CHAPTER 3

METHODOLOGY

The present study was undertaken to study the Information and Communication Technology in Higher Education. The purpose of the present study was to understand the use and integration of ICT by faculty members in teaching, research, and administration work. It also focuses on the influence of ICT on the professional work of the faculty members as well as to understand the problems faced by faculty members in the use of ICT. The survey method was used in this study with a quantitative method for data collection. The present chapter describes the steps followed in conducting present research which were as below:

3.1 Feasibility Study

To know the feasibility of studying, information and communication technology usage by faculty members in higher education, a pilot study was carried out between April 2017 - May 2017 at the Maharaja Sayajirao University of Baroda, Vadodara.

3.1.1 Objectives of the study

- To investigate the learning strategies adopted by the faculty members in acquiring internet skills.
- To study the frequency and purpose of using internet services by the faculty members for professional work.

- To examine the influence of the internet on the various academic, personal, and administrative activities of the faculty members.
- To explore the use of browsers and resources for assessing information on the internet by the teachers.
- To study the problems faced by the teachers in utilizing internet services.

3.1.2 Population of the study

The population of the study consisted of faculty members of the Maharaja Sayajirao University of Baroda, Vadodara.

3.1.3 Sample of the study

The sample of the study was selected through a purposive sampling technique. Thirty teaching faculty members were selected from a discipline like arts, commerce, social science, and technology and engineering of the Maharaja Sayajirao University of Baroda, Vadodara.

3.1.4 Tool used for data collection

A structured questionnaire was prepared for the collection of data. It comprised of the two sections. The first section dealt with the background information of the faculty members and the second section dealt with the use of the internet for various academic and professional purposes.

3.1.5 Procedure of data collection

The method used for data collection was survey. The prepared questionnaire was circulated to faculty members via personal visit to their offices.

The data collected were analyzed by calculating frequency and percentage.

3.1.6 Major findings of the feasibility study

3.1.6.1 Background information of the respondents

- The majority (63.33%) of the faculty members were female whereas thirty-six percent were male.

- Forty-three percent of the faculty members were from 31- 40 age group whereas forty percent were from 25-30 age groups.
- Fifty-six percent of the faculty members were Temporary Teaching Assistant and Temporary Assistant Professors. Twenty-six faculty members were Assistant Professor whereas ten percent of the faculty members were Associate Professors.
- The majority (66.66%) of the faculty members had less than 10 years of experience whereas ten percent had 21 – 30 years of experience.

3.1.6.2 Use of Internet

- The high majority (83.33%) of the faculty members were using the internet for more than 4 years whereas ten percent of the faculty members were using the internet since last 2-4 years. A higher percentage of the faculty members were using the internet for more than 4 years.
- All faculty members use the internet daily for performing their routine activity.
- Thirty-six percent of the faculty members spent over 20 hours a week on the internet whereas thirty-three percent spent 10-20 hours a week.
- An equal percentage (66.66%) of the faculty members were using the internet at university and home respectively. It shows that access to the internet is there at the workplace and home for the majority of them.
- The majority (76%) of the faculty members were using their mobile for accessing the internet whereas nearly half (53.33%) of the faculty members were using a laptop.
- Seventy-six percent of the faculty members learned about internet usage on their own whereas the majority (66.66%) of the faculty members learned internet skills through trial and error method.
- The high majority (86.66%) of the faculty members were using the internet for educational activities whereas seventy-three percent of faculty members were using for research work. Sixty-six percent of the faculty members were using the internet for communication and only forty-six percent of the faculty members were using it for entertainment purposes.

- All the faculty members were aware of the e-mail and search engines. The high majority (93.33%) of the faculty members were aware of WWW whereas the majority (63.33%) of them were aware of online chatting.
- The high majority (83.33%) of the faculty members were using search engines to browse the information whereas seventy-three percent of the faculty members type the web address directly for searching the information. None of the faculty members were using the subscription database for browsing information.
- The majority (66.66%) of the faculty members felt that the internet has improved their professional competencies.
- The majority (60%) of the faculty members reported that their dependency on the internet has increased while performing their professional work.
- The majority (60%) of the faculty members faced trouble in finding relevant information from the internet whereas forty-six percent of the faculty members faced internet speed issues while accessing the data from net.
- Respondents gave the following suggestions for improving internet usage:
    - Control on an advertisement, by putting some button/option to remove them.
    - Free and easy access to the internet and computer should be provided to the students for attending educational activities.
    - Speed of internet and availability of authentic information, are two things which should be considered while using the internet.
    - Regular maintenance of computers is required.
    - Regular working of Wi-Fi is not there at the department so restrictions are experienced in browsing and surfing data.

It was understood from the findings of the feasibility study, that faculty members of the Maharaja Sayajirao University of Baroda were using ICT for executing their teaching, research, and administrative work. The results of the study showed that the key reasons for using the internet were to transact educational work, research work, and establish communication with their colleagues, higher-ups, and students.

All faculty members have to perform the task of teaching, research, and administrative work. They need to plan, organize, manage the information, and achieve those tasks. The results of the feasibility study indicate that ICT may work as an aid to carry out

their entire task. Through, the feasibility study, it was understood that all the faculty members were using the internet for their numerous professional work. Also, the results of the feasibility study found the influence of the internet on the performance of the faculty members related to their professional work. Therefore it was decided to study the use and integration of information and communication technology by faculty members teaching in the higher education sector.

The findings of the feasibility study revealed that faculty members were using the internet for various reasons. It was found that faculty members were using the internet in teaching, research, and administrative work through being from different age groups, designation, gender, discipline, and competency in using ICT. These variables may be used to carry out a research study on a similar topic. To find faculty members' use and integration of ICT in teaching, research, and administrative work, an exploratory study need to be carried out. Hence, the study on **"Information and Communication Technology in Higher Education"** was undertaken.

3.2 Population of the Study

The population of the study comprised of all the faculty members of The Maharaja Sayajirao University of Baroda, Vadodara. The university has around 1200 faculty members (www.msubaroda.ac.in) in the fourteen different faculties in the year 2017-18.

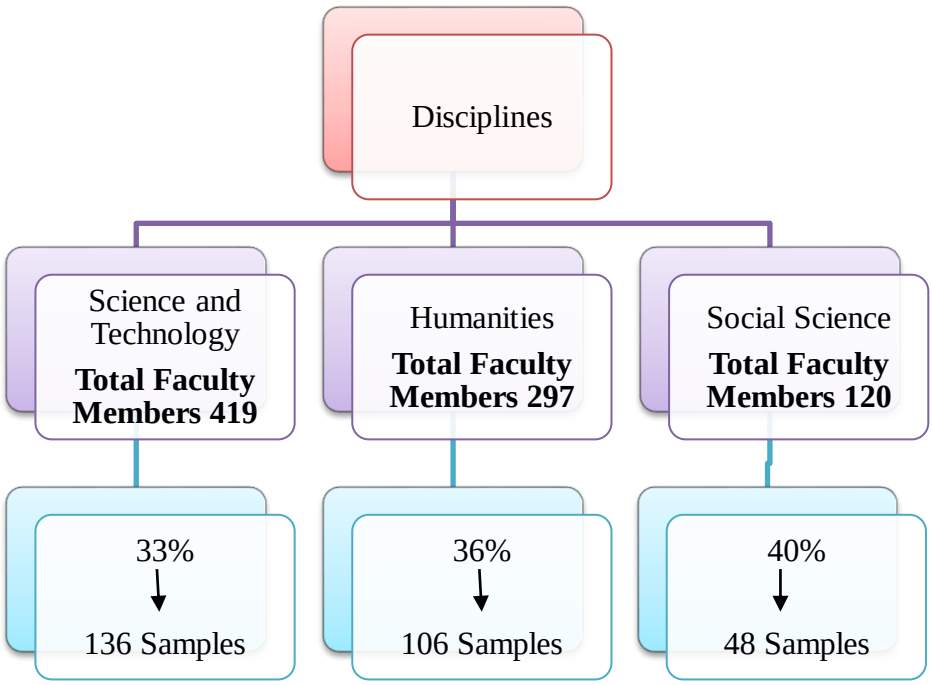
3.3 Sample of the Study

Quantitative data were collected for this study using the survey method. The Maharaja Sayajirao University has a total of 14 faculties. All the faculties of the university were purposively categorized into three categories except the Faculty of Medicine. The Faculty of Medicine was not selected for the study due the unavailability of teaching staff beyond their teaching hour.

Discipline of Study

Science and Technology	Humanities	Social Science
• Faculty of Science • Faculty of Technology and Engineering • Faculty of Pharmacy	• Faculty of Arts • Faculty of Commerce • Faculty of Fine Arts • Faculty of Performing Arts • Faculty of Management Studies	• Faculty of Family and Community Sciences • Faculty of Education and Psychology • Faculty of Social Work • Faculty of Journalism and Communication • Faculty of Law

It was decided to select 30% to 40% samples of the total population of the particular category through purposive convenient sampling and as per the availability of the faculty members between the period of data collection that was from November 2018 to May 2019. The detail about the total number of teaching faculty members was collected from the university diary of 2018. The percentage distribution of samples from each category is as follow:



In total, two hundred and ninety faculty members were selected from three categories by using a purposive convenient sampling method to collect the data.

3.4 Construction of the Research Tool

The research tool is the cornerstone of any kind of study. The construction of good research tools influences the quality of the data and consequently the quality of the research. A questionnaire, rating scales, were structured to collect quantitative data. The tool was designed by a detailed analysis of the relevant literature. The research tool was developed in line with the objectives of the study by refereeing relevant review of the literature. In order to prepare the desired research tool, the researcher referred to research studies relevant to the present study. The thesis, research journals and e-resources related to ICT in higher education, Indian Education Policy related to ICT for education, ICT and university teachers were referred from –

- Smt. Hansa Mehta Library, The Maharaja Sayajirao University of Baroda
- Library of Department of Extension and Communication, FFCSc., The Maharaja Sayajirao University of Baroda.

The findings of the feasibility study helped to decide the content of the research tool.

3.4.1 Description of the Research Tool

To obtain detailed and required data, a questionnaire was designed with eight sections. These sections were classified according to the objectives of the study. They covered the profile of the respondents, their ICT usage, opinions regarding ICT, their integration of ICT, problems faced by them in use of ICT, the influence of ICT, and suggestion to improve the use of ICT.

Table 1:- Description of the Research Tool

Section	Content	Response System
I	Background Information (Age, Designation, Discipline, ICT availability in the department)	Checklist
II	Use of ICT (frequency and duration of using ICT, types of ICT used)	Checklist, Open-ended Three-Point Rating Scale
III	Opinions about ICT	Thee Point Rating Scale
IV	Competency in using ICT	Thee Point Rating Scale
V	Integration of ICT	Thee Point Rating Scale
VI	Problems in the integration of ICT	Thee Point Rating Scale
VII	Influence of ICT	Thee Point Rating Scale
VIII	Suggestions	Open-ended

Table 1 highlights the eight sections of the research tool. The details of it are as follows:

Section I – Background Information

Section I of the research tool was designed to obtain data related to the profile of the faculty members. It includes questions related to their –

- Age
- Designation
- Gender
- Experience in teaching and research
- Availability of different ICT resources in the department.
- Training/workshops/courses attended related to ICT

Section II – Use of ICT

This segment dealt with collecting information on the use of ICT by respondents. It contains questions related to

- Frequency of using desktop/laptop with internet and without internet
- Duration of using desktop/laptop
- Gadgets used to access the internet
- Help required to use ICT
- Use of ICT in performing different duties at different levels.
- Use of computer accessories
- Use of e-resources accessible through Hansa Mehta Library Portal in teaching and research
- Use of ICT in teaching, research, and administrative work. It includes items related to hardware use, use of services provided by the university, and use of the software.
- Use of internet-based ICT resources in teaching and research. It includes items related to information resources, collaborative resources, learning resources, reference managing, and data storage software

Section III – Opinions towards ICT

Section III was structured to gather information on one of the independent variables of the present analysis , i.e. opinions of faculty members towards ICT. Both positive and negative statements related to opinions were developed by referring similar research studies. A three-point rating scale was prepared in which the respondents had to verify their degree of approval for the given statements. A total of twenty-six items were included in this section to the extent of opinions of the faculty members regarding ICT.

Section IV – Competency in using ICT

Section IV was prepared to obtain data related to competency in using ICT. Competency was divided into three aspects namely hardware related competency, software-related competency, and internet-related competency. These categories were made by reviewing a similar type of research articles and related literature. A three-point rating scale was prepared wherein the respondents had to tick mark whether they use ICT alone without any one's help, with some one's help or they do not know how to use ICT.

Table 2: Number of Statement under Each Competency

Competency	No. of Statements
Hardware Related Competency	9
Software Related Competency	10
Internet Related Competency	13
Total number of statements = 32	

Section V – Integration of ICT

This section was made to gather responses related to one of the dependent variables of the present study i.e. integration of ICT. In this section, the responses were collected about the integration of ICT in teaching, integration of ICT in research, and integration of ICT in administrative work. For each statement, a three-point scale was prepared to collect their responses. Faculty members had to provide their responses in terms of integrating ICT in their teaching, research, and administrative work. The statements were developed after reviewing relevant literature and with the help of the results of the feasibility study.

Table 3: Number of Statement Related to Integration of ICT

Competency	No. of Statements
Integration of ICT in Teaching	16
Integration of ICT in Research	14
Integration of ICT in Administrative Work	12
Total number of statements = 42	

Section VI – Problems in the Integration of ICT

Section VI contained a three rating point scale prepared to obtain data related to the problems faced by respondents while integrating the ICT in teaching, research, and administrative work. The statements prepared were related to human-resource-related problems and nonhuman resource-related problems. Thirty-eight statements were stated to collect the responses. The respondents were asked to provide their responses in terms of their agreement level for the given statements.

Section VII – Influence of ICT

This section obtains the data about one of the dependent variable i.e. influence of ICT on respondents teaching, research, and administrative work. Both positive and negative statements related to influence were developed by reviewing related studies. Three-point rating scale was used to obtain the responses. They had to provide their responses to the statements in terms of their degree of agreement. A total of thirty-five statements were prepared to obtain the responses.

Table 4: Number of Statement Related to Influence of ICT

Competency	No. of Statements
Integration of ICT in Teaching	13
Integration of ICT in Research	14
Integration of ICT in Administrative Work	8
Total number of statements = 35	

Section VIII – Suggestions

Section VIII was made to gather suggestions from the respondents regarding improving the integration of ICT. This section was kept open-ended wherein respondents had to write about their suggestions regarding improving the integration of ICT. Three

questions were asked related to improving the integration of ICT in teaching, research, and administrative work.

3.5 Validation of the Tool

The content validity was checked for the developed research tool. The developed questionnaire was given to experts from various fields. The experts were asked to provide their useful recommendations in terms of its –

- Content
- Appropriateness of response system and
- Language clarity

The experts approached were from the following faculties: -

- Professor and Head, Department of Extension and Communication, Faculty of Family and Community Sciences, The Maharaja Sayajirao University of Baroda, Vadodara
- Professor, Department of Extension and Communication, Faculty of Family and Community Sciences, The Maharaja Sayajirao University of Baroda, Vadodara
- Associate Professor, Department of Extension and Communication, Faculty of Family and Community Sciences, The Maharaja Sayajirao University of Baroda, Vadodara
- Professor, Department of Education, Faculty of Education and Psychology The Maharaja Sayajirao University of Baroda, Vadodara
- Professor, Department of Educational Administration, Faculty of Education and Psychology, The Maharaja Sayajirao University of Baroda, Vadodara
- Assistant Professor, Department of Statistics, Faculty of Science, The Maharaja Sayajirao University of Baroda, Vadodara.

The recommendations made by the experts were incorporated into the research tool. These suggestions were related to the sequencing of the questions and additions of the statements in the different sections.

3.6 Reliability of the Research Tool

The test-retest method was used to check the reliability of the research tool. The tool was administered to ten respondents. In the fifteen day gap, the respondent filled the questionnaire twice. The coefficient of correlation between the two sets of scores was calculated. The tool was found reliable at 0.958 levels which showed that it was highly reliable. Coefficient of Correlation was calculated using the following formula:

$$r = \frac{\sum xy}{\sqrt{\sum x^2 \sum y^2}}$$

Where r = Coefficient of correlation

X= Score of the First test

Y= Score of the Second test

3.7 Pre-testing of the Tool

The pre-testing of the tool was undertaken with ten faculty members teaching at the Maharaja Sayajirao University of Baroda. The purpose of pre-testing was to know whether the respondents face any difficulty while filling up the questionnaire. The repetition of the questions was identified in the pre-testing and necessary changes were implemented before finalizing the tool for the data collection. The respondent did not find any major problem in filling the questionnaire and the tool was found clear and understandable. It took twenty to twenty-five minutes to fill the questionnaire.

3.8 Procedure for Data Collection

The data was personally collected by the investigator by administering the questionnaire from November 2018- May 2019. All the selected faculties were covered by the researcher one by one for data collection. Before visiting the respondents, the investigator contacted the heads of the department and took their permission for the data collection from their department. The questionnaire was distributed amongst the faculty members of each department and they were requested to fill the questionnaire. The respondents returned the questionnaire within eight to ten days.

The data was also obtained via e-mail. The questionnaire was uploaded on "Google Forms" and a web link was created to fill it out. The weblink was exchanged via email and WhatsApp. The response rate via online mode was very low. Only two forms were filled out online. Faculty members opted to fill out the forms offline due to the length of the questionnaire.

Nearly five hundred and seventy-five forms were distributed amongst the faculty members for the data collection. Out of which 298 questionnaires were received back. The reasons for receiving less number of questionnaires, despite distributing more than five hundred questionnaire were due to –

- Length of the questionnaire
- The busy schedule of the faculty members
- Unavailability of the faculty members in the department despite repeated visits at a different time of the day.
- The unwillingness of the respondents to fill the questionnaire
- Some of the faculty members lost the questionnaire and never returned.

Later two hundred and ninety questionnaires were selected as data-generating questionnaires with a 50.43% response rate. The reasons for the exclusion of the remaining eight forms were

- Incomplete information provided by the respondents.
- Respondents had not answered the questions properly.

3.9 Scoring and Categorization

The collected data on information and communication technology in higher education was scored and categorized as follows –

3.9.1 Scoring and Categorization of Variables

The independent and dependent variables of the study were categories as follows-

Table 5: Categorization of Independent Variables of the Study

Independent Variables	Basis	Categories
Age	24-32 Years	Young Teachers
	33-43 Years	Middle Aged Teachers
	44-62 Years	Senior Teachers
Designation	Professor	Professor
	Associate Professor	Associate Professor
	Assistant Professor	Assistant Professor
	Temporary Assistant Professor	Temporary Assistant Professor
	Temporary Teaching Assistant	Temporary Teaching Assistant
Discipline	Faculty of Technology and Engineering Faculty of Science Faculty of Pharmacy	Science and Technology
	Faculty of Arts Faculty of Commerce Faculty of Fine Arts Faculty of Performing Arts Faculty of Management Studies	Humanities
	Faculty of Family and Community Sciences Faculty of Education and Psychology Faculty of Social Work Faculty of Journalism and Communication Faculty of Law	Social Science
Opinions towards ICT	63-103	Favorable
	26-62	Unfavorable
Competency in Using ICT	93-123	Highly Competent
	86-92	Moderately Competent
	42-85	Less Competent
Technology Infrastructure	7-21	Good
	0-6	Poor

Table 6: Categorization of Dependent Variables

Dependent Variables	Basis	Categories
Use of ICT	238-380	High Usage
	199-237	Moderate Usage
	153-198	Low Usage
Integration of ICT	105-177	High Integration
	86-104	Moderate Integration
	42-85	Low Integration
Problems faced in use of ICT	73-238	More Problems
	60-72	Moderate Problems
	38-59	Few Problems
Influence of ICT	94-185	High Influence
	82-93	Moderate Influence
	38-81	Less Influence

3.9.2 Scoring of Independent Variables

3.9.2.1 Opinions about ICT

A three-point rating scale was used to get the responses for opinions of the respondents about ICT. In this section total, twenty-six statements were included. Which were indicated positive (16) and negative (10) opinions about ICT.

Table 7: Score Provided for Different Responses of Opinions about ICT

Responses	The score for Positive items	The score for Negative items
Agreed to a great extent	3	1
Agreed to some extent	2	2
Agreed to a less extent	1	3

The scores achieved by the respondents ranged from 26 to 78 and they were categorized as follows:

Table 8: Minimum and Maximum Obtained Scores for Overall Opinions about the ICT

Opinions about ICT	No. of Items	Maximum Obtained Score	Minimum Obtained Score
Overall	26	78	26

The range of intensity indices was calculated overall and statement wise to study the opinions of the faculty members regarding ICT. To describe opinions the range of intensity indices were decided as follows:

Table 9: The Range of Intensity Indices

Extent	Range of Intensity Indices
Great Extent	2.31 – 3.00
Some Extent	1.61 – 2.30
Less Extent	1.00 – 1.60

3.9.2.2 Competency in Using ICT

A three-point rating scale was used to study the competency of faculty members in using different ICT resources. Competencies were categorized as hardware related competency, software-related competency, and internet-related competency.

Table 10: Score Provided for Different Responses of Competency of Faculty Members in Using ICT

Responses	Score	Range of Intensity Indices
Alone without any one's help	3	2.31 – 3.00
With some one's help	2	1.61 – 2.30
Do not know	1	1.00 – 1.60

Table 11: Scoring of Data for Overall Competency and Category Wise Competency

Categories	No. of Items	Maximum Obtained Score	Minimum Obtained Score
Overall	32	96	32
Hardware Related Competency	9	27	9
Software Related Competency	10	30	10
Internet Related Competency	13	39	13

3.9.3 Scoring of Dependent Variables

3.9.3.1 Usage of ICT

The ICT usage was calculated by time spent on desktop/laptop with internet and without internet, a device used to access the internet, help required for using ICT, computer accessories used, use of e-resources available on Smt. Hansa Mehta Library Portal for teaching and research, use of hardware, services, and software for teaching, research and administration and use of information resources, collaborative resources, learning resources, and reference managing and data storage software.

Table 12: Usage of ICT

ICT Usage	Minimum Scores	Maximum Scores
	155	476

3.9.3.2 Integration of ICT

The integration of ICT was studied with a three-point rating scale. Integration was studied with three aspects i.e. integration of ICT in teaching, integration of ICT in research, and integration of ICT in administrative work.

Table 13: Score Provided for Different Responses of integration of ICT by the Faculty Members in teaching, research, and administrative work

Responses	Score	Range of Intensity Indices
Great Extent	3	2.31 – 3.00
Some Extent	2	1.61 – 2.30
Less Extent	1	1.00 – 1.60

Table 14: Scoring of Data for Overall integration and Category wise Integration

Categories	No. of Items	Maximum Obtained Score	Minimum Obtained Score
Overall	42	126	42
Integration of ICT in teaching	16	48	16
Integration of ICT in research	14	42	14
Integration of ICT in administrative work	12	36	12

3.9.3.3 Problems faced in Use of ICT

Problems faced by faculty members in the integration of ICT were studied with a three-point rating scale. Problems were categorized into two categories viz. non-human resources related problems and human resource-related problems

Table 15: Score Provided for Different Responses of integration of ICT by the Faculty Members in teaching, research, and administrative work

Responses	Score	Range of Intensity Indices
Great Extent	3	2.31 – 3.00
Some Extent	2	1.61 – 2.30
Less Extent	1	1.00 – 1.60

Table 16: Scoring of Data for Overall integration and Category wise Integration

Categories	No. of Items	Maximum Obtained Score	Minimum Obtained Score
Overall	38	114	38
Non-human resources related problems	16	48	16
Human resources related problems	22	66	22

3.9.3.4 Influence of ICT

A three-point rating scale was used to study the influence of ICT on the professional work of the faculty members. The influence of ICT was studied for three aspects i.e. the influence of ICT on teaching, the influence of ICT on research, and the influence of ICT on administrative work. Both positive and negative statements were included. A total of 6 negatives and 29 positive statements were included.

Table 17: Score Provided for Different Responses of influence of ICT on the Teaching, Research and Administrative Work of the Faculty Members

Responses	The score for Positive Items	The score for Negative Items	Range of Intensity Indices
Great Extent	3	1	2.31 – 3.00
Some Extent	2	2	1.61 – 2.30
Less Extent	1	3	1.00 – 1.60

Table 18: Scoring of Data for Overall Influence and Category wise Influence

Categories	No. of Items	Maximum Obtained Score	Minimum Obtained Score
Overall	35	105	35
Influence of ICT on Teaching	13	39	13
Influence of ICT on Research	14	42	14
Influence of ICT on Administrative Work	8	24	8

3.10 Plan of Statistical Analysis

Various statistical measures were used to analyze the obtained data. The data were encoded and analyzed using computer software namely M. S. Excel and the SPSS. The statistical measures used were as follows:

Table 19: Statistical Measures Used to Analyze the Data

Content	Statistical Measures
Background information of faculty members	Frequency and percentage
Use of ICT	Frequency and Percentage, T-Test, ANOVA (F-Test)
Opinions about ICT	Frequency and Percentage, Intensity Indices
Competency in using ICT	Frequency and Percentage, Intensity Indices
Integration of ICT in teaching, research, and administrative work	Frequency and Percentage, Intensity Indices, T-Test, ANOVA (F-Test)
Influence of ICT in teaching, research, and administrative work	Frequency and Percentage, Intensity Indices, T-Test, ANOVA (F-Test)
Problems faced in the integration of ICT	Frequency and Percentage, Intensity Indices, T-Test, ANOVA (F-Test)

Formula Used fort-Test

$$t = \frac{(\overline{x_1} - \overline{x_2})}{\sqrt{\frac{s_p^2}{n_1} + \frac{s_p^2}{n_2}}}$$

$$S_p = \sqrt{\frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}}$$

Where,

$\overline{x_1}$ = mean of Group 1 $\overline{x_2}$ = mean of group 2

n_1 = number of group 1 n_2 = number of group 2

df = n_1 + n_2 - 2

S1= SD Group 1

S2 = SD Group 2

Sp = Pooled Variance

The formula used for ANOVA (F-test)

$$F = \frac{\text{Large Variance}}{\text{Small Variance}}$$

$$\text{Or} = \frac{\text{Between Group Variance}}{\text{Within Group Variance}}$$

Between-group variance = Variance in the mean of each group from the total mean of all variance groups

Within-group variance = Average variance of scores within groups

The formula used for Calculating Item Wise Intensity Indices:

$$\textbf{Item Wise Intensity Indies} = \frac{\text{Total Score for an Item}}{\text{Total Number of Respondents}}$$