CHAPTER-3

RESEARCH METHODOLOGY

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CHAPTER-3
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3.1: Introduction

In old days Library science is the study of the theory, organization and dissemination of information within a library which now being explored rapidly in all over the world with the use of modern ICT tools and techniques. The field of library science is constantly evolving to include several aspects of information communication and technology, education and information management. As this evolution continues, library science must use certain research methods to evaluate and determine which types of information are most valuable to develop the library and it's user as well. As being a Librarian, researcher has decided to do the research work to improve the University Libraries with the use of ICTs which would be really valuable and helps to the library community as well to the society to acquire the knowledge in the current ICT era. To find the contribution of ICT in the development of Grant-in-aid University Libraries of Gujarat, it is very important to do pure research work which will provide the clear vision of future steps to be taken for the improvisation of university library with the use of ICTs.

So, Research refers to a search for knowledge. It is a scientific and systematic search for pertinent information on a specific topic. When you say that you are undertaking a research study to find answers to a question, you are implying that the process;

1. is being undertaken within a framework of a set of philosophies (approaches);
2. uses procedures, methods and techniques that have been tested for their validity and reliability;
3. is designed to be unbiased and objective.

A philosophy means approaches e.g. qualitative, quantitative and the academic discipline in which you have been trained.
Validity means that correct procedures have been applied to find answers to a
question. Reliability refers to the quality of a measurement procedure that provides repeatability and accuracy.

Unbiased and objective means that you have taken each step in an unbiased manner and drawn each conclusion to the best of your ability and without introducing your own vested interest. (Bias is a deliberate attempt to either conceal or highlight something).

Adherence to the three criteria mentioned above enables the process to be called ‘research’. However, the degree to which these criteria are expected to be fulfilled varies from discipline to discipline and so the meaning of ‘research’ differs from one academic discipline to another. The difference between research and non-research activity is, in the way we find answers: the process must meet certain requirements to be called research. We can identify these requirements by examining some definitions of research.

According to (Thyer, 2001), "the word research is composed of two syllables, re and search. re is a prefix meaning again, anew or over again search is a verb meaning to examine closely and carefully, to test and try, or to probe. Together they form a noun describing a careful, systematic, patient study and investigation in some field of knowledge, undertaken to establish facts or principles." [1]

As per the Merriam-Webster Online Dictionary, the word research is derived from the Middle French “recherche”, which means “to go about seeking”, the term itself being derived from the Old French term “recerchier” a compound word from “re-” + “cerchier”, or “searcher”, meaning ‘search’. The earliest recorded use of the term was in 1577. [2]

Research is a structured enquiry that utilizes acceptable scientific methodology to solve problems and create new knowledge that is generally applicable. (Dawson, Catherine) [3]
According to (Rocco, 2011), "Research is a careful investigation or inquiry especially through search for new facts in any branch of knowledge." [4]

Research is a movement, a movement from the known to the unknown (Redman and Mory, 2010) [5]

Research is manipulation of things, concepts or symbols for the purpose of generalizing to extend, correct or verify knowledge, whether that knowledge aids in construction of theory or in the practice of an art (Kothari, C.R.) [6]

According to (Creswell, 2008), "Research is systematic investigation to establish the facts." [7]

In the broadest sense of the word, the definition of research includes any gathering of data, information and facts for the advancement of knowledge. [8]

So, simply we can say that research means Collection Of the data for Specific purpose in the systematic manner is called research.

This chapter presents and discusses the about the research methodology. Researcher will also discuss about the methodology adopted in this research.

3.2: Meaning of Research

Research is to be understood as an "original investigation undertaken in order to gain knowledge and understanding". It includes work of direct relevance to the needs of the public, private and voluntary sectors; "the invention and generation of ideas, images, performances including design, where these lead to new or substantially improved insights; and the use of existing knowledge in experimental development to produce new or substantially improved materials, devices, products and processes, including design and construction. We can say that its add more in existing invention and provides
something new in the relevant field with such new and researchers own innovative methods and techniques.

3.2.1: Definition of Research

According to Clifford woody, "research comprises defining and redefining problems, formulating hypothesis or suggested solutions collecting, organizing and evaluating data, making deductions and reaching conclusions; to determine whether they fit the formulating hypothesis." [9]

According to Cambridge dictionary online, research is "a detailed study of a subject, especially in order to discover (new) information or reach a (new) understanding." [10]


Cohen, N. & Arieli, T. (2011). explain that research means "gathering and analyzing a body of information or data and extracting new meaning from it or developing unique solutions to problems or cases. This is "real" research and requires an open-ended question for which there is no ready answer." [12]

Kumar, Ranjit, (2005). said that "research is “a careful investigation or enquiry especially through search for new facts in any branch of knowledge.” [13]

3.2.2: Nature of Research

- It strives to be objective and logical.
- It is based on observable experience or empirical evidence.
- It is characterized by patient and unhurried activity.
- It demands accurate observations, reservations and descriptions.
- It is directed towards the solution of the problem.
- It is carefully recorded and reported.
- It requires expertise.
- It involves gathering new data from primary or first hand sources or using existing data for new purpose.

3.3: Objectives of Research

- To investigate a subject.
- To collect data regarding the problem.
- To conduct logical and objective study.
- To conduct a systematic enquiry of the subject.
- For carefully recording, reporting and presenting the facts.

![Diagram of Types of Research]

Fig.4
3.3.1: Significance of Research

- It provides the basis for nearly all government policies in our economic system.
- It helps in solving various operational and planning problems of business and industry.
- It is an aid to decision making.
- It establishes the relation between variables.
- It is equally important for social scientists in studying social relationships and in seeking answers to various social problems.
- It provides a basis for innovation.
- It facilitates the process of thinking, analysis, evaluation and interpretation of various situation.

3.3.2: Criteria for Good Research

- Purpose should be clearly defined.
- Common concepts should be used that can be understood by all.
- Research procedure should be explained in detail.
- Research design should be carefully planned.
- Researcher should declare all the possible errors and their possible impact on finding.
- Analysis of data should be sufficiently adequate to reveal significance.
• The methods of analysis should be appropriate.
• The validity and reliability of the data should be checked carefully.
• The researcher has good command over research methodologies and should be intelligent and experience.

3.3.3: Limitations of Research

• It is based on sample & sampling research lacks the complete accuracy.
• Long time is required in the research procedures.
• Difficult to evaluate the economic benefits derived from the research.
• Trained personnel and a lot of time are required for research.
• Lack of adequate knowledge of research.

According to Dipak Kumar Bhattachryya, "research always begins with a question or a problem. Its purpose is to find answers to questions through the application of systematic and scientific methods. Thus, research is the systematic approach towards purposeful investigation. This needs formulating a hypothesis, collection of data on relevant variables, analyzing and interpreting the results and reaching conclusions either in the form of a solution or certain generalizations. Research is an academic activity and systematized effort to gain new knowledge which will be useful for the forthcoming research scholars as well in society." [14]

• Research is a systematic way of asking questions (Drew, 1980) [15]
• The scientific examination or reexamination of empirical data, collected by someone first hand, concerning the social and psychological forces operating in a situation (Monette et al, 1994) [16]
• A way of going about finding answers to questions about the researchers topic (Wimmer, 1997) [17]
3.4: Types of research

It is imperative that a researcher has to have a broad understanding of the various types of research, in general. There are eleven types of research depending on whether it is primarily “fundamental” or “applied” etc. in nature. They are as follows:

1. **Applied research**, also known as decisional research, use existing knowledge as an aid to the solution of some given problem or set of problems.
2. **Fundamental research**, frequently called basic or pure research, seeks to extend the boundaries of knowledge in a given area with no necessary immediate application to existing problems.
3. **Futuristic research**: Futures research is the systematic study of possible future conditions. It includes analysis of how those conditions might change as a result of the implementation of policies and actions, and the consequences of these policies and actions.
4. **Descriptive research** includes surveys and fact-finding enquiries of different kinds. It tries to discover answers to the questions who, what, when and sometimes how. Here the researcher attempts to describe or define a subject, often by creating a profile of a group of problems, people, or events. The major purpose of descriptive research is description of the state of affairs as it exists at present.
5. **Explanatory research**: Explanatory research goes beyond description and attempts to explain the reasons for the phenomenon that the descriptive research only observed. The research would use theories or at least hypothesis to account for the forces that caused a certain phenomenon to occur.
6. **Predictive research**: If we can provide a plausible explanation for an event after it has occurred, it is desirable to be able to predict when and in what situations the event will occur. This research is just as rooted in theory as explanation. This research calls for a high order of inference making. In business research, prediction is found in studies conducted to evaluate specific courses of action or to forecast current and future values.
7. **Analytical research**: The researcher has to use facts or information already available, and analyze these to make a critical evaluation of the material.
8. **Quantitative research**: Quantitative research is based on the measurement of quantity or amount. It is applicable to phenomena that can be expressed in terms of quantity.

9. **Qualitative research**: It is concerned with qualitative phenomenon (i.e.) phenomena relating to or involving quality or kind. This type of research aims to discovering the underlying motives and desires, using in depth interviews for the purpose. Other techniques of such research are word association test, sentence completion test, story completion tests and similar other projective techniques. Attitude or opinion research i.e., research designed to find out how people feel or what the think about a particular subject or institution is also qualitative research.

10. **Conceptual research**: Conceptual research is that related to some abstract idea(s) or theory. It is generally used by philosophers and thinkers to develop new concepts or to reinterpret existing ones.

11. **Empirical research**: It is appropriate when proof is sought that certain variables affect other variables in some way. Evidence gathered through experiments or empirical studies is today considered to be the most powerful support possible for a give hypothesis.

### 3.4.1: Research Process

Several authors have attempted to enumerate the steps involved in the research process, however, inconclusive. Nevertheless, the research process broadly consists of the following steps.

1. Problem formulation
2. Development of an approach to the problem
3. Research Design
4. Selection of Data collection techniques
5. Sampling techniques
6. Fieldwork or Data Collection
7. Analysis and interpretation
8. Report preparation and presentation
The above mentioned steps may be placed in three groups as follows:

**First** there is initiating or planning of a study, which comprises the initial four steps in our model: determining (1) problem formulation, (2) development of an approach to the problem (3) Research design (4) selection of data collection techniques (5) sampling techniques. Second, there is (6) fieldwork or data collection Third, there is (7) analysis and interpretation of the data and (8) report preparation and presentation.

### 3.5: Research Methodology, Philosophical Perspective

The system of collecting data for research projects is known as research methodology. The data may be collected for either theoretical or practical research for example management research may be strategically conceptualized along with operational planning methods and change management.

Some important factors in research methodology include validity of research data, Ethics and the reliability of measures most of your work is finished by the time you finish the analysis of your data.

Formulating of research questions along with sampling weather probable or non probable is followed by measurement that includes surveys and scaling. This is followed by research design, which may be either experimental or quasi-experimental. The last two stages are data analysis and finally writing the research paper, which is organized carefully into graphs and tables so that only important relevant data is shown.

#### 3.5.1: Philosophical Perspective:

The paradigmatic considerations of ontology, epistemology and methodology are viewed from a philosophical perspective. A combination of inductive and deductive logic is used to assay evidence, develop arguments and counter-arguments, and to substantiate claims made about quantitative and qualitative research. The substantive
content of the chapter concerns information on philosophical inquiry, quantitative and qualitative research approaches in education and the analytic techniques specific to quantitative educational research. The philosophical critique of quantitative methods contained in this chapter highlights limitations of the method in dealing with the temporal and socio-cultural nature of education. This focuses on a bias in the method where more attention is given to methodological issues than to those concerning ontology and epistemology. However, a detailed examination of specific aspects of the method as it is currently applied to investigate more ‘subjective’ (e.g. socio-cultural) educational problems suggests that the limitations and bias could be addressed without detracting from the inherent scientific rigor of the method. This is viewed as achievable in two ways, firstly; by incorporating philosophical considerations in the conceptualization of theoretical models and the specification of research hypotheses. Secondly, by exploiting fully multi-variety techniques, statistical modeling techniques, and other recent developments in the construction of attitude scales and analysis of rating scale data. These philosophical paradigms underpin the basic assumptions of a research process. So, below picture will clear about the research process.

3.6: Defining the Research Problem

Research problem refers to some difficulty which the researcher experiences in the context of either a theoretical or a practical situation and wants to obtain solution for the same.

3.6.1: Approaches to the problem

The outputs of the approach development process should include the following components: (i) Objective/theoretical framework (ii) analytical model (iii) Research questions (iv) hypothesis. Each of these components is discussed below:
(i) **Objective/theoretical framework:** Every research should have a theoretical framework and objective evidence. The theoretical framework is a conceptual scheme containing: a set of concepts and definitions, a set of a statement that describes the situations on which the theory can be applied, a set of relational statements divided into: axioms and theorems.

The theoretical evidence is very much imperative in research as it leads to identification of variables that should be investigated. They also lead to formulating the operational definition of the marketing problem. An operational definition is a set of procedures that describe the activities one should perform in order to establish empirically the existence or degree of existence of a concept. Operationalising the concept gives more understanding on the meanings of the concepts specified and explication of the testing procedures that provide criteria for the empirical application of the concepts. Operational definition would specify a procedure that involves, for example, a weighing machine that measures the weight of a person or an object.

(ii) **Analytical model:** An analytical model could be referred to as a likeness of something. It consists of symbols referred to a set of variables and their interrelationships represented in logical arrangements designed to represent, in whole or in part, some real system or process. It is a representation of reality making explicit the significant relationships among the aspects. It enables the formulation of empirically testable propositions regarding the nature of these relationships. An empirical model refers to research that uses data derived from actual observation or experimentation.

(iii) **Research Questions:** Research questions are refined statements of the specific components of the problem. It refers to a statement that ascertains the phenomenon to be studied. The research questions should be raised in an unambiguous manner and hence, would help the researcher in becoming resourceful in identifying the components of the problem. The formulation of the questions should be strongly guided by the problem definition, theoretical framework and the analytical model.
The knowledge gained by the researcher from his/her interaction with the decision maker should be borne in mind as they sometimes form the basis of research questions. The researcher should exercise extreme caution while formulation research questions as they are the forerunner for developing hypothesis. Any flaw in the research questions may lead to flawed hypothesis. The following questions may be asked while developing research questions:

a) Do I know the area of investigation and its literature?
b) What are the research questions pertinent to the area of investigation?
c) What are the areas that are not explored by the previous researchers?
d) Would my study lead to greater understanding on the area of study?
e) Are enough number of literatures available in this topic area?
f) Is my study a new one thus contributing to the society or has it been done before?

(iv) **Hypothesis:** Hypothesis could be termed as tentative answers to a research problem. The structure of a hypothesis involves conjectural statements relating to two or more variables. They are deduced from theories, directly from observation, intuitively, or from a combination of these. Hypothesis deduced from any of the means would have four common characteristics. They should be clear, value-free, specific and amenable to empirical testing. Hypothesis could be viewed as statements that indicate the direction of the relationship or recognition of differences in groups. However, the researcher may not be able to frame hypotheses in all situations. It may be because that a particular investigation does not warrant a hypothesis or sufficient information may not be available to develop the hypotheses.

**3.6.2: Components of Research Problem**

- There must be individual or the group which has some difficulty or the problem.
- There must be some objective to be attained.
- There must be alternative means for obtaining the objectives one wishes to attain.
• There must be some doubt in the mind of the researcher with regard to the selection of the alternatives.
• There must be some environment to which the difficulty pertains.

3.6.3: How Problem is selected?

Should not be:
• The subject which is overdone.
• Controversial Subject.
• Too narrow or too vague problem.

Should be:
• Subject should be familiar and feasible.
• Some criteria like: qualification, training, literature, cost should be considered.
• Problem should be selected by preliminary study.

3.6.4: What is the need defining Problem?

Definition of the problem will enable the researcher to be on track, whereas an ill defined problem will create problems. The further action plan depends upon defining the problem.

3.6.5: What is the Technique?

It includes following steps:

1. Statement of problem in a general way.
2. Understanding the nature of the problem.
3. Surveying the available literature.
4. Developing the ideas through discussions.
5. Rephrasing the research problem
Points to be kept in mind

a) Technical terms and words to be clearly defined.
b) Basic assumptions to be clearly stated.
c) Straight forward criteria for selecting the problem should be provided.
d) Suitability of the time period and sources of the data must also be considered.
e) Scope of investigations and limitations should be kept in mind.

3.7: Data Collection Method

3.7.1: Content Analysis

Content analysis is a research method that evaluates the content and features of media. The method is typically used to identify common themes and phrases in books and other forms of media. Content analysis can indicate the comprehensiveness, accuracy, biases and oversights of authors and publishers. A librarian would use this research method to determine what books, articles, films and periodicals to feature in the library.

3.7.2: Qualitative Research

Qualitative research involves the use of data to understand and explain social patterns. In this field, interviews, surveys, documents and participant observational data are used as research tools. Qualitative research methods were developed to help researchers better understand people and cultures. These methods are used in library and information science to study societal trends in order to better serve the needs and interests of patrons.

3.7.3: Historical Method

Using the historical method of research involves learning about the history of a subject or field prior to analysis. This method can give a person analyzing the contents of a book, for example, insight into the time and culture in which it was written. This information can provide the researcher with the tools necessary to produce a more accurate analysis of the book.
3.7.4: Survey Method

One of the most important research methods in the social sciences, surveying involves posing questions to people and categorizing their responses. There are essentially two types of survey: the questionnaire and the interview. While questionnaires are capable of reaching thousands of people at once, interviews tend to be more personal and in-depth. Questionnaires are ideal when researchers want to create statistical data from information provided by a large number of respondents.

3.8: Sampling Fundamentals

3.8.1: Sampling

Sampling is the process of selecting units (e.g., people, organizations) from a population of interest so that by studying the sample we may fairly generalize our results back to the population from which they were chosen. Let's begin by covering some of the key terms in sampling like "population" and "sampling frame."

Then, because some types of sampling rely upon quantitative models, we'll talk about some of the statistical terms used in sampling. Finally, we'll discuss the major distinction between probability and Non-probability sampling methods and work through the major types in each. We should be very clear that........

Information may be obtained about a universe or a population in two ways. One way is by studying each and every unit form in part of the population. This is known as census method of investigation.

Mainly two types of sampling methods are there. i.e. Non-probability sampling and Probability sampling.
3.8.2: Probability Sampling:

A probability sampling method is any method of sampling that utilizes some form of random selection. In order to have a random selection method, you must set up some process or procedure that assures that the different units in your population have equal probabilities of being chosen. Humans have long practiced various forms of random selection, such as picking a name out of a hat, or choosing the short straw. These days, we tend to use computers as the mechanism for generating random numbers as the basis for random selection.

3.8.3: Non Probability Sampling:

Non probability sampling does not involve random selection and probability sampling does. Does that mean that non probability samples aren't representative of the population? Not necessarily. But it does mean that non probability samples cannot depend upon the rationale of probability theory. At least with a probabilistic sample, we know the odds or probability that we have represented the population well. We are able to estimate confidence intervals for the statistic. With non probability samples, we may or may not represent the population well, and it will often be hard for us to know how well we've done so. In general, researchers prefer probabilistic or random sampling methods over non probabilistic ones, and consider them to be more accurate and rigorous. However, in applied social research there may be circumstances where it is not feasible, practical or theoretically sensible to do random sampling. This sampling method is based on the theory of probability so it does not provide a chance of selection to each population element.

In this research, the researcher has used a non-probability sampling techniques as this research provides the data of usage of different ICT tools and techniques towards the contribution of grant-in-aid university libraries of Gujarat.

3.8.4: Size of Sample:

In every research, the size of research is played a crucial role for further statistical analysis of the research. In this research, the researcher has considered 8 University
Libraries of Gujarat because the topic of researcher is "A Contribution of ICT in the development of grant-in-aid university libraries of Gujarat". There is a total eight grant-in-aid universities existing in Gujarat. As, the ICT is a very wide subject area, the questionnaire was prepared to cover utmost areas of ICT tools and techniques probably used in university libraries. So, the number of questionnaire is of eight universities but the questionnaire was made of 20 pages to cover and to search the maximum utilization of ICT in grant-in-aid university libraries of Gujarat. Generally, university librarians are too busy with their work to develop the library of their own as well others till though 100% questionnaire is returned to the researcher with maximum answers given by the university librarians of grant-in-aid university libraries of Gujarat. Here is the list of the grant-in-aid university library of Gujarat which has been taken for the research work.

(1) Maharaja Sayajirao (M.S.) University - Vadodara
(2) Gujarat University - Ahmedabad
(3) Sardar Patel University - Vallabh Vidyanagar
(4) Veer Narmad South Gujarat University - Surat
(5) Saurashtra University - Rajkot
(6) Bhavnagar University - Bhavnagar
(7) Hemchandracharya North Gujarat University - Patan
(8) Shyamji Krushna Verma Kachchh University - Kachchh

3.8.5: Instrument/Method

3.8.5 (1) Questionnaire Method:

According to Galton, Francis (1909) "questionnaire is a research instrument consists of a series of questions and other prompts for the purpose of gathering information from the respondents. Although they are often designed for statistical analysis of the
responses, this is not always the case. The questionnaire was invented by Sir Francis Galton." [18]

According to (Dornyei, Zoltan, 2003 p.6) "questionnaire are any written instruments that present respondents with a series of questions or statements with a series of questions or statements to which they are to react either by writing out their answers or selecting from existing answers given by the researcher." [19]

According to (Kaplan, R. M. 2009) "questionnaire as a list of questions that several people are asked so that information can be collected about something.' Oxford Advance learner's Dictionary defines questionnaires as ' a written list of questions that are answered by a number of people so that information cab be collected from the answers." [20]

There is number of instrument are being used to search out the researchers topic. The present researcher has used the questionnaire method in this study. A special care has been taken after the questionnaires which are returned back with taking keen interest by the university librarians to fill it.

Forms of questions: The q u e s t i o n s  must  be relevant, meaningful and easy to understand

**Types of Questionnaire:**

As we know that a questionnaire is a list of written questions that can be completed in one of two basic ways, there is such type of questionnaires which researcher used often in their research work.

Postal questionnaire: Firstly, respondents could be asked to complete the questionnaire with the researcher not present. This is a postal questionnaire and (loosely) refers to any questionnaire that a respondent completes without the aid of the researcher.
structured interview: Secondly, respondents could be asked to complete the questionnaire by verbally responding to questions in the presence of the researcher. This variation is called a structured interview.

Although the two variations are similar (a postal questionnaire and a structured interview could contain exactly the same questions), the difference between them is important. If, for example, we are concerned with protecting the respondent’s anonymity then it might be more appropriate to use a postal questionnaire than a structured interview.

Questionnaires are restricted to two basic types of question:

**Close-ended:** Closed-ended (or “closed question”) is a question for which a researcher provides a suitable list of responses (e.g. Yes / No). This produces mainly quantitative data. The usual format of a closed question is to ask a question, then provide the range of answers, and ask the respondent to tick the appropriate answer. It is also called multiple-choice question.

**Open-ended:** Open-ended (or “open question”) is a question where the researcher doesn’t provide the respondent with a set answer from which to choose. Rather, the respondent is asked to answer "in their own words". This produces mainly qualitative data.

This questionnaire comes in many different forms from: factual to opinion based, from tick boxes to free text responses. Whatever their form, questionnaires are often viewed as quick and easy to do. This is not always the case. To get useful responses, in a cost-effective way, it is important to be clear about the aim of the questionnaire and how the responses will help you improve the learning technology or its implementation. Think also about the analysis of results. It can be sobering to consider the amount of data you will generate and the time it will take to analyze.
Some advantages and disadvantages of questionnaires follow. Notes on how to deal with some of the disadvantages are also provided, as are some references to more comprehensive information on questionnaires.

(i) **Strengths of the questionnaire method**

- Quick and easy to administer.
- Can get a large amount of information in a short time.
- Allows for employee participation.
- Does not require trained interviewer.
- Relatively less expensive.
- This technique is free from bias.
- Large amount of data can be collected from small or large population group.
- It is suitable method when it is intended to collect some specific information from a large number of people.
- The respondents feel free to express their views through a questionnaire than they would do personally to the researcher.
- It places less pressure on the respondents for immediate response. They can complete it at their own time and pace. They can also look through the whole questionnaire and form an idea of the nature and scope of questions before replying to these.

(ii) **Limitations of questionnaire method**

- Quality of information related to the quality of the questionnaire.
- Must have high school reading and writing ability to complete one.
- Often needs follow-up interview or observation.
- May be difficult to construct.
- May have low response rate.
- Responses may be incomplete.
- Responses may be difficult to interpret (open-ended)
• Respondent may not reply to all questions for one reason or another and leave some blanks.
• The respondents may not give their full attention to the job of replying to the questions. The answers may lack depth resulting in superficiality.

Points which are considered for present Questionnaires:

• For this research, in the beginning; researcher has states concisely what the survey is about, and how the findings will be used. Request the respondents for their co-operation.

• Researcher has keep things short and to the point. Researcher has edited and revised the questionnaire several times to make it concise and easy for the respondent which covers all the aspects of the ICT tools and techniques used in grant-in-aid university libraries of Gujarat.

• Researcher has written the questions in plain and simple language, which is understandable to the respondents. Researcher has tried to write as if he is talking to the respondent aim for a warm, friendly tone. Attention is given to keep the sentences short as possible.

• Researcher has tried to avoid ambiguous questions. In other instances, ambiguity can arise through the construction of a question. This often happens when a question contains double negatives.

• Researcher has tried to void lengthy or descriptive response for the respondent and try to ask as possible as simple for which researcher has to

• With ‘Yes/No’ answers, researcher makes provision for ‘Any other’ or ‘Can’t say’ response to enable the respondents to express themselves more specifically.

• Researcher has tried to structuring the questionnaire schedule, proceed from general to specific.
• Researcher has enclosed a self-addressed, stamped or pre-paid cover with the questionnaire for the mailed questionnaire and also email the questionnaire for ease of respondent.

• Researcher has requested to the respondent for the personal interview also if there may be a requirement from the respondent.

3.9: Role of Computer in Research

Today, in the ICT era educated man can not imagine his/her life without computer. Computer involves now from standard first in the school also because of its usefulness in each and every step of human life. Computer assists to solve the problem faced by the mankind. It performs variety of jobs with the use of different operating systems, software applications, internet and such interactive tools of ICT. Computer is being used in every walk of life.

The importance of computers in research is exceptionally high and the use of a computer can help scientific research immensely, and is an almost invaluable and priceless tool. There are many reasons why computers are so important in research and here are some of the main reasons:

**Speed:** Although calculations can be done by a human being, a computer can process numbers and information in a very short space of time. This means that time is then saved thanks to the use of the computer, leaving researchers more time to complete and conduct further research. Also, a sum that may take a person several hours to process will take computer mere minutes, if not seconds.

**Accuracy:** Computers are incredibly accurate, and like mentioned above, a calculation or piece of research that is very difficult to calculate by a human can be processed easily by a computer, delivering flawless accuracy. Accuracy is of the utmost importance in scientific research as a wrong calculation could result in an entire project / research piece being filled with incorrect information.
**Organization:** When researcher is doing research, there is a different pieces of information, calculations and notes, and with a computer, he may able to stock it all neatly and safely. By using simple folders, word processors and computer programs, researcher can store millions of pages of information, which are stored safe within the computer. This is a method that is significantly more productive and safer than using a paper filing system in which anything can be easily misplaced, therefore disrupting research.

**Consistency:** As a computer is a machine, it cannot make mistakes through "tiredness" or fatigue or lack of concentration which humans can sometimes suffer with when working. This trait alone makes the computer exceptionally important to the world of scientific research.

**3.9.1: Data Storage & Analysis:**

Experimentation is the cornerstone of scientific research. Every experiment in any of the natural sciences generates a lot of data, which needs to be stored and analyzed to derive important conclusions, to validate or disprove hypotheses. Computers attached with experimental apparatuses, directly record data as it is generated and subject it to analysis through specially designed software.

Analyzing tons of statistical data is made possible using specially designed algorithms that are implemented by computers. This makes the extremely time-consuming job of data analysis to be a matter of a few minutes.

Data can be processed and analyzed with greater ease and speed. Moreover, the results obtained are generally correct and reliable. Researcher can generate statistical data, put findings of the collective data, make the design; pictorial graphing and report are being developed with the help of computers. So, this is the crucial and most essential part for the researcher which can perform easily with the Microsoft office tool like word, excel, power point etc..
3.9.2: Knowledge Sharing Through Internet:

Lastly, in the form of Internet, computers have provided an entirely new way to share knowledge. Today, anyone can access the latest research papers that are made available for free on websites. Sharing of knowledge and collaboration through the internet has made international cooperation on scientific projects possible.

Through various kinds of analytical software programs, computers are contributing to scientific research in every discipline, ranging from biology to astrophysics, discovering new patterns and providing novel insights. When the work in neural network based artificial intelligence advances and computers are granted with the ability to learn and think for themselves, future advances in technology and research will be even more rapid. If we survive human strife and manage not to self destruct our civilization, future is going to be an exciting time!

Thus, we can say that the use of computer in any type of research work is so extensive and essential because it is difficult to conceive today a scientific research project without computer. Many research studies can not be carried out without use of computer particularly those involving complex computations, data analysis and such statistical work. Computer in scientific research is used at all stages of study-from proposal/budget stage to submission/presentation of findings. Techniques involving trial and error process are quite frequently employed in research methodology. This involves lot of calculations and work of repetitive nature. Computer is best suited for such techniques, thus reducing the drudgery of researchers on the one hand and producing the final result rapidly on the other. Thus, different scenarios are made available to researchers by computers in less time which otherwise might have taken days or even months.

3.10: Structure of the Questionnaire

Questionnaires usually form an integral part of descriptive and opinion related surveys. Questionnaires can either be in the form of a self administered questionnaire i.e. where the respondents is requested to complete the questionnaire in his/her own
time or in the form of a structured interview, where the interviewer (very often the researcher) writes down the answers of the respondent during a telephone or face-to-face interview. Irrespective of which method is used, the formulation of the questions and the structure of the questionnaire are critical to the success of the survey. This document focuses on the issues involved in the design of a structured questionnaire.

3.10.1: Advantages and disadvantages of self administered structured questionnaires:

Self-administered structured questionnaires, whether disseminated by hand (i.e. delivered at a person’s home or office), by post, (i.e. via snail-mail), via e-mail or the Web, have the following distinct advantages:

- They are more cost effective to administer than personal meet.
- They are relatively easy to administer and analyze
- Most people are familiar with the concept of a questionnaire
- They reduce the possibility of interviewer bias
- They are perceived to be less intrusive than telephone or face-to-face surveys and hence, respondents will more readily respond truthfully to sensitive questions
- They are convenient since respondents can complete it at a time and place that is convenient for them.

The most important disadvantage of self-administered structured questionnaires that are disseminated by hand, post, e-mail or the Web is that the response rate tends to be low, especially when the questionnaire is too long or is complicated to complete, the subject matter is either not interesting to the respondent or is perceived as being of a sensitive nature. Another disadvantage is that the researcher does not have control over who fills in the questionnaire even though it may be addressed or delivered to the intended participant.
3.10.2: Format of the questionnaire:

In this research work, researcher has made the structure in eighteen different parts as main questions in which different sub questions was asked.

Que-1:
In this part, the questionnaire consists questions of the basic information about the University, name of the university library, establishment year, etc.

Que.2:
In this part, the professional details of the librarian, its qualification, working experience and details of other library staff member has been discussed.

Que.3:
In the third part, details about the library building, about the different sections of the library and the users of the library has been asked by the researcher.

Que. 4:
In the forth part, the questions related with the budget were asked. How many funding agencies have funded the budget to develop the university libraries, how much budget is being sanctioned for ICT applications and how much amount is being spent for the development of library has been discussed.

Que. 5:
In this part, the total collection of library has been discussed. Print collection, digital material, reference material, news papers, journals, magazines and how much collection of institutional repositories in different forms like physical, digital or in both forms have been discussed.

Que.6:
The most important part for any university library is Library Automation. In this part, the questions related with the library automation have been discussed. What software is being used, networking facility, OPAC, services like SDI and CAS, in-house
activities, data back up, and other ICT tools applied for library automation has been discussed in detail.

Que.7: Digitization of the library is very essential part of any library. Researcher has asked the questions about the planning of digitization, current situation, digital collection, software for maintaining digitized material, copyright rules etc.

Que. 8: In this part, the researcher has asked the questions about different e-resources used in libraries. Researcher asked the questions about the type of computers, its specifications, printers, such external devices, about server, hardware and software, storage medium, internet facility, multimedia projector, collection of e-resources like e-books, e-Journals, CD/DVD, Video Lectures etc.

Que.9: In this part, status about UGC INFONET has been discussed as it is providing large number of resources to the university and colleges.

Que.10: In this part, different connectivity with national and international consortium has been discussed.

Que.11: Here, researcher has been asked about the different services like DDS, Int library loan, reference, indexing, abstracting, literature, CAS, web OPAC, content pages and facilities like Wi-Fi connectivity, database searching, Audio-Visual facility, video conferencing etc. used in university library with the use of latest ICT tools and techniques.

Que. 12: The most important questions related with the Internet and Intranet has been asked in this part of the questionnaire. The questions about LAN, WAN, Speed of internet,
networking, university website, server, connectivity with education channel, cyber security has been asked to find out the ICT usage with this medium.

Que.13:
Here researcher has asked about the summarized budget used for the development of library with help of ICT tools only.

Que.14:
In this part, the questions has been asked about the users awareness to acquire the knowledge with the help of ICT.

Que.15:
In this part, how many library professionals are engaged in the work of different ICT tools utilized in the routine work of library has been discussed.

Que.16:
In this part, some managerial questions has been asked for the upliftment of the work as a part of TQM i.e. Total Quality Management.

Que.17:
In this part, researcher has tried to find out the details about the seminars/workshops/conferences/training programs and refresher courses organized by the university library to development the ICT skills in the library professionals.

Que.18:
In this part, researcher has asked the questions about disadvantages if any is there in ICT usage.

Que.19:
Researcher has asked such views and reviews of the expert university librarian through which researcher can know about the usefulness of ICT tools.

Que.20:
In the end of this questionnaire, in the last question; researcher has asked to give the valuable suggestions for future development of university libraries with the help of ICT tools and techniques.
End Notes:

10. http://dictionary.cambridge.org/dictionary/british/research_1
References:


17. http://www.uic.edu/classes/socw/socw560/INTROSWK/sld008.htm, accessed on 03-01-13


