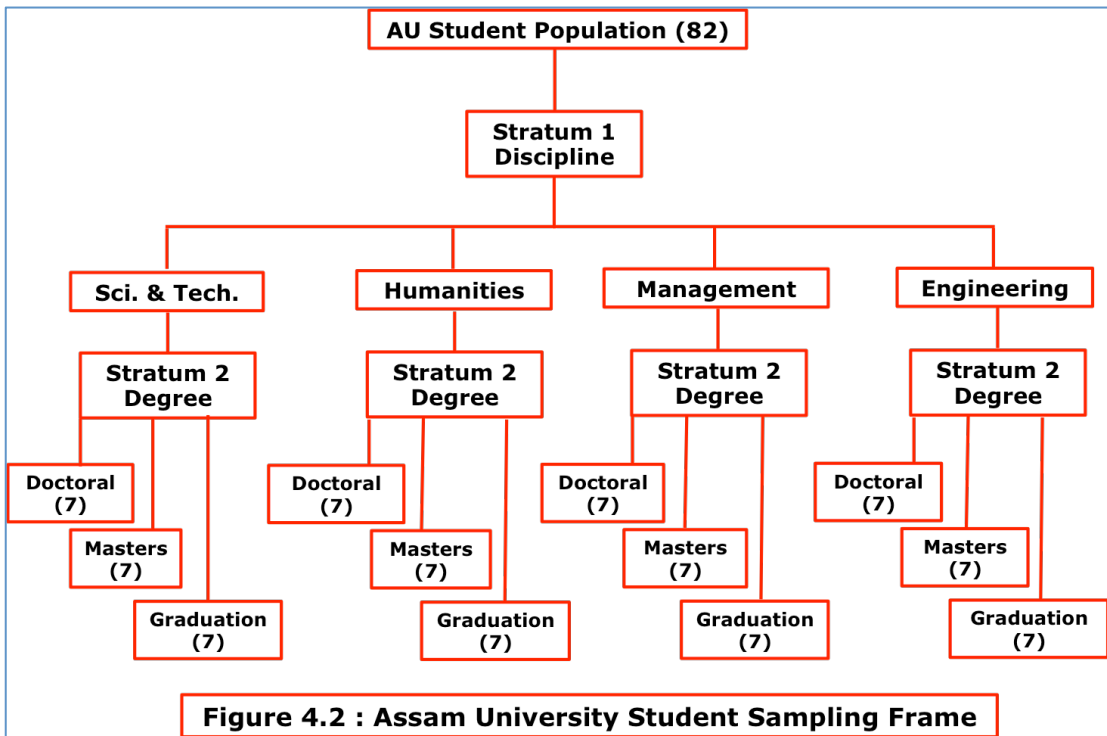
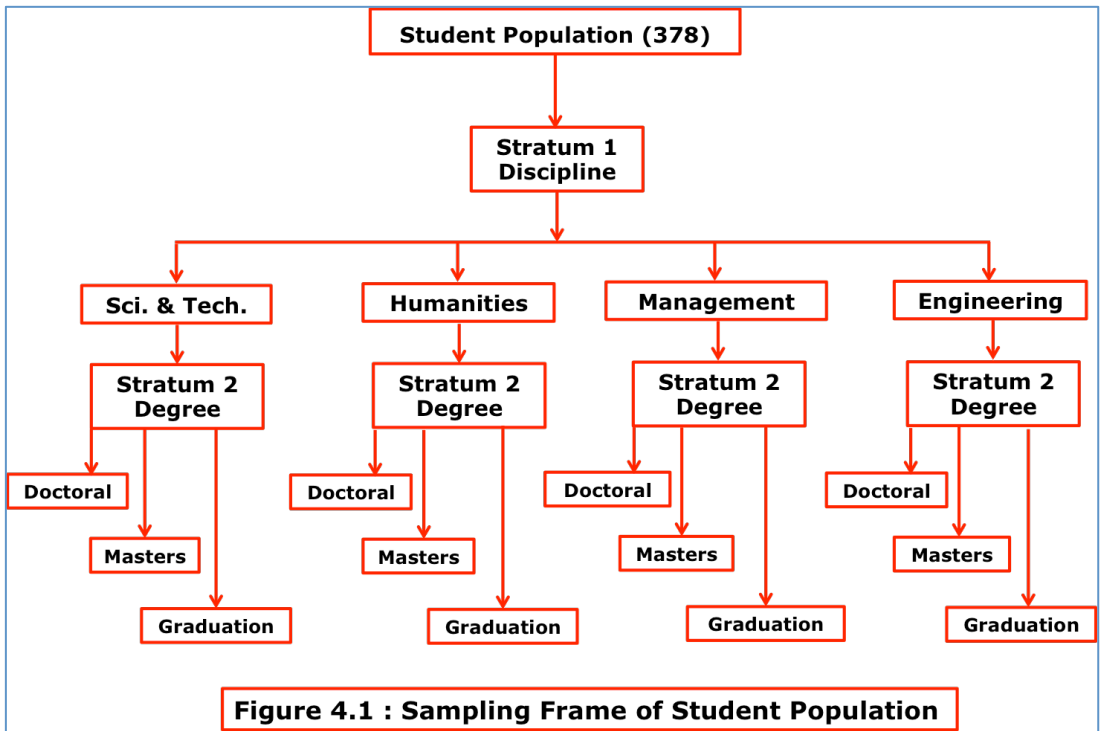
4.4.1. Selection of Universe

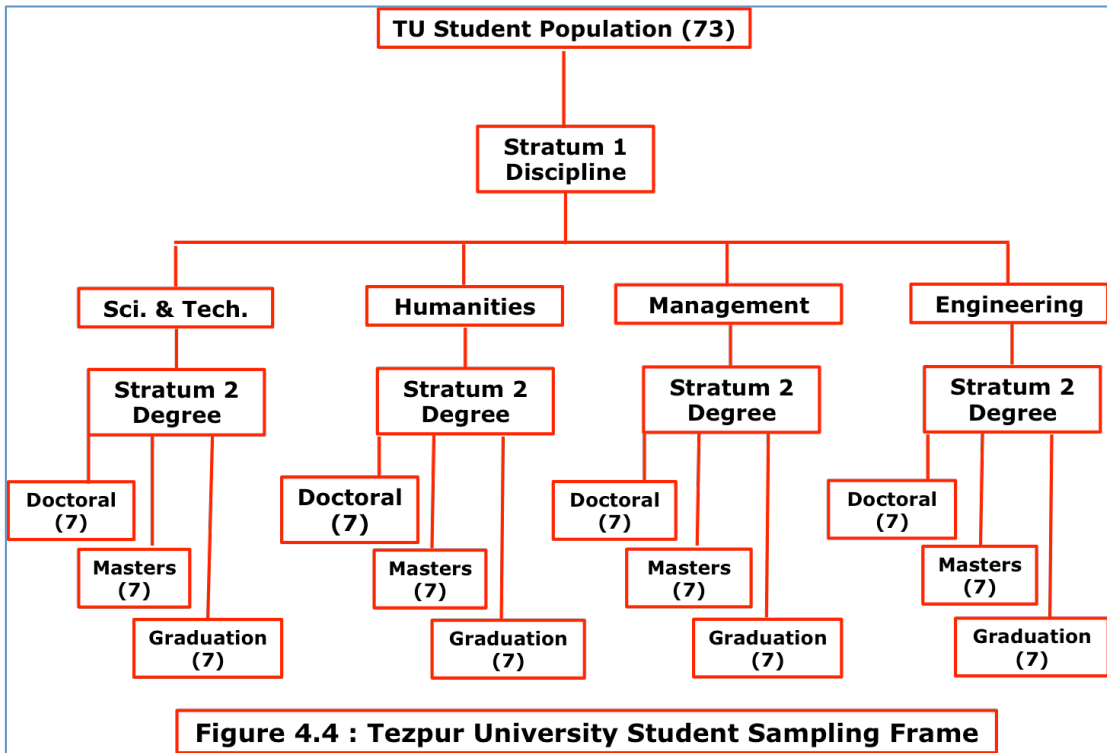
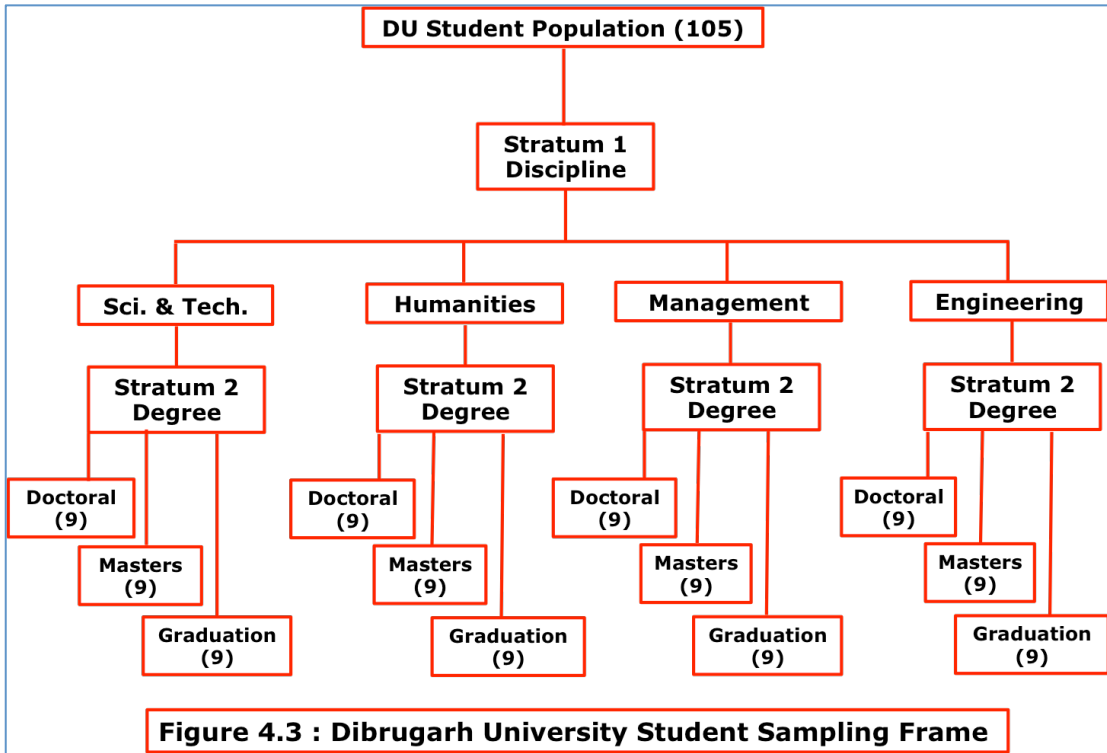
In the present study, universities of Assam constitute the universe. There are only five government run universities in Assam, two central universities, two state universities and one agricultural university. For better comparison of the ICT impact, two central universities: Tezpur University (TU) and Assam University (AU) and two state-run universities - Gauhati University (GU) and Dibrugarh University (DU) are selected purposively.

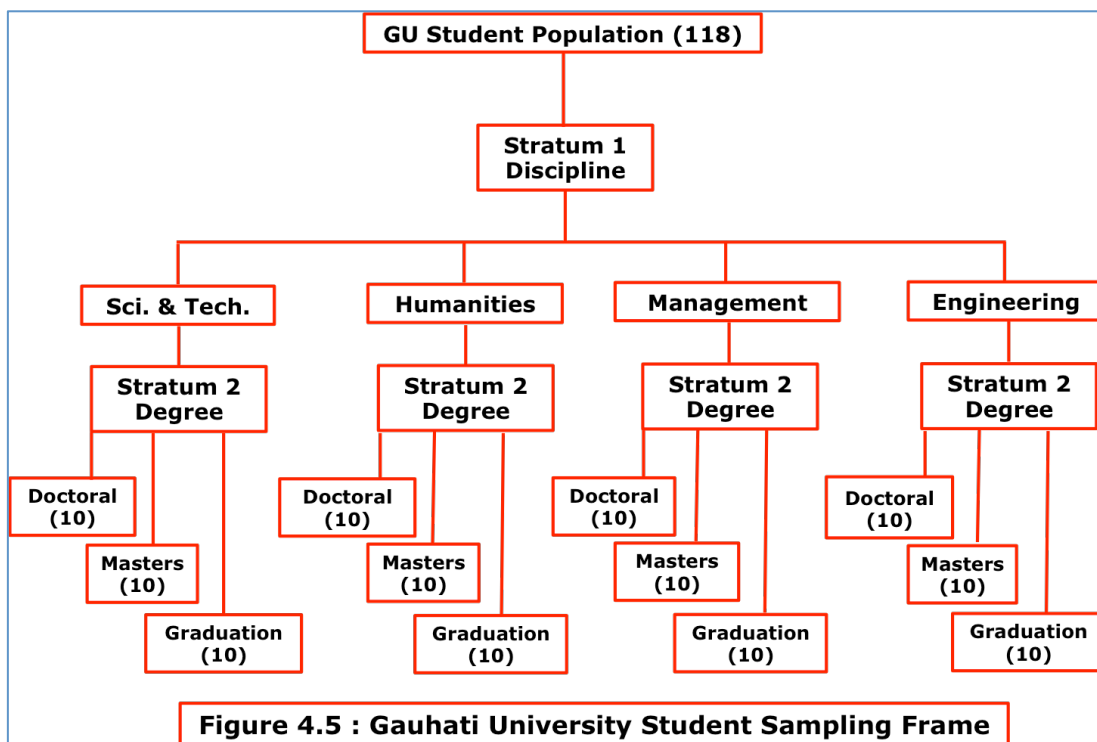
4.4.2. Selection of respondents

The respondents are selected using the following methods:

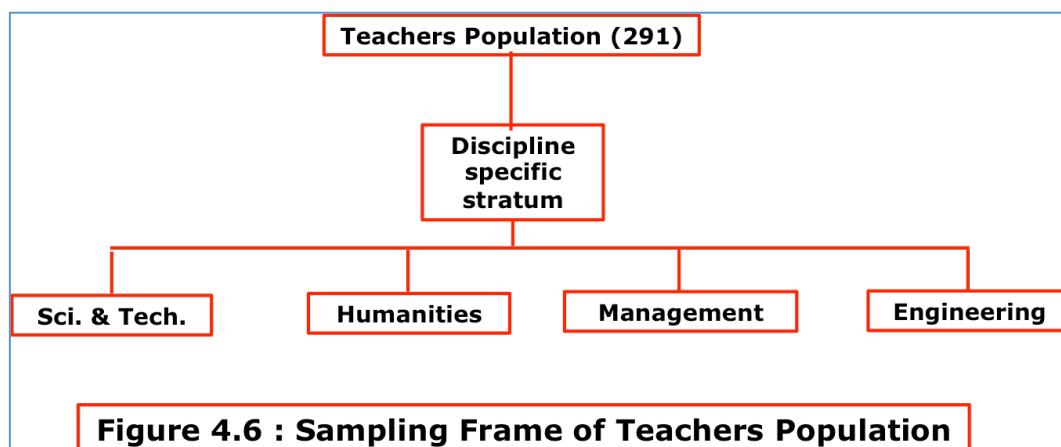
a) Student: For the selection of student respondents, stratified sampling was used. In the first strata each university students were categorized “discipline” wise under ‘Science & Technology’, ‘Engineering’, ‘Management’ and ‘Humanities’. In the second strata each “level of degree” was categorized under ‘Doctoral’, ‘Masters’ and ‘Graduate’. As the stratification of the population led to creation of homogenized groups, students were selected randomly being on their easy accessibility.

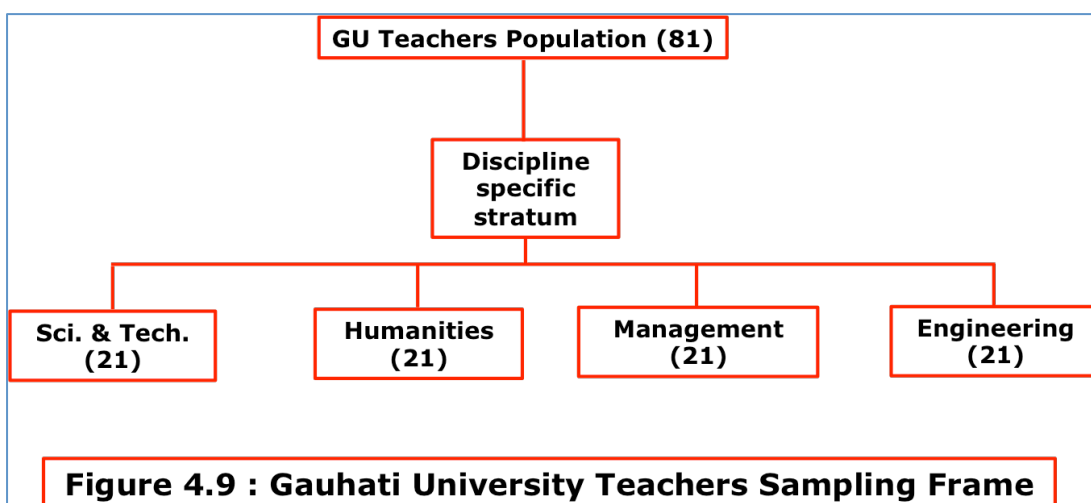
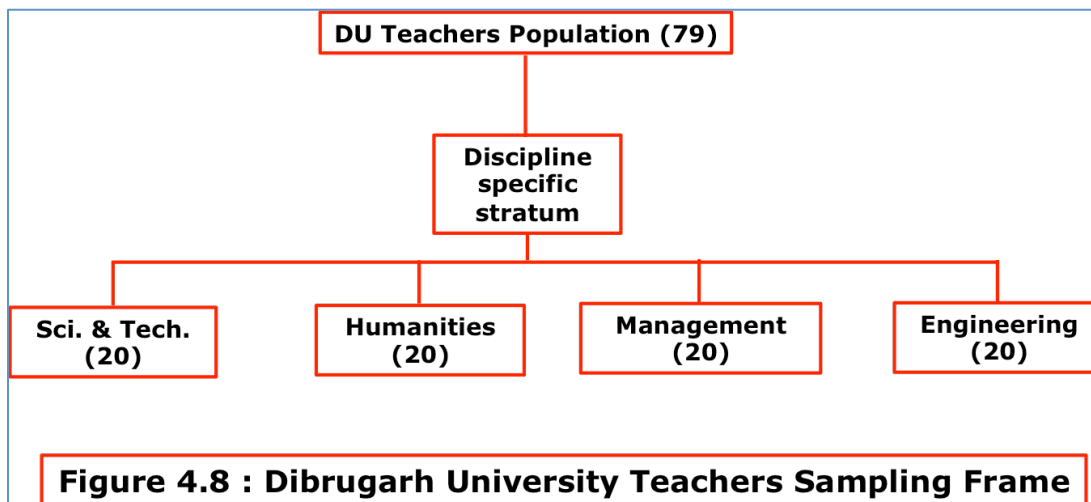
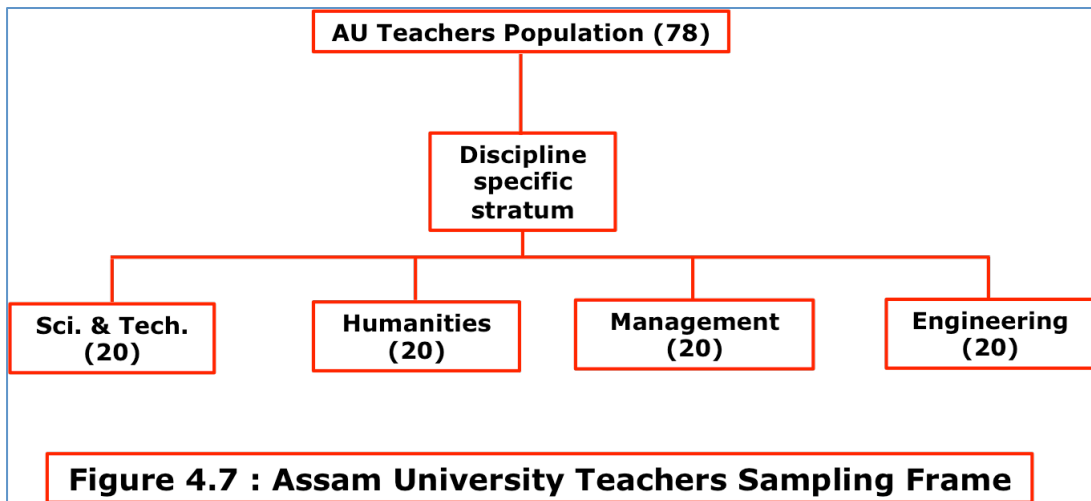


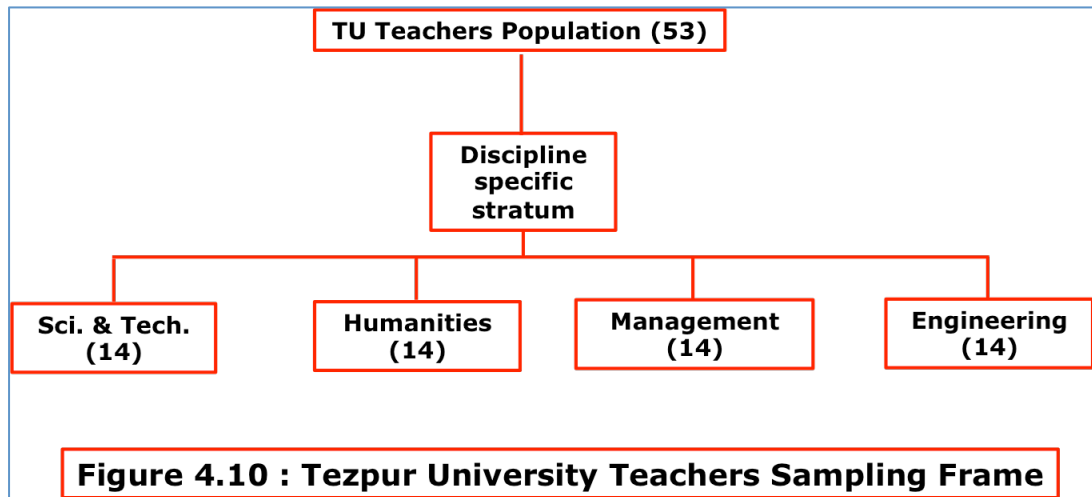




b) Teacher: For the selection of teacher respondents, stratified sampling was used. Teachers were randomly selected from the discipline specific homogeneity groups like ‘Science & Technology’, ‘Engineering’, ‘Management’ and ‘Humanities’.







c) ICT experts and administrators: Purposive sampling was used to select the ICT experts and administrator among the head / staff of library, Computer Centre and administration based on their position and significance to the research for investigating the different kinds of ICT facilities, technical support and other problems while implementing ICT. Total 40 nos. of ICT expert selected from the four universities, and each university represent 10 respondents.

4.5. Pilot Study

Several scholars (Kothari, 1990; Saunders et al., 2003) emphasize that pilot study should be undertaken to pre-test the questionnaire. It enables the researcher to obtain assessment of validity of questionnaire as well (Saunders et al., 2003). According to Cooper and Schindler (2003) research instrument should be piloted to detect weaknesses or errors in the instrument. It should be conducted with the subjects from the target population and simulate the procedures and protocols that have been designated for data collection (Cooper and Schindler, 2003). According to them, the size of the pilot groups may range from 25 to 100 subjects, depending on the method to be tested, but the respondents do not have to be selected by a purely statistical method.

In the present study, a pilot study with a random sample of 30 for students, 20 for

teachers and 6 for ICT experts / administrators was conducted to evaluate the information provided in the questionnaire and to test the readability of the questionnaire. The objective of the pilot test was to pre-test the questionnaire with the respondents and ensure that there was no ambiguity in the questionnaire. The respondents had no major issues with the questionnaire.

4.6. Research tools used for data collection

In the present study, two research instruments were designed to gather the primary data --- interview and two questionnaires.

i. Interview: Interview was used to gather information from key people of the universities specially the heads / staff of Computer Centre, library and administration Investigating the different kinds of ICT facilities, technical support, and other problems while implementing ICT. Interview schedule was used to gather information from key people of the universities specially the heads / staff of Computer Centre, library and administration.

ii. Questionnaire: This was administered to the students and faculty to measure the impact of ICT facility implementation in the teaching learning process of higher education. The questionnaire also investigated the respondent's perception and attitude towards ICT facilities, problems and prospects. For this perception towards the use of ICT in higher education the investigator developed a scale based on Likert method. There were 32 statements related to different aspects of use of ICT in higher education. Some of the aspects were use of ICT in admission, hostel management, evaluation of teaching staff, instructional material, giving assignments and thought-provoking questions on websites, examination of students etc. There were five choices given against each statement like: Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D), and Strongly Disagree (SD). The respondent was required to put tick mark only on one option amongst the given five options as response. Out of 32 statements, there were 16 positive statements and the remaining statements were negative. For positive statements the weightages for SA, A, U, D, and SD were 5, 4, 3, 2 and 1 respectively were given while it was reversed for negative statements.

Before framing the questionnaire the investigator also had one to one interaction with some of the ICT heads and administrators for the opinions and views on ICT and its implementation in universities. After designing the questionnaire comments and opinions were obtained regarding the structure and the contents of the questionnaire from ICT heads and administrators and it was modified accordingly.

4.7. Procedure of data collection

The survey was administered by the researcher after obtaining permission from the administration of the universities. The researcher visited and administrated the questionnaires personally to ICT experts / administrators, faculty members and students. The students' questionnaires were distributed in the classrooms and hostels. The faculty members were contacted personally and were given enough time to complete the questionnaires. For the interviews with the ICT expert and administration prior appointment was arranged. The survey was carried out from January to July, 2016. Each questionnaire returned by the respondent was checked for any incomplete answers.

4.8. Statistical techniques used for data analysis

The following statistical techniques were employed in the present investigation. Descriptive statistical tool like percentage and weighted mean are used to compare the feedbacks of students, teachers and ICT experts and administrators within respondent categories and universities.

The feedback of the questionnaires was analysed based on the identification of themes in the quantitative open-ended questions, identified by means of a coding scheme. These are - availability of ICT facilities, importance, utilization, impacts, challenges and suggestions for further interventions and improvements. The quantitative data was analysed, using SPSS 21 version which allowed the researcher to categorise chunks of the text into particular code or themes described. The researcher used a simple and friendly statistical tool of percentage and weighted mean to compare the feedback of students, teachers and ICT experts / administrators in respondents and among the universities. Finally the findings were presented in a narrative or textual, tabular and

charts forms as deemed necessary to make the presentation more clear and informative.

4.9. Ethical considerations in the research

Ethical issues are given lot of importance in social science research. Several issues such as voluntary participation, no harm to the participants, ensuring anonymity and confidentiality, avoiding deception and fair reporting has been emphasized as some important ethical considerations in social science research (Babbie, 2014). Brief discussion on the due care taken in the present study is presented below.

i) Voluntary participation:

The major tenet of social science research is that participation in the research should be voluntary and no one is forced to participate in the research. As the respondent participating in the survey had to fill a long questionnaire, they were briefed on the objectives of the research and assured of confidentiality of data to motivate them to participate voluntarily. The data were collected by making personal visits to the universities and the respondents who were not willing to participate were not included in the study.

ii) No harm to the participants:

Unlike several social science research studies, no personal questions were asked to the respondents. The study focused on specific questions rather than those involving respondents' personal lives. Therefore, the present research had no questions that might have led to embarrassment or harm to the participants.

iii) Anonymity and confidentiality:

In the present research the respondents were assured of confidentiality of the data provided by them. However, since the data was collected through survey and personal interview by visiting their universities and not through mail survey, identity of the respondent was revealed to the researcher, anonymity was not ensured. The respondents were assured that the data would be used only for generalization of the observation and no specific mention of their name or identity would be revealed in the

research report or in results. This practice was strictly followed to ensure the interest of the respondents participating in the research.

4.10. Chapter Summary

This chapter identified the research methods adopted for this study. The chapter began by outlining the philosophical background of the research with an introduction to the quantitative approach. The section explained the design considerations with the purpose, objectives, type of data required; how the data was collected, source of data and discussing about the unit of analysis. The tools used for data collection were questionnaires. The chapter concluded by highlighting the method of data analysis (percentage and weightage mean) and its presentations are in the form of text, tables and charts.

Reference:

- Adams, G., & Schvaneveldt, J. (1985). *Understanding Research Methods*. NY: Longman.
- Babbie, E. (1990). *Survey Research Methods*. (2nd ed.). California: Wadsworth Publishing Company: Belmont.
- Babbie, E. (2014). *The basics of social research*. (6th ed). Wadsworth, Cengage Learning, USA
- Chu, G.C., and Ju, Y. (1993). *The great wall in ruins: Communication and cultural change in china*. New York: New York University Press.
- Cavana, R., Delahaye, B., & Sekaran, U. (2000). *Applied Business Research: Qualitative and Quantitative Methods*. USA: John Wiley & Sons Inc.
- Cooper, D. R. & Schindler, P. S. (2003). *Business Research Methods* (8th ed). USA: McGraw-Hill
- Denscombe, M. (1999). *The good research guide: For small-scale social research projects*. Maidenhead, UK: Open University Press.
- Denzin, N. K., & Lincoln, Y. S. (2000). Introduction: The discipline and practice of qualitative research. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (2nd ed., pp. 1-28). Thousand Oaks, CA: Sage Publications Inc.
- Galliers, R.D. (1985) In search of a paradigm for information systems research. In: *Research Methods in Information Systems*. E. Mumford, R.A. Hirschheim, G.
- Galliers, R. D. (1992) "Choosing Information Systems Research Approaches" in

Information Systems Research: Issues, Methods and Practical Guidelines,
(Galliers, R. D. ed.) Blackwell Scientific, Oxford, pp. 144-162.

Hair, J. F, Bush, R. P & Ortinau, D. J, (2003). *Marketing research: Within a changing Information environment*, 2nd edn. McGraw-Hill/ Irwin, New York

Hussein, A. (2009). The use of triangulation in social sciences research: can qualitative and quantitative method be combined. *Journal of Comparative Social Work*, 1, 1-12.

Jenkins, M.A. (1985). Research methodologies and MIS research. In: *Research Methods in Information Systems*. E. Mumford, R.A. Hirschheim, G. Fitzgerald and A.T. Wood-Harper (Eds.). Amsterdam: Elsevier Science Publishers B.V (North-Holland). 103 – 117.

Johnson, B., & Christensen, L. (2008). *Educational research: Quantitative and qualitative, and mixed approaches* (3rd ed.). Thousand Oaks, CA: Sage Publication Limited.

Kerlinger, F.N. (1986). *Foundations of Behavioral Research*, (3rd ed.), Holt Rinehart & Winston.

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30, 607-610.

Kothari, C. R. (1990). *Research Methodology: Methos and Technique* (2nd ed.), New Age International (P) Ltd., ISBN (13) : 978-81-224-2488-1

Mertens, D.M. (2009). *Transformative research and evaluation*. New York: Guilford.

Malhotra, N. K. (1999). *Marketing research: An applied orientation*, (3rd ed), Prentice Hall, New Jersey.

Miller, R.L. and Brewer, J.D. (eds) (2003) *The A-Z of Social Research*. London: Sage Publications.

Neuman, W. Lawrence (1997). *Social research methods, qualitative and quantitative approaches* (3rd ed.). Boston: Allyn and Bacon.

Neuman, W. L. (2011). *Social research methods. Qualitative and quantitative Approaches*. (7th ed.). Pearson Education Inc.

Punch, K.F. (2005) *Introduction to Social Research: Quantitative and Qualitative Approaches*, (2nd ed.). London: Sage Publications.

Pickard, A. J. (2007). *Research methods in information*. London, UK: Facet Publishing.

Stake, R. E. (1995). *The art of case study research*. Thousand Oaks, CA: Sage Publications Ltd.

Saunders, M., Lewis, P and Thorndike, A. (2003). *Research methods for business students*. (3rd ed.) Pearson Education limited, New Delhi.

Vogel, D.R. & Wetherbe, J. C. (1984). *MIS Research: A Profile of Leading Journals and Universities*. Data Base, Fall, 3 – 14.

Witkin, B. R., & Altschuld, J. W. (1995). *Planning and Conducting Needs Assessments: A Practical Guide*. Thousand Oaks, CA: Sage Publications.