



**Department of Distance Education**  
**Punjabi University, Patiala**

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**Class : Master of Library and Information Science**

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**Paper : MLIS 205**

**Unit : I**

**(Research Methodology and Statistical Techniques)**

**Medium : English**

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***Lesson No.***

- 1.1 : Research : Definition, Need, Purpose and Types
- 1.2 : Basic Concept of Research Methodolgy : Hypothesis Variables, Induction, Deduction, Observation, Objectivity, Validity and Reliability
- 1.3 : Research Design : Meaning, Purpose, Principles, Components And Criteria. Literature Search : Print, Non-Print and Electronic
- 1.4 : Instruments of Research : Schedule Questionnaire, Interview, Observation
- 1.5 : Scientific Method
- 1.6 : Historical Method

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**RESEARCH : DEFINITION, NEED, PURPOSE AND TYPES**

**Structure of the lesson**

- 1.0. Objectives
- 1.1. Introduction
- 1.2. Definition
- 1.3. Characteristics of Research
- 1.4. Need for and purpose of Research
  - 1.4.1 Need for Research
  - 1.4.2 Purpose of Research
- 1.5. Functions of Research
- 1.6. Types of Research
  - 1.6.1 On the basis of Immediate Purpose
  - 1.6.2 On the basis of Research Approach
- 1.7. Summary
- 1.8. Self-Check Exercises
- 1.9. Answer to Self-Check Exercises
- 1.10. References for further study.

**1.0 Objectives :**

Human Knowledge as it exists today broadly consists of facts and theories. New facts, new concepts and new ways of doing things increased its quantum with the passage of time, which helps us to understand, comprehend, explain, control and predict the expansion of knowledge in automatic and self-perpetrating process. On the contrary it requires constant, planned efforts by intelligent and highly trained people. The present level of knowledge is outcome of research and its various methods adopted by intellectuals over a period of several centuries which led the man from cave to space. The present lesson of Research methodology is based on the following objectives to :

- (i) Conceptual basis of research ;
- (ii) Definition of Research and its characters ;
- (iii) Need, purposes and functions of research; and
- (iv) Classification of research.

**1.1 Introduction :**

Research is a systematic endeavour towards treading into UNKNOWN TRAINS of KNOWLEDGE by interpreting critically what we already know. It is different from a generalized investigation of knowledge which applies SCIENTIFIC METHOD.

Research is a rational process aiming at discovery of relationships among the phenomena. Because certain regularities exist among the phenomena and events, therefore, it has become possible to drive laws, principles and theories in different disciplines of knowledge, which express the regularities and informations among the phenomenon.

Research is an objective, impartial, empirical and logical analysis and recording of controlled observations that may lead to the development of generalizations, principles or theories as mentioned above, resulting into some extent initialies in *prediction* and *control* of events that may be consequences or causes of specific event, happening or phenomena. Therefore, it is scientific and as such not satisfied with isolated facts, but seeds to *integrate* and *systemize* its findings. In true sense it is concerned with true and objective verification of generalizations, in which verification requires logical analysis of problems based on statistical techniques and devising of appropriate methodologies for obtaining results and evidences.

### 1.2 Definition of Research :

Research is composed of two words 're' and 'search' which means to search again or to search for new facts or to modify older one in any branch of knowledge. There is non agreed definition of the term " Research" due to the reason that, there are different kinds of researchers having different purposes, setting etc.

Webster's Third International Dictionary of the English Language defines research as " studious inquiry or examination, especially critical and exhaustive investigation or experimentation, having for its aim the discovery of new facts, and their correct interpretation, the revision of accepted conclusions, theories or, laws in the light of newly discovered facts, or practical applications of new or revised conclusions, theories, or laws."

According to the Random House Dictionary of the English Language, "Research is a systematic inquiry into a subject in order to discover or revise facts, theories, etc"

In the Encyclopaedic of Social Sciences, Research is defined as " the manipulation of things, concepts or symbols for the purpose of generalization to extend, correct or verify knowledge whether that knowledge aids in the construction of a theory or in practice of an art."

Best and Kahn, in their book Research in Education define research "as the systematic and objective analysis and recording of controlled observations that may lead to the development of generalization, principles or theories , resulting in prediction and possibly ultimate control of events."

Busha in his book Research Methods in Librarianship says that Research is " a systematic quest for knowledge that is characterized by disciplined enquiry. Efficient and effective approach to expand knowledge is the conduct of special, planned and structured investigations."

Cook outlines research as an honest, exhaustive, intelligent searching for facts and their meanings or implications, with reference to a problem. He sees the word 'Research ' as an acronym, each letter of the word standing for a particular aspect as given below :

R = Rational way of thinking

E = Expert and Exhaustive treatment

S = Search and solution

E = Exactness

A = Analysis

R = Relationships of facts

C = Critical observation, Careful planning, Constructive attitude and Condensed generalisation

H = Honesty and Hard working

Ranganathan describes “research to represent a critical and exhaustive investigation to discover new facts, to interpret them in the light of known ideas, theories and laws, to revive the current laws and theories in the light of the newly discovered facts to apply the conclusion to practical purpose.”

The substance of all these samples of definitions of research can be broadly summed up, to restate, the substantive phrases that stand out in all these definitions of research are that research is :

- An intellectual activity of high order;
- An investigation of a phenomenon, event or activity;
- Aims to discover data and facts and their interpretations;
- To arrive at conclusions to formulate new theories and laws or revise the already established theories and laws;
- To be accepted or rejected before adding this new knowledge to the already existing general pool of knowledge.

### 1.3 Characteristics of Research :

In order to clarify the meaning and spirit of research we may deduce the following characteristics of research :

- (i) Research is directed towards the situation of a problem ;
- (ii) Research emphasizes the development of generalization, principles or theories that will be helpful in prediction of future events ;
- (iii) Research is based on observable experiment or empirical evidence ;
- (iv) Research demands accurate observation and description;
- (v) Although research activity may at times be somewhat random and unsystematic, it is more after characterised by careful designed procedures, always applying rigorous analysis)
- (vi) Research requires expertise;
- (vii) Research strives to be objective and logical , applying every possible test to validate;
- (viii) Research is characterised by patient and unhurried activity;
- (ix) Research is carefully recorded and reported;
- (x) Research sometimes requires courage.
- (xi) Research requires rigorous standards of scientific spirit and integrity; and
- (xii) Research is never mysterious.

### 1.4 Need for and Purpose of Research

Knowledge is the primary and powerful resource that can provide scope for material prosperity of a society. *New knowledge* can be acquired only with the pursuit of research to extend the frontiers of knowledge. Need for and purpose of research should be viewed in this perspective.

### 1.4.1 Need for Research

There is always need of adding new knowledge to the existing store of knowledge, which is only possible through research. Equally important is to reorient existing theories to meet the present day requirements. Research is also needed to know the unknown.

The significance and need of research may be analysed as under :

#### 1. Guidance for Social Planning :

Research is needed to guide social planning. A reliable as well as factual knowledge may be utmost needed to take decision for planning. So any planning for success of our economic development needs research.

#### 2. Promotion of Better Understanding and Social Cohesion :

Research is needed for dispelling of old settings, superstitions etc. and to throw light on them for further welfare and development. Thus, social research may have the effect of promoting better understanding and social cohesion.

#### 3. Basis for Prediction :

Research is needed for effective functioning of facts. It affords a considerably sound basis for prediction. Ability for prediction of events, likely to happen in near or distant future help in preparing successful plans, and thus helping in achieving the goals or set targets, Success in rural development, agriculture and industry under various five year plans in India is a fine example of setting priorities on the basis of prediction.

#### 4. Innovations, Inventions and Discoveries :

Research is needed for innovations, new inventions and discoveries tools for research. So the techniques and tools for research are desired to achieve greater perfection.

### 1.4.2 Purpose of Research :

Purpose of research is to discover new facts and ideas not previously known. Presently it seems to be most reliable means of knowledge. It is part and parcel of social progress and is essential for advancement of knowledge for national development.

Realising the purpose and utility of research for social, economic, political and educational development almost all countries around the globe are establishing different institutes for conducting research in various fields.

For the business and industrial community world over, knowledge management has become a crucial area for combating competition. This is a big challenge, which has made them to invest very heavily on research on new knowledge creation. This trend is also visible in the Indian context although somewhat blurred at present.

Accessibility and availability of information and knowledge through Internet is another very important development, supporting research activities.

To develop a knowledge reservoir. The application of this knowledge for socio-economic and cultural development of a country to provide material well being of societies; is the purpose.

### 1.5 Functions of Research.

Functions may be enlisted as under :

- (i) It produces new knowledge:

- (ii) It enables discovery of new application of old knowledge;
- (iii) It helps in the development of the researches intellectually and professionally;
- (iv) It leads to better teaching as new knowledge is integrated into teaching curriculum,;
- (v) It brings prestige to the person and institution;
- (vi) It can prove to be a source of income Funded research as a source of finance.
- (vii) It enables an institute to attract better faculty, researchers and graduate students;
- (viii) It enables finding solutions to problems and to resolve conflict in society;
- (ix) It enables man to relate more effectively to his environment and achieve his purpose;  
and
- (x) It promotes progress of society.

## 1.6 Types of Research :

### 1.6.1 On the basis of Immediate purpose research is of three types :

- (a) Basic research
- (b) Applied Research
- (c) Action Research

#### 1.6.1.1 Basic Research

This is also known as pure, fundamental or even thoretical research. It is research for knowledge sake and its aim is to create new knowledge irrespective of any use at the moment of discovery. There may not be any immediate need or application of new knowledge thus produced ; nor it is conducted for any immediate gain or problem solving. It may be done out of curiosity, or to build a theory. Greatest research experiments and expeditions fall in this category of research .Why the man went to moon ? In our field the five laws of library science by S. R. Ranganathan were formulated as a theoretical research. It is mostly conducted in academic and related research centres.

#### 1.6.1.2 Applied Research

Research conducted to solve any immediate problem of theory or practice at hand is known as applied research. It is of practical nature. Example are “Action research” “Case Studies”, “Clinical Research”, “Research and Development”, popularly known as R&D. Most of the research in industry, business, military and government departments is of applied or practical nature. For example,

- To design a system to record the receipt of periodicals and to automatically send reminders when due for more than a month.
- To diagnose the very low use of a certain collection in a library.
- To find solution to the decreasing space problems in libraries in 1960s.  
(Library and information management is a fertile field for applied research).

#### Pure versus Applied Research

Whatever be the motive or nature of research the demarcation between the two is superficial, illusory and temporary, if at all it is there. History of science shows that no hard and fast line can be drawn between the two for a longer time. If knowledge is power as Francis Bacon (1561–1626) said long ago, then all knowledge is utilitarian,. Both the basic and applied research employs the

same methods and techniques.

Moreover experience has shown that only line between the two is of time. What today seems purely theoretical having no direct use (thus dubbed useless by some) may find many applications tomorrow. Look at the history of many discoveries and inventions. X-ray's discovery was accidental and had no use then; now its practical applications are in thousands in every walk of life. Telephone and movies were invented not out of any necessity but for curiosity, if not fun. Thomas Alva Edison could never have thought that invention of moving pictures will bring revolution to influence the society, and a billion dollar film industry would be based on it. They are an integral part of our culture now. Even the most basic laws such as Newton's laws underpin all astronomical, aeronautical and space expeditions and research. Every research from laboratory ultimately reaches the industry later or sooner. At home we can say the same about the five laws of library science. In the words of Professor Pauline Atherton (Cochrane) these laws put knowledge to work. Every theory finds applications that is why it is paradoxically said that the theory is the most applied knowledge just as every action originates from the thinking in mind i.e. thought is the mother of all actions. Distinction is also hazy in the sense there is always an interaction and iteration of theory and practice. Many problems for theoretical research emerge from practical failures. Similarly a practical research may generate a new theory or modify the existing one. Whatever be its source knowledge is always utilitarian, ultimately.

### 1.6.1.3 Action Research

Developed in 1930s in education, action research is a form of interpretive research to study human actions and social practices with the participation of the researcher. It is an applied research, which is focused on immediate application, not to develop any theory for general applications. Emphasis is on a local problem, which involves the researcher and takes the librarian to jointly seek and find a solution to a library problem. For example, the problem could be as simple as "How to improve upon the existing circulation of periodicals among the research scientists in the research institution." Its purpose for our field may be to improve library management and use; and ultimately to improve the skill of the librarian i.e. to change the ways to do things more effectively. It requires identification of practices that need change to meet the needs of the changing use pattern of libraries or meeting new demands of users and to take better decisions. Simply speaking it is common sense and good management, and not any genuine research.

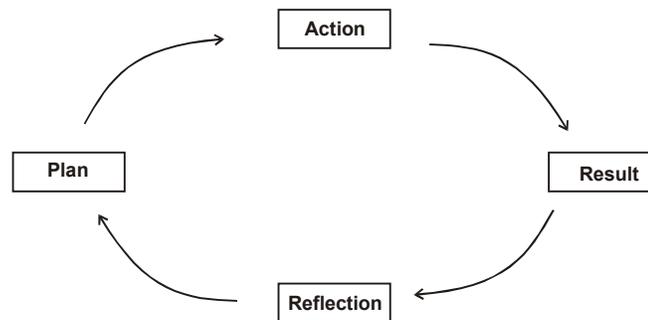
It is applied research whose aim is to provide practical benefits to the client. The researcher is expected to do so methodologically, it is cyclic research to solve problems and generate new knowledge simultaneously. Majola J.H. Oosthuizen gives the following equation and diagram to show its nature:

Action research = Action + Research (knowledge generated). It is to bring out progressive and incremental improvement in practice as it goes through different cycle after cycle.

**Characteristics:** Action research is usually focussed on a single situation, say on a single library:

- (i) It is carried out in a series of cycles steadily improving upon the previous cycle.
- (ii) It is mostly reflective and audit like or evaluative.
- (iii) It is concerned with real practice to examine if the practice needs change.

- (iv) In each cycle a hypothesis is proposed, tested and next action is planned.
- (v) Method is refined in each cycle by using different method of observation and interpretation.
- (vi) It involves many people such as informants, interpreters, planners, administrators and researchers - the list is not exhaustive. Therefore, it also requires communication skills and conflict management. Each cycle may use a different method. In such case the action research may take the following form:



The Cycle of Action Research

- (vii) It is like a heuristic method as the next action is based on the previous result. It is not any series of pre-planned methods as it happens in other types of research methods.

Research approaches are research methods as distinguished from research techniques. Methods are: Descriptive, Comparative, Exploratory, Diagnostic, Experimental and Historical. These approaches to research are applicable in different situations depending upon the problem. In some cases a combination of two or more approaches may be used. In this section we will study the definition, nature techniques and application of these methods especially in library and information field.

### 1.6.2 On the basis of Research Approach

On the basis of research approaches, research may be classified as under.

#### 1.6.2.1 Descriptive Research

It is a sort of survey research at a given time to study, understand and report the status of a current situation. In simple words it is concerned with answering the questions. What, Who, When and Where.

It is to collect data by simple or common sense techniques then collate and tabulate it. In a descriptive research hypothesis formation and testing may or may not be involved. In library science in India most of the research is of descriptive type, e.g.:

- A survey of reference service in children libraries in Punjab.
- A survey of the reading habits of housewives in Chandigarh.
- A survey of the information needs of geo-scientists in CSIR laboratories.

Its techniques are direct observation and measurement, or through a questionnaire, or interview. Its stages are:

- 1) Area of research is conceived broadly.
- 2) Literature research is done to know the work already done, problems being faced and to concisely formulate the problem.
- 3) What is to be surveyed is clearly demarcated.
- 4) Data is collected, collated, tabulated, and inferred.
- 5) Conclusion is drawn, and reporting is done.

The method is not as simple or straight as it looks. Comparative Research

In essence it is another survey type of research describing two or more entities of the same nature, which are compared and contrasted in terms of certain predefined parameters. Motive may be to isolate best features and shortcomings of each entity under comparison.

The ultimate aim is to compare, contrast and design an idea, system or plan having the best available features after correcting the shortcoming of others. The comparison is mostly descriptive.

For comparison the two entities must belong to the same class. For example, we can make a comparative study of public libraries in two or more cities. Not much purpose will be served by comparing a public with an academic or industrial library. It will be absurd to compare classification with circulation.

#### 1.6.2.2 Comparative Research

Comparative research is an applied research, which may lead to improvement of the existing systems under comparison, and may help create a model having best of both the worlds. Comparison leads to better understanding and acquaints you of different models and perspectives. In social life it helps to increase tolerance of other viewpoints or methods. Comparative religion has played a great role in social peace and harmony. In our field S.R. Ranganathan's classic **Prolegomena to library classification** (1967) makes a comparative study of some library classifications to propose an ideal theory of classification. Regarding limitations, it is often said that comparison are odious.

#### 1.6.2.3 Exploratory Research

Research cannot be done in one go as a single piece. Before a project is undertaken finally, it is always wise to explore the possibility of its successful conclusion. In many cases an idea or problem may initially strike as very interesting to pursue. But soon after starting, the researcher may feel struck due to many reasons as mentioned below:

- dearth of literature and other guiding sources;
- lack of data; and
- serious problem in quantifying or measuring data.

In such situations the researcher simply gropes in the dark. Formally or informally viability of the problem first conceived has to be explored. Exploration may be mental, silent or visible. It is matter of commonsense otherwise researcher may be plunging in the dark, and running the risk of wasting time and money. It is a safeguard against the future failure and frustration.

Before the use of scientific method it is essential to make an exploratory study of the situation. At this stage the researcher has absolute freedom to run his imagination wild, unchecked and move seemingly aimlessly. It is then to follow some seemingly gainful leads exercising ingenuity and some concrete evidence of leading the exploratory research to some fruitful and tangible

conclusion. Indeed, the researcher has to be very judicious.

Apart from checking the viability, exploratory research provides more ideas, and alternative techniques. At that stage the problem may be modified. It thus helps to make the problem more concrete, concise and formally worded to finalise and proceed to the real investigation. That is why it is also known as formulative studies. It is to pave the way, see what is there than to predict. A research investigation is a constant process of reformation and alteration, a sort of heuristic approach, till one arrives at some problem for pursuit.

**It should undergo the following steps:**

- 1) Preliminary review of literature;
- 2) Consulting colleagues and experts to make use of their experience and wisdom;
- 3) Let the problem brew or mature in mind for sometime;
- 4) Make some rudimentary studies by survey or experimental method and identify the variables;
- 5) Cultivate only insights into the hypotheses; do not test them or prove them; and
- 6) Delimit the area, if required.

Such steps may help researchers to follow and discard many ideas and problems which may not materialise in the long run. Negative power is a forceful aid to lead researchers to the right problem. It is important to consider that it is an initial stop in a long and tedious research process. Exploratory research is simply to untangle and pave the way; or to map the way for future safe and uninterrupted travel to reach the destination without going astray or stumbling at roadblocks.

#### **1.6.2.4 Diagnostic Research**

It is a fact-finding aspect of clinical practice. It represents the most typical and simple problem solving strategy. Its method include screening to attain insights into the problem. It consists of the following phases:

- Emergence and identification of the problem;
- Diagnosis of its roots and causes;
- Formulation of possible ways to treat the problem; and
- Suggesting a possible solution.

**Data Collection:** Diagnosis can yield data in four major ways:

- 1) Case history or interviews;
- 2) Clinical observation;
- 3) Informal testing; and
- 4) Formal standardised testing.

**Case study/Interview:** Here the purpose is to understand the life cycle of an individual with focus on the problem and other life events that have influenced not only the individual but the whole family and previous generation. The unit of study may be a person, family, commune or an institution. Adequate data is required for clarifying sorting and resolving controversial issues.

It requires a skillful but sensitive interview to elicit maximum data without offending the client.

**Clinical Observation:** It is observation of behaviour by formal or informal methods. Diagnostic tests provide a microscopic view of the component of some areas of performance. Collected data is employed for causal thinking. By manipulating causes we can vary dependent variables. This method is mostly applied in psychology and other behavioural sciences. In library science it can be used to study the reading habits, bibliotherapy and user behaviour in the library.

#### **1.6.2.5 Social Research**

Social research or surveys are a kind of assessment and evaluation studies to gather data from a large number of cases at a particular time. It is not concerned with individuals as individual but as a part of a large whole. It is cross-sectional. Each statement in the survey portrays a prevailing condition at a given time. These are large or wholesale in nature; huge and vast in size. Purpose is to discover occurrence, distribution and interrelationships of sociological, economic or attitudinal variables in a large segment of population. The scope of surveys can be widened to include economic, religious, anthropological or habitual; or to study the distribution of economic activities. In analysing political, social or economic or consumer preferences or attitudes data is to draw a picture of the conditions prevailing or emerging at that time. It requires expert and careful planning, accurate analysis and imaginative interpretation of the huge mass of data.

Social survey has been made since the beginning of the last century. For example. Alfred Kinsey made two separate but comprehensive surveys of American male and female sexual behaviour of 12,000 respondents each time. These two reports are still considered classic surveys.

These surveys have now been extended to what are called opinion and exit polls to predict the results of general elections. In many cases these surveys make remarkably accurate prediction of the results. These have now also been extended to market and consumer surveys. Business houses now make a survey of consumer preferences regarding particular consumer goods before producing and launching them in the market. Such a type of research has contributed significantly in understanding social attitudes, preferences, traits opinions and composition of a community.

There is no reason these surveys cannot be extended to library- surveys. Librarians conduct (social) surveys of the information needs of a particular professional segment of society. These include large-scale survey of libraries, their collection, client services, and technical procedures. Reading habits of people are a joint field for surveys by librarians, educationist, and literacy experts.

#### **Method**

Social research can be conducted by personal interviews, door-to-door surveys, and oral opinions or by mailed (electronic or postal) questionnaires. These are quite extensive and expensive. Even a small error in sampling may lead to wrong results thus making a negative impact. These require astute planning careful conducting, accurate processing and imaginative interpretations. For this purpose, apart from the researchers you need a very informed and aware population of respondents who understand the question and their responsibility for correct answer.

#### **1.7 Summary**

Research is a systematic endeavour towards treading the unexplored terrains of knowledge by interpreting critically what we already know. It is to search for new facts or to modify already existing older one in any segment of universe of knowledge. There is no single agreed definition of researcher due to adoption of different approaches by different investigators. Research is an

intellectual activity of higher order to investigate phenomenon or event with an aim to discover data and facts for interpretation in view to generalize it for future or to formulate new theories amend already existing theories.

Research is the backbone of development of all kinds and all levels, therefore, R & D is becoming the slogan of all developed, developing and under developed countries. Due to research we have passed through the phase of industrial society and now living in “Information Society.” Basic, applied and action researcher are gaining momentum and leading a country in its progress and prosperity.

### **1.8 Self-Check Exercises**

1. What is Research ?
2. List Characteristics of Research ?
3. Define Research.
4. List Functions of Research.
5. List types of Research.

### **1.9 Answer to Self-Check Exercises**

1. See Section 1.1
2. See Section 1.3
3. See Section 1.2
4. See Section 1.5
5. See Section 1.6

### **1.10 References for Further Readings :**

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**BASIC CONCEPT OF RESEARCH METHODOLOGY :  
HYPOTHESIS, VARIABLES, INDUCTON, DEDUCTION, OBSERVATION,  
OBJECTIVITY, VALIDITY AND RELIABILITY**

**Structure of the lesson**

- 2.0. Objectives
- 2.1 Introduction
- 2.2 Conceptual Frame Work
  - 2.2.1 Hypothesis
  - 2.2.2 Variables
  - 2.2.3 Reasoning
  - 2.2.4 Observation
  - 2.2.5 Objectivity
  - 2.2.6 Validity and Reliability
- 2.3 Self-Check Exercises
- 2.4 Answer to Self-Check Exercises
- 2.5 References and Books for further studies

**2.0 Objectives**

The present lesson attempts to provide conceptual information on the basic elements of research methodology. After the study of the lesson the student will have a clear idea about

- (i) Hypothesis, its characteristics and importance;
- (ii) Role of different variables ;
- (iii) Importance of reasoning, observation and objectivity; and ;
- (iv) Validity and Reliability of research process.

**2.1 Introduction**

Belkin, a well-known information scientist, in dealing with concepts for Information Science makes a distinction between definition and concept. The distinction is, while a definition presumably defines phenomena, the concept explains or interprets it. By accepting this approach, in our discussion here for concepts of research, it becomes easier to look for a set of useful concepts, which would help to provide a conceptual framework for operating the process of research.

We have already discussed a number of definitions of research in previous Lesson. In this Lesson, we shall examine the different concepts from the point of view of performing the different functions of research.

The general meaning of a concept is that *it is an idea complex of something, formed up of its characteristics. It is a construct, putting together all parts of a thing.*

We can perceive concepts of research in two sets, (i), as their attributes for ensuring high quality of research, and (ii) from the functional or operational point of view.

Generally a research topic is identified for study and research in a discipline, either to add further to the existing knowledge by creating new ideas or modifying existing knowledge by new findings. A research topic is always selected on the basis of the *theoretical knowledge* of a subject possibly to bridge up a gap or reinterpret a known finding or find new ideas to solve a new problem. To do this, a *hypothesis* is formulated, identifying *variables* to test the hypothesis. The process gets to the next step to find evidences by collecting appropriate *data or facts* by a suitable method, *analyse* the collected data systematically, *interpret* the results to arrive at *conclusions* and *generalise* the findings, possibly to be applied to an appropriate or a typical situation to *test* the result and its *validity* and finally add the validated findings to the already existing body of knowledge after peer review.

Each one of these words or phrases in italics in the sentence above can be deemed to be a functional concept and can be considered as a step-by-step procedure for a research activity. These concepts when integrated, serve as a general functional model of a research process.

Research is characterised by two types viz. Basic Research and Applied Research. Many or most of the concepts stated above are also associated with the process of research in both these types. Basic research — also referred to, as pure or fundamental research, — studies phenomena to get a fuller understanding of it. This is essentially to obtain knowledge of a natural phenomenon whose applications may or may not have any bearing on any application in the immediate future or even after a long time.

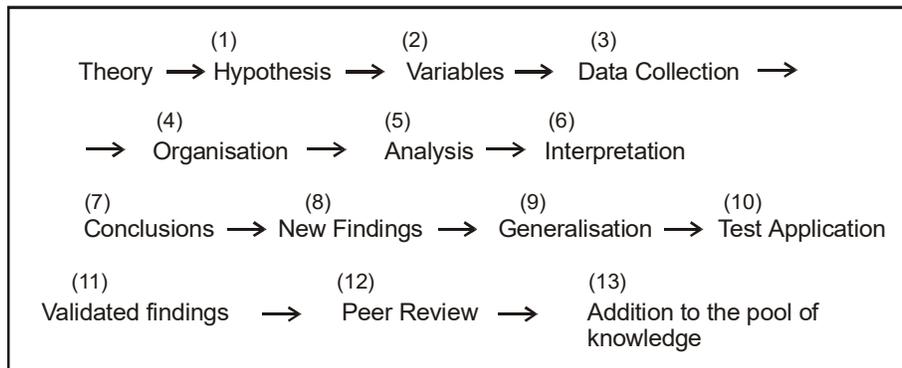
Applied research on the other hand, is to acquire knowledge on the practical application of the theoretical base already built up which is expected to solve a critical problem. Applied Research is usually conducted for industries or governments by universities or by specialised research laboratories or institutions. Applied Research is always for development purposes. It is generally referred to as Research and Development (R& D).

The concepts stated above can be used for planning a research process both in basic or applied research.

## **2.2 Conceptual Framework**

To restate here, the 13 functional concepts stated at the beginning of this Lesson are: Theory, Hypothesis, Variables, Data/facts, Organisation of data/facts, Analysis, Interpretation, Conclusions, Generalisations, Tests for Validity of findings. Application to solve a problem, finally adding to the pool of knowledge.

A schematic diagram given below explains the step-by-step procedure of a research process/methods :



To explain the above schematic diagram, a theory acts as a body of knowledge that establishes a cause and effect relationship between variables with the purpose of explaining and predicting a phenomenon. Theory of a subject is the source from which a topic is identified for research. A gap may exist in already established knowledge and this gap has to be bridged. Filling up this gap may need to be investigated through research. Once the topic for research is identified and taken up for investigation, the first step in research is to formulate hypothesis (es).

### 2.2.1 Hypothesis

The derivation of a suitable hypothesis goes hand in hand with the selection of a research problem. When the mind has before it a number of observed facts about some phenomenon, there is a need to form some generalization relative to the phenomenon concerned.

#### 2.2.1.1 The Concept of Hypothesis

A hypothesis is a statement temporarily accepted as true in the light of what is, at the time, known about a phenomenon, and it is employed as a basis for action in the search of new truth.

A hypothesis is a tentative assumption drawn from knowledge and theory which is used as a guide in the investigation of other facts and theories that are yet unknown.

It is a guess, supposition or tentative inference as to the existence of some fact, condition or relationship relative to some phenomenon which serves to explain such facts which are already known to exist in a given area of research and to guide the search for new truth.

A hypothesis is a tentative supposition or provisional guess which seems to explain the situation under observation.

A hypothesis states what we are looking for. A hypothesis looks forward. It is a proposition which can be put to a test to determine its validity. It may prove to be correct or incorrect.

A hypothesis is a tentative generalisation, the validity of which remains to be seen. In its most elementary stage the hypothesis may be any hunch, guess, imaginative idea which becomes the basis for further investigation.

Science employs hypotheses in guiding the thinking process. When our experience tells us that a given phenomenon follows regularly upon the appearance of certain other phenomena, we conclude that the former is connected with the latter by some sort of relationship and we

form hypothesis concerning this relationship.

Hypotheses reflect the research worker's guess as to the probable outcome of the experiments.

A hypothesis is an assumption or proposition whose tenability is to be tested on the basis of the compatibility of its implications with empirical evidence and with previous knowledge.

A hypothesis is therefore a shrewd and intelligent guess, a supposition, inference, hunch, provisional statement or tentative generalization as to the existence of some fact, condition or relationship relative to some phenomenon which serves to explain already known facts in a given area of research and to guide the search for new truth on the basis of empirical evidence. The hypothesis is put to test for its tenability and for determining its validity.

The testing of a hypothesis is the important characteristic of the scientific method. It is a prerequisite of any successful research, for it enables us to get rid of vague approaches and meaningless interpretations. It establishes the relationship of concept with theory, and specifies the test to be applied especially in the context of a meaningful value judgment. The hypothesis, therefore, plays a very pivotal role in the scientific research method.

#### **2.2.1.2 Characteristics of hypothesis**

Hypothesis must possess the following characteristics:

- (i) Hypothesis should be clear and precise. If the hypothesis is not clear and precise, the inferences drawn on its basis cannot be taken as reliable.
- (ii) Hypothesis should be capable of being tested. In a swamp of untestable hypotheses, many a time the research programmes have bogged down. Some prior study may be done by researcher in order to make hypothesis a testable one. A hypothesis "is testable if other deductions can be made from it which, in turn, can be confirmed or disproved by observation."
- (iii) Hypothesis should state relationship between variables, if it happens to be a relational hypothesis.
- (iv) Hypothesis should be limited in scope and must be specific. A researcher must remember that narrower hypotheses are generally more testable and he should develop such hypotheses.
- (v) Hypothesis should be stated as far as possible in most simple terms so that the same is easily understandable by all concerned. But one must remember that simplicity of hypothesis has nothing to do with its significance.
- (vi) Hypothesis should be consistent with most known facts i.e., it must be consistent with a substantial body of established facts, in other words, it should be one which judges accept as being the most likely.
- (vii) Hypothesis should be amenable to testing within a reasonable time. One should not use even an excellent hypothesis, if the same cannot be tested in reasonable time for one cannot spend a life-time collecting data to test it.
- (viii) Hypothesis must explain the facts that gave rise to the need for explanation. This means that by using the hypothesis plus other known and accepted generalisations, one should be able to deduce the original problem condition. Thus hypothesis must

actually explain what it claims to explain; it should have empirical reference.

### 2.2.1.3 Importance of Hypothesis

Hypothesis has a very important place in research although it occupies a very small place in the body of a thesis. It is almost impossible for a research worker not to have one or more hypotheses before proceeding with his work. If he is not capable of formulating a hypothesis about his problem, he may not be ready to undertake the investigation. The aimless collection of data is not likely to lead him anywhere. The importance of hypothesis can be more specifically stated as under :

- (i) It provides direction to research. It defines what is relevant and what is irrelevant.
- (ii) It sensitizes the investigator to certain aspects of situations which are relevant from the standpoint of the problem in hand. It spells the difference between precision and haphazardness, between fruitful and fruitless research.
- (iii) It is a guide to the thinking process and the process of discovery. It is the investigator's eye — a sort of guiding light in the world of darkness.
- (iv) It focusses research. Without it research would be like a random and aimless wandering.
- (v) It prevents blind research. Prevents indiscriminate gathering of data which may later turn out to be irrelevant.
- (vi) It sensitizes the individual to facts and conditions that might otherwise be overlooked.
- (vii) It places clear and specific goals before us. These clear and specific goals provide the investigator with a basis for selecting samples and research procedures to meet these goals.
- (viii) It serves the function of linking together related facts and information and organising them into one comprehensible whole.
- (ix) It enables the investigator to understand with greater clarity his problem and its ramifications, as well as the data which bear on it. It further enables a researcher to clarify the procedures and methods to be used in solving his problem and to rule out methods which are incapable of providing the necessary data.
- (x) It serves as a framework for drawing conclusions. It makes possible the interpretation of data in the light of tentative proposition or provisional guess, it provides the outline for setting conclusions in a meaningful way.

### 2.2.1.4 Types of Hypotheses

On the basis of level of abstraction, hypotheses may be classified under three categories.

The first type of hypotheses state some degree of uniformity among the empirical phenomena. For example, in an urban market like Bombay, the determinants of demand for TV sets are identical for all the prominent makes, say, Onida, BPL, Crown, Televista, etc. This is a common sense observation.

The second type of hypothesis aim at testing the existence of logically-derived relationships between empirical uniformities. For example, we can compare, and then frame a sceptical proposition that there is some sort of relationship between the empirical uniformities :

- (i) There exists a given magnitude of relationship between the percentage of colour TV programmes and the demand for colour TVs in Bombay;
- (ii) The longer the time the TV viewers view the TV programmes, the greater the demand for TVs; and
- (iii) The more the entertainment programme is in colour, the more the time the viewers spend on watching the TV etc.

The third type of hypothesis deal with a study of analytic variables between changes in one property and changes in another. The dependent variable “demand for TV” in Bombay, Madras and New Delhi and its relationship with the independent variables,, viz. the entertainment programmes, the economic standards of the city inhabitants, the demonstration effect, the promotional budget of the company concerned, etc. arc related to one another.

### 2.2.2 Variables

A variable is an element, entity, or a factor of a research investigation having varying quantitative qualitative values.

A concept which can take on different values is called a variable. As such the concepts like weight, height, income are all examples of variables. Qualitative phenomena (or the attributes) are also quantified on the basis of the presence or absence of the concerning attribute(s). Phenomena which can take on quantitatively different values even in decimal points are called ‘continuous variables’. But all variables are not continuous. If they can only be expressed in integer values, they are non-continuous variables or in statistical language ‘discrete variables’. Age is an example of continuous variable, but the number of children is an example of non-continuous variable. If one variable depends upon or is a consequence of the other variable, it is termed as a dependent variable, and the variable that is antecedent to the dependent variable is termed as an independent variable. For instance, if we say that height depends upon age, then height is a dependent variable and age is an independent variable. Further, if in addition to being dependent upon age, height also depends upon the individual’s sex, then height is a dependent variable and age and sex are independent variables. Similarly, ready-made films and lectures are examples of independent variables, whereas behavioural changes, occurring as a result of the environmental manipulations, are examples of dependent variables.

#### (i) Extraneous variable

Independent variables that are not related to the purpose of the study, but may affect the dependent variable are termed as extraneous variables. Suppose the researcher wants to test the hypothesis that there is a relationship between children’s gains in social studies achievement and their self-concepts. In this case self-concept is an independent variable and social studies achievement is a dependent variable. Intelligence may as well affect the social studies achievement, but since it is not related to the purpose of the study undertaken by the researcher, it will be termed as an extraneous variable. Whatever effect is noticed on dependent variable as a result of extraneous variable(s) is technically described as *an ‘experimental error’*. A study must always be so designed that *the effect upon the dependent variable is attributed entirety to the independent variable(s), and not to some extraneous variable or variables.*

**(ii) Control**

One important characteristic of a good research design is to minimise the influence or effect of extraneous variable(s). The technical term 'control' is used when we design the study minimising the effects of extraneous independent variables. In experimental researches, the term 'control' is used to refer to restrain experimental conditions.

**(iii) Confounded relationship**

When the dependent variable is not free from the influence of extraneous variable(s), the relationship between the dependent and independent variables is said to be confounded by an extraneous variable(s).

**2.2.3 Reasoning : Deduction and induction.**

If we ponder upon the schematic diagram of Research Process Model depicted in the present lesson under the heading conceptual Frame work, it could be easily fished out that reasoning is the backbone of step (6), (7) and (9) i.e. Interpretation, Conclusion and Generalization. With the ladder of reasoning we proceed from unknown to known and could get new horizon of knowledge. It is only reasoning through which we get 4 by adding 2+2. Philosopher have recognized two types of reasoning in their discussion based upon deduction and induction.

**2.2.3.1 Deductive Reasoning**

A significant contribution towards the development of a systematic method for obtaining reliable knowledge was made by the ancient Greek philosophers like Aristotle and his followers. Aristotle developed the *sylogism*, which can be described as a thinking process in which one proceeds from general to specific statements by *deductive reasoning*. It provides a means of testing the validity of any given conclusion or idea by proceeding from the known to the unknown. The syllogistic reasoning consists of (1) a major premise based on a self-evident truth or previously established fact or relationship; (2) a minor premise concerning a particular case to which the truth, fact, or relationship invariably applies; and (3) a conclusion. If the major and minor premises can be shown to be true, the conclusion arrived at is necessarily true. To use a simple example, consider the following proposition:

1. All animals are mortal;
2. Dog is an animal;
3. Therefore, dog will die.

The method of syllogism or deduction, however useful, has the following limitations:

1. The conclusion of a syllogism is always derived from the content of premises. Therefore, if the premises are unrelated or if one of the premises is erroneous, the conclusion arrived at will not be valid.
2. Another serious limitation of the deductive reasoning is its dependence upon verbal symbolism.
3. Deductive reasoning can systematize what is already known and can identify new relationships as one proceeds from known to unknown, but it cannot be relied upon as a self sufficient method for securing reliable knowledge.

### 2.2.3.2 Inductive Reasoning

The conclusions derived from generalities and from statements of presumed authorities by deductive reasoning are true only if they are based upon true premises. To determine whether the premises are true, Francis Bacon stressed the need for basing general conclusions upon specific facts gathered through direct observations. This is what is known as *inductive reasoning*, that is, going from the particular to the general. Rather than accepting premises laid down by authorities as absolute truths, Bacon advised man to observe nature closely, to experiment, to tabulate all the facts, to study these facts in order to reach minor generalizations, and then to proceed from minor generalizations to greater ones. He, however, cautioned against formulating any hypothesis or any probable solution to a problem until all the facts had been gathered.

In deductive reasoning the premises or generalizations must be known before a conclusion can be reached. On the other hand, in inductive reasoning a conclusion is reached by observing instances and generalizing from instances to the whole phenomenon. In order to be absolutely certain of an inductive conclusion, all instances must be observed. Under Baconian system of reasoning it is known as perfect induction. In practical situations, however, it is not possible to examine every instance of a phenomenon to which a generalization refers. When examining all the instances of a phenomenon under study is not practical, one may arrive at a generalization by observing only some instances that make up the phenomenon. This is known as *imperfect induction*.

Although imperfect induction does not help man to arrive at infallible conclusions, it can provide him reliable knowledge upon which he makes reasonable decisions.

Both inductive and deductive methods have advantages and limitations. If premises are true, deductive reasoning helps to arrive at absolutely true conclusions. These conclusions, however, do not probe beyond that, which is already known—already present, at least *implicitly*, in the premises. The conclusions reached by imperfect *inductive* reasoning do contain information that is not present, even implicitly, in one of the premises (the observed instances). If all the premises (observed instances) are true, the probability of conclusions arrived at may be of varying degrees.

### 2.2.4 Observation

Observation is the process in which one or more persons observe that is occurring in some real-life situation and they classify and record pertinent happenings according to some planned scheme. It is used to evaluate the overt behaviour of individuals in controlled and uncontrolled situations. Observational methods have occupied an important place in descriptive research.

As a good research tool, observation needs proper planning, expert execution, and adequate recording and interpretation.

#### 2.2.4.1 Planning for Observation

Observation as a research technique must always be expert and directed by a specific purpose. It is neither haphazard nor unplanned. The planning for observation includes definition of specific activities or units of behaviour to be observed, the nature of the groups of the

subjects to be observed, the scope of observation-individual or group, determination of the length of each observation period, deciding about the tools to be used in making the observation and recording, etc.

According to Good (1966, pp. 244-245) planning for observation include the following factors:

- (i) An appropriate group of subjects to observe.
- (ii) Selection and arrangement of any special condition for the group.
- (iii) Length of each observation period, interval between periods, and number of periods.
- (iv) Physical position of the observer and possible effect on the subject or subjects.
- (v) Definition of specific activities or units of behaviour to be observed.
- (vi) Entry of frequencies or tallies in the record, as a total for the entire observation period or by sub-division of time within the observation period.
- (vii) Scope of observation, whether for an individual child or for a group.
- (viii) Form of recording, including consideration of mechanical techniques and such quantitative factors as number, time, distance, and spatial relationships.
- (ix) Training of the observer in terms of expertness.
- (x) Interpretating of observations.

#### **2.2.4.2 Execution of Observation**

An expert execution of observation includes:

1. Proper arrangement of specific conditions for the subject or subjects to be observed.
2. Assuming the proper role or physical positions for observing.
3. Focussing attention on the specific activities, or units of behaviour under observation.
4. Handling well the recording instruments to be used.
5. Utilizing the training and experience fairly well in terms of making the observation and recording the facts.

#### **2.2.4.3 Types of Observations**

- (i) Observation maybe either participant or non-participant. In the participant observation the observer becomes more or less one of the group under observation.
- (ii) In the non-participant observation, observer takes a position where his presence is not disturbing to the group. He may follow in the detail the behaviour of one individual or may describe one or two behaviour characteristics of a dozen or more individuals.
- (iii) In selecting tests for collecting data in research situations a researcher must evaluate their validity, reliability and usability. These evaluative criteria are considered desirable for a good test.
- (iii) Observation may also be classified as unstructured and structured. Unstructured observation is mainly associated with participant observation and it is often such an exploratory technique. The structured observation are much too formal and they are designed to provide systematic description to test casual hypotheses. Structured observations are executed in controlled

situations like classroom or laboratory settings. Interaction analysis of the classroom verbal behaviour of a teacher is an example of structured observation. Structured observations start with relatively specific formulations.

### 2.2.5 Objectivity

Objectivity is the state of attitude of the researcher and plays a vital role in the validity, reliability and trueness of the objectives of the research and research results. If we keep into the “Schematic Diagram of Research Process Model” under conceptual framework, objectivity has its role and place in research steps namely data collection, data organization, analysis, interpretation, conclusion and generalization. Objectivity means having no purpose and being impartial. It is the expressing or emphasizing the nature of reality as it is, apart from personal reflections or feelings. In another words it is expressing or involving the use of facts derived from perception without distortion by personal feelings or prejudices.

Objectivity refers to methods of collection of data, tabulation of data, data analysis, basis of interpretation, guiding points for conclusion, and foundation of generalization for accuracy in collection and recording of the research phenomenon. It advises us to see a black spot as block and call a spade a spade without laminating it with personal touch. It should away from subjectivity which is just oposite to objectivity. Therefore, objectivity is the acid test for the methods adopted in research process. It can make or mar the whole research process to any level. Therefore, the investigator should act as a tool of research process and should never dictate his/her own term due to personal reasons. This attitude of objectivity will keep the research process in its true directions and will definitely help in generalization and application of the results of the research process.

The objectivity of procedure may be judged by the degree of agreement between the final scores assigned to different individuals by more than one independant observer. Poll questionnaires have greater degree of objectivity to a open end questionnaires.

### 2.2.6 Validity and Reliability

In selecting tests for collecting data in researcher must evaluate their validity, reliability and usability. These evaluative criteria are considered desirable for a good test.

#### 2.2.6.1 Validity

The test, as a data collection tool, must produce information that is not only relevant but free from systematic errors; that it must produce valid information. In general, a test is valid if it measures what it claims to measure. A test, however, does not possess universal and eternal validity. It may be valid for use in one situation but invalid if used in another. Cronbach (1964, p. 103) says that test which helps in making one decision in a particular research situation may have not value at all for another. This means that researcher should not ask the general question. “Is this a valid test?” The pertinent question to ask is “How valid is this test for the decision I wish to make?” Or more generally, “For what decision is this test valid?”

There are different types of validity including: (i) content validity criterion-related validity, and (ii) crieterion related validity, and (iii) construct validity.

- (i) **Content validity** : Content validity is essentially applied only to tests of proficiency and of educational achievement. It is estimated by evaluating the relevance of the test items, in relation to instructional objectives and actual subject matter studied, individually and

as a whole.

This form of validity is based upon judgement of several subject experts and test specialists, careful analyses of instructional objectives, and the actual subject matter studied. This analysis is rational as well as judgement and, therefore, the content validity is sometimes also named as rational or logical validity.

**(ii) Criterion related validity.** In some situations of decision making especially in selection or classification, the decision is based on an individual's expected future performance as predicted from the test score. A test which predicts the kind of behaviour it was intended to predict (e.g. success in a job) is said to possess *predictive validity*. This validity, therefore, refers to the association between present results as indicated by a test and future behaviour; and in order to determine the predictive validity of a test the results from it must be compared with the actual performance in -future. If a test is designed to select students for some engineering course, for example, scores on the test must indicate a significant positive correlation with ultimate success in this field. While establishing the predictive validity of a test a follow up study is required.

In many situations for which tests are developed some cumbersome technique or method of collecting information is already in use. If the existing technique is considered useful for decision making the first question in validation is whether the new test agrees with the present source of information. If they disagree, the new test in spite of its good qualities can certainly not be a substitute for the original technique. The agreement between the test and the existing cumbersome technique for which the test is developed is estimated by an empirical comparison. Both the test and the original technique are applied to the same subjects, and the results are compared. For example, tests developed for some clinical diagnosis are compared with the opinions framed by a psychiatrist. This type of empirical check on agreement is called concurrent validation, because the two sources of information lead to nearly the same results. The validity of the newly developed test thus established is called concurrent validity.

In case of predictive validity, the-record of the outcome may be termed as criterion. While investigating concurrent validity the test is proposed as a substitute for some other existing cumbersome technique. The information obtained through this technique acts as criterion. In both the cases the information obtained through the newly developed tests is related to a criterion and, therefore, the two types of validities are also termed as criterion-related validity. It is worth noting that whilst predictive validity refers to the association between present results and future behaviour, the concurrent validity is concerned with the test's ability to provide an estimate of present behaviour.

**(iii) Construct validity :** Construct validity is concerned with the meaning and interpretation of the test scores obtained in terms of psychological or theoretical constructs. A construct is a trait of ability, temperament, or attitude which is hypothesized to explain certain aspects of behaviour such as 'Achievement Motivation', 'Intelligence', 'Creative Thinking' or Test Anxiety'. Construct validity thus is concerned not only with the test itself but also with the theory which seeks to explain, or to account for the

results which are obtained when the test is used.

### 2.2.6.2 Reliability

A data collection test must be reliable, that is, it must have the ability to consistently yield the same results when repeated measurements are taken of the same individuals under the same conditions. If an individual receives a score of 60 on an achievement test, for example, and is assigned a rank, he should receive approximately the same rank when the test is administered on the second occasion. In the words of Freeman (1965, p. 66) :

“The term reliability has two closely related but somewhat different connotations in psychological testing. First, it refers to the extent to which a test is internally consistent, that is, consistency of results obtained throughout the test when administered once. In other words, how accurately is the test measuring at a particular time? Second, reliability refers to the extent to which a measuring device yields consistent results upon testing and retesting. That is, how dependable is it for predictive purposes?”

Repeated measures of an attribute, characteristics or a trait by a test may produce different results. These may be due to either a real change in behaviour or to the unreliability of the test itself. If the variation in the results is due to a real change in behaviour, the reliability of the test is not doubtful. However, if the variation is due to the test itself, then the test is either internally inconsistent or it can have little predictive value.

There are four procedures in common use for assessing the reliability of a test. They include: (1) The test-retest method, (2) The alternate or parallel forms method, (3) The split-half method, and (4) The rational equivalence method.

*The test-retest method* In this method the same test is re-administered shortly after the first administration, and the two sets of scores are correlated to obtain the reliability of the test. The chief disadvantage of this method is that if the time interval between the two administrations of the test is short, the immediate memory effects, practice and the confidence induced by familiarity with the test: material may overestimate the reliability of the test. On the other hand, if the time interval is long, the real changes in behaviour in terms of growth may under-estimate the reliability of the test. Owing to the difficulties in controlling conditions which influence test scores on the second administration of the test, the test-retest method is generally less useful than the other methods.

*The equivalent or parallel forms method.* This method requires that two equivalent or parallel forms of a test are prepared, administered to the same group of subjects and the results in terms of two sets of test scores are correlated to obtain the reliability of the test.

In drawing up parallel forms, care has to be taken to match test materials for content, difficulty and form; and precautions must be taken not to have the items in the two forms too similar. When the parallel forms are virtually identical, reliability is too high. On the other hand, when parallel forms are not sufficiently alike, reliability will be too low. It is also worth noting that practice effects are not eliminated by this method. In spite of all these limitations, the parallel forms method of determining reliability is widely used.

*The split half method.* In this method, the test is first divided into two equivalent ‘halves’ and the scores on one half of the items are correlated with the scores on the other half. From the

reliability of the half-test, the self-correlation of the whole test is then estimated by Spearman-Brown Prophecy formula. The items of the test can be divided into two sets in a variety of ways. This method of reliability measures the internal reliability of the test and if the two halves do not correlate highly it suggests that they are not measuring the same thing. Moreover, the method has the advantage of controlling the fatigue and practice effects. The main criticism of the method is that a test can be divided into two halves in a number of ways and, therefore, the correlation between the scores on the two halves may not have a unique value.

*The rational equivalence method.* This method of reliability is evolved to get an estimate of the reliability, of a test, free from the objection raised against the methods discussed. Two forms of a test are defined as equivalent when corresponding items are interchangeable; and when the inter-item correlations are the same for both the forms. Two internal consistency formulae developed by Kuder-Richardson are often used to obtain coefficients of equivalence for tests where one point is given for every correct answer and zero for a wrong answer.

*The reliability coefficient.* The reliability of a test is *usually* reported in terms of reliability coefficient; it is the coefficient of correlation between the test and retest scores of the same subjects on the same form or a parallel form of the test, or between the scores on the two halves of the test. The test and retest coefficient becomes a close estimate of the stability of the test scores and, therefore, Cronbach (1964, pp. 139-141) has called it *coefficient of stability*. He has called other coefficients as the *coefficients of equivalence*.

### 2.3 Self Check Exercises

1. Distinction between Definition and Concept.
2. Discuss characteristics of Hypothesis.
3. List basic Concepts of Research Methodology.

### 2.4 Answer to Self-Check Exercises

1. See Section 2.1
2. See Section 2.2.1.2
3. See Section 2.2

### 2.5 References and Books for Further Reading :

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**RESEARCH DESIGN : MEANING, PURPOSE  
PRINCIPLES, COMPONENTS AND CRITERIA.  
LITERATURE SEARCH : PRINT, NON-PRINT AND ELECTRONIC**

**Structure of the lesson**

- 3.0. Objectives
- 3.1 Introduction
- 3.2 Research Design
- 3.3 Purposes of Research Design
- 3.4 Basic Principle of Research
- 3.5 Components of Research Design
- 3.6 Criteria
- 3.7 Literature search
- 3.8 Summary
- 3.9 Self-Check Exercises
- 3.10 Answers to Self-Check Exercises
- 3.11 References and Further Readings

**3.0 Objectives of the lesson**

followings are the objectives of the lesson

- (i) To through light on the definition and concept of Research Design ;
- (ii) To highlight the need and purposes of research design
- (iii) To depict various components of the research design; and
- (iv) To through light on literature search and its various sources.

**3.1 Introduction**

Research involves the quest for answer to unsolved problems, pushing back the dark frontiers of the ignorance in its goal and originality, which is frequently a quality of good research. It is a systematic effort of recording and reporting. Robson has characterised research as systematic, skeptic, and ethic. By systematic, he means that we should be clear about: what we are doing ? Why we are doing : and how we are doing ? Skepticism denotes that we should check, cross-check and verify our views before finalizing them. Researchers should not violate ethical codes while conducting research, whether it is conceptualization of topic, data collection, analysis or presenting the results.

Research is of two types : pure and applied. The modern trend of is toward applied research, but it is not to belittle pure research, as each one is complimenting and supplementing the other.

Research needs to be systematic and organized. Research design is a step to carry out

research in planned way.

### **3.2 Research Design :**

Research is an important activity affecting the society as a whole, therefore, it involves a lot of decision making. Research design provides a STRUCTURE and SHAPE to research project.

#### **3.2.1 Definitions**

Research design has been defined by different social scientists in different terms. All these definitions emphasise systematic methodology in collecting accurate information for interpretation with economy in procedure. To mention a few definitions, Miller has defined “Designed research” as “the planned sequence of the entire process involved in conducting a research study.” According to Selltitz and others, “Research design is a catalogue of the various phases and facts relating to the formulation of a research effort. It is an arrangement of the essential conditions for collection and analysis of data. in a form that aims to combine relevance to research purpose with economy in the procedure.”

A few other definitions of research design are: “A research design designates the logical manner in which individuals or other units are compared and analysed, it is the basis of making interpretations from the data.”

“The challenge of a research design is to translate the general scientific model into a practical research operation. Research design will refer to the entire process of planning and carrying out a research study.”

“Research design is the plan, structure and strategy of investigation conceived so as to obtain answers to research questions and control variance.

In fact, the research design is the conceptual structure within which research is conducted; it constitute the blue print for collection, measurement and analysis of data and its interpretation towards generalization.

#### **3.2.2 Parts of Research Design**

Keeping in view the above stated definitions of Research design, one may split the overall research design into the following parts:

- (a) *the sampling design* which deals with the method of selecting items to be observed for the given study;
- (b) *the observational design* which relates to the conditions under which the observations are to be made;
- (c) *the statistical design* which concerns with the question of how many items are to be observed and how the information and data gathered are to be analysed; and
- (d) *the operational design* which deals with the techniques by which the procedures specified in the sampling, statistical and observational designs can be carried out.

#### **3.2.3 Features of Research Design**

From what has been stated above, we can state the important features of a research design as under:

- (i) It is a plan that specifies the sources and types of information relevant to the research problem.

- (ii) It is a strategy specifying which approach will be used for gathering and analysing the data.
- (iii) It also includes the time and cost budgets since most studies are done under these two constraints.

In brief, research design must, at least, contain — (a) a clear statement of the research problem; (b) procedures and techniques to be used for gathering information; (c) the population to be studied; and (d) methods to be used in processing and analysing data.

### 3.3 Purpose of Research Design

The purpose of Research design is to facilitate the smooth sailing of the various research operations, thereby making research as efficient as possible yielding maximum information with minimum expenditure of effort, time and money. Just as for better, economical and attractive construction of a house, we need a blueprint (or what is commonly called the map of the house) well thought out and prepared by an expert architect, similarly we need a research design or a plan in advance of data collection and analysis for our research project. Research design stands for advance planning of the methods to be adopted for collecting the relevant data and the techniques to be used in their analysis, keeping in view the objective of the research and the availability of staff, time and money

The purpose of Research Design is to provide the information regarding :

- (i) What is the study ?
- (ii) Why is the study being carried out ?
- (iii) Where will the study be carried ?
- (iv) How will the study be carried ?
- (v) What will the processes and tasks involved ?
- (vi) What will be the data ?
- (vii) How will be data collected ?
- (viii) What method of sampling will be used ? and
- (ix) How will the analysis be done ?

#### 3.3.1 Functions of Research Design

On the basis of aforesaid purposes the functions of Research Design may be as under :

- (i) Provide a plan to undertake systematic study and help to devise procedure to undertake the research work; and
- (ii) Ensure objective, valid and economic undertaking of the study. To sum up Research Design enables the researcher to put his study on a sound scientific footing. He is able to decide in advance the what, why and how of his study. It acts as a guide to conduct the various steps of the study in an objective, valid and economic way.

### 3.4 Basic Principles of Research Designs

Professor Fisher has enumerated three principles of experimental designs: (1) the Principle of Replication; (2) the Principle of Randomization ; and the (3) Principle of Local Control.

(1) According to the *Principle of Replication*, the experiment should be repeated more than once. Thus each treatment is applied in many experimental units instead of one. By doing so

the statistical accuracy of the experiments is increased. For example, suppose we are to examine the effect of two varieties of rice. For this purpose we may divide the field into two parts and grow one variety in one part and the other variety in the other part. We can then compare the yield of the two parts and draw conclusion on that basis. But if we are to apply the principle of replication to this experiment, then we first divide the field into several parts, grow one variety in half of these parts and the other variety in the remaining parts. We can then collect the data of yield of the two varieties and draw conclusion by comparing the same. The result so obtained will be more reliable in comparison to the conclusion we draw without applying the principle of replication. The entire experiment can even be repeated several times for better results. Conceptually replication does not present any difficulty, but computationally it does. For example, if an experiment requiring a two-way analysis of variance is replicated, it will then require a three-way analysis of variance since replication itself may be a source of variation in the data. However, it should be remembered that replication is introduced in order to increase the precision of a study; that is to say, to increase the accuracy with which the main effects and interactions can be estimated.

(2) *The Principle of Randomization* provides protection, when we conduct research against the effects of extraneous factors by randomization. In other words, this principle indicates that we should design or plan the experiment in such a way that the variations caused by extraneous factors can all be combined under the general heading of "chance." For instance, if we grow one variety of rice, say, in the first half of the parts of a field and the other variety is grown in the other half, then it is just possible that the soil fertility may be different in the first half in comparison to the other half. If this is so, our results would not be realistic. In such a situation, we may assign the variety of rice to be grown in different parts of the field on the basis of some random sampling technique, i.e., we may apply randomization principle and protect ourselves against the effects of the extraneous factors (soil fertility differences in the given case.) As such, through the application of the principle of randomization, we can have a better estimate of the experimental error]

(3) *The Principle of Local Control* is another important principle of experimental designs. Under it the extraneous factor, the known source of variability, is made to vary deliberately over as wide a range as necessary and hence eliminated from the experimental error. This means that we should plan the experiment in a manner that we can perform a two-way analysis of variance, in which the total variability of the data is divided into three components attributed to treatments (varieties of rice in our case), the extraneous factor (soil fertility in our case) and experimental error. In other words, according to the principle of local control, we first divide the field into several homogeneous parts, known as blocks, and then each such block is divided into parts equal to the number of treatments. Then the treatments are randomly assigned to these parts of a block. Dividing the field into several homogeneous parts is known as 'blocking'. In general, blocks are the levels at which we hold an extraneous factor fixed, so that we can measure its contribution to the total variability of the data by means of a two-way analysis of variance. In brief, through the principle of local control we can eliminate the variability due to extraneous factor(s) from the experimental error.

### 3.5 Components of Research Design

On the basis of the purposes of research design, the components of research design are as under :

(1) Title of investigation, (2) Purpose of study, (3) Critical appraisal of previous studies (4) Statement of problem; (5) Scope of investigation, (6) Objective of the study, (7) Conceptualization of related terms, (8) Variables (9) Hypothesis (10) Selection of sample (11) Data collection, (12) Analysis of data, (13) Tabulation of data, (14) Interpretation of results, (15) Verification of results, (16) Conclusion, (17) Suggestion for further research, (18) Summary (19) Bibliography, and (20) Annexure.

### **3.5.1 Title of the Investigation**

The title of any research project.

- Should be as brief as possible.
- Should be as precise as possible.
- Should project the scope of the problem in generalised terms.

### **3.5.2 Purpose of the Study**

A brief mention of the importance of the area of research in the present context should be attempted highlighting the main purpose which prompted the investigator to take up the present study.

### **3.5.3 Critical Appraisal of Previous Studies**

Instead of reviewing previous studies for the sake of doing it; critical appraisal of previous studies is more meaningful, useful and a correct approach in any field of investigation for the following reasons :

- (i) To know about the different areas covered by various studies in the field of investigation in which the investigator is interested and to categorise them accordingly.
- (ii) To get acquainted with the different meanings given to certain concepts and the usage of different concepts in various studies and arrive at the meanings of different concepts used in the present study.
- (iii) To concentrate on the areas where little research has been carried out and to give less importance to the areas which have already been thoroughly investigated while delimiting the scope of the present study.
- (iv) To look into different merits and shortcomings of the research designs followed in different studies with a purpose to retain the merits of different studies and cover up the loopholes while designing the plan of research for the present study.
- (v) Finally, to verify the present findings with the previous findings discussing the results of the present study.

### **3.5.4 Statement of the Problem**

Once the researcher is able to collect different studies conducted in his field of investigation from various sources and examine each one of them critically for the points mentioned above, he will be in a position to state his problem in unambiguous and more precise terms. Usually, the problem of investigation is stated in two ways—(i) in the form of a statement or (ii) question form. In some cases the problem is stated with the help of more than one statement or a question.

### **3.5.5 Scope of the Investigation**

The scope of any researcher is dependent on several factors such as the time and money

available to the investigator, availability of the sample, accessibility of the investigator to the respondents, the amount of time the respondents can spare for the investigator etc. Once the scope of the investigation is delimited, the investigator will report the scope in explicit terms while giving out the limitations of his investigation.

### 3.5.6 Objectives of the Study

The researcher will spell out the objectives of the present study in the form of statements and while doing so, he takes care that the objectives mentioned are well within the scope of the investigation envisaged by him.

### 3.5.7. Conceptualisation of the Different Terms Used in the Investigation

The researcher should be clear about the meaning of every term he uses. It not only helps him but also the other investigators, respondents and readers of the research report in understanding the different terms without any ambiguity. Normally these concepts are explained either in the form of nominal definitions or in the form of operational definitions.

Sometimes, the investigators even define a variable operationally with the help of items in the questionnaire or interview schedule.

The investigator usually engages himself in the following exercise before arriving at the operational definitions of the different terms. The investigator will : (a) discover the various dimensions involved within the concept, (b) correlate these different dimensions so that all possible types can be discerned, (c) reduce the number of types to be studied, (d) translate those types selected for study into operational categories and empirical indices.

It is always advisable to define each concept both : (i) in abstract terms giving the general meaning it intends to convey, and (ii) in terms of operational categories by which it is represented in a particular study.

### 3.5.8 Variables

The word variable refers to an event or process that can be changed or can change on its own accord. The variables are classified in several ways. A few of them are mentioned below:

*Qualitative variables* are usually discrete in their nature. For example, sex, methods of teaching etc.

*Quantitative variables* are usually continuous in their nature and are broadly categorised into four types—the nominal, ordinal, interval and ratio variables.

- (i) *Nominal variables* (i.e., variables measured by nominal scales). Nominal variables make it possible to establish relations to equality or diversity for any pair of objects but they do not enable us to ascertain that one object belonging to a particular group has a given feature in a higher, degree than another object belonging to the same group, e.g., Indians, Punjabi University players group (i) and group (ii) etc.
- (ii) *Ordinal or ranking variables*: These variables enable us to state whether two objects, compared from a given point of view, possess a given property to the same degree or whether one has it to a higher degree.
- (iii) *Interval variables*: These variables make it possible to establish by how much one of the two objects possesses a given feature in greater measure than the other. However interval variables does not permit to determine, how many times a given

object has a given feature to a more intensive degree, e.g., calendar time, temperature scale where an arbitrary zero has been set by convention.

- (iv) The last category of variables consists of *ratio variables*, i.e., those attributing a certain absolute value of intensity to a certain variable, thus permitting comparison not only of the distances between different values but also the ratio between them, e.g., speed of a vehicle, when expressed in terms of KMPH, the speed has an absolute zero value of immobile vehicle.

In experimental research the following terminology is commonly used — independent variables, dependent variables and interfering variables.

*Independent variables* are those variables which are manipulated by the experimenter in his attempt to ascertain their relationships to an observed phenomenon. Independent variables are also known as stimulus variables and antecedent variables.

*Dependent variables* or response variables or consequent variables are those events which are hypothesised as dependent on the changes in the independent variables.

*Interfering variables* or mediating variables or intervening variables are those variables which distort the relationship between the independent and the dependent variables.

### 3.5.9 Formulation of Hypothesis

A tentative solution suggested to a problem is called a hypothesis. McGuigan (1969) has defined hypothesis as a testable statement of a potential relationship between two (or more) variables. A hypothesis is usually framed depending on one or more of the following sources :

- facts established by previous investigations in the related areas,
- through the investigator's experience and observation, and
- through the investigator's reasoning, insight and logical derivation from a theory.

For any reason, if the researcher cannot make use of any of the above sources to frame a hypothesis, he will have to resort to 'Null hypothesis', which assumes 'no relationship' between the variables under consideration.

McGuigan suggested the following criteria to frame a good hypothesis.

- (i) The hypothesis must be an adequate answer to the specific problem that demanded an answer.
- (ii) The hypothesis should have logical simplicity.
- (iii) The hypothesis should be expressed in a quantified form or be susceptible to convenient quantification.
- (iv) The hypothesis must be verifiable.
- (v) The hypothesis must be stated in such a way as to allow it to be refuted.

### 3.5.10 Selection of the Sample

It is needless to say that no investigator can study the entire population and hence selects a few individuals belonging to a population for the purpose of his investigation. These selected individuals form a sample and while selecting these individuals the investigator should consider the following facts:

- (i) *Definition of the Population*

The investigator should define population in operational terms, describing it with all the necessary identifiable characteristics.

(ii) *Sample Size*

Depending on the mode of research the sample size varies. For example, in experimental research the sample size is very small compared to that of descriptive research.

(iii) *Representativeness of the Sample*

When a sample is selected, it is assumed that it represents the population for which it stands. Failure of this is failure of entire research study.

### **3.5.11 Data Collection**

*Construction/Adaptation of Instruments*

The investigator should now find instruments for collecting the data required by the hypotheses. The investigator himself may have to construct these instruments or he may have to adopt the readily available instruments to suit the local conditions the investigator may adopt other methods like observation, examination of records and so forth for data collection. Each of these various methods has its own advantages and limitations, which will be discussed in detail in the forthcoming chapters.

*Administration of the Questionnaires/Tests etc.*

Depending on the nature of the questionnaire/test and the purpose of the investigation, the investigator decides whether to administer the questionnaire/test individually or in small groups or in large groups.

### **3.5.12 Analysis of the Data**

Complete planning of analysis in advance is not always possible or even desirable; new ideas occur to the investigator as he collects the data. But, except in exploratory studies, it is always possible and desirable to work out in advance the basic outlines of the analysis. Depending on the nature of the data and the information required by the hypothesis, the investigator should subject the data to appropriate statistical analysis.

### **3.5.13 Tabulation of the Results**

Tabulation of the results in a meaningful way is by itself a technique and an art. Each table should be given a suitable heading and followed by a discussion.

### **3.5.14 Interpretation of the Results**

The results of an investigation are to be interpreted:

(i) *With Reference to Previous Studies*

The knowledge previously accumulated by the investigator by his earlier review of research will have a great impact on the interpretation of the results.

(ii) *Generalisation*

The investigator can safely generalise findings obtained in his study, provided he has information regarding the: (a) definition of the population from which the representative sample is selected, (b) reliability of statistics, (c) level of significance of statistics set by him for testing the hypothesis.

(iii) *Looking for Unusual Cases*

It is customary to test the difference or relationship between two or more variables as significant or not and to interpret the data accordingly. But, at times, deviant cases may reveal additional factors which should be taken into consideration in order to increase the predictive value of the

#### **3.5.15 Verification of Results**

The same methods of data collection should be employed on some other small representative sample of the population and the data should be analysed to check whether these results confirm the earlier findings. In case the results are not confirmed on the second occasion, the investigator should think over the loopholes of the research design if any and rectify them in collecting further data.

#### **3.5.16 Conclusions**

The results for which cross validity is established (i.e., the results verified for the second time) can be used for drawing conclusions.

#### **3.5.17 Suggestions for further Research**

No research is an end in itself. The investigator should be able to give directions to the future researchers from the insights he has gained during the investigation.

#### **3.5.18 Summary of the Report**

The investigator should give a summary of the entire investigation briefly highlighting the findings of the present investigation and suggestions for the future research.

#### **3.5.19 Bibliography**

There are different ways of reporting the bibliography. The investigator can select any method he likes but should follow the same procedure throughout. The following order is usually observed by a large number of investigators while reporting the references.

The sequence may be

Name of author (years of Publication) : Title of the book/

Title of article. Name of Journal. Vol (No). Page No referred. Publisher's address.

#### **3.5.20 Annexure**

Other important documents used but are not given in the main body of the research report i.e. Letter of permission, questionnaires etc. are given in annexure for ready references.

### **3.6 Criteria of Research Design**

Before considering the criteria of good research design, it may be mentioned here that any mode of research— descriptive, explorative, experimental, evaluative, diagnostic, prognostic— incorporates all the essential components of a research design but more importance is given to certain aspects of a research design in a particular type of research compared to the other.

It must be noted that the research hinges heavily on collection of data for getting the right evidences and the subsequent operations of assembling them in a logical way, and organising the data for analysis and interpretation.

A research design should have the attributes like objectivity, reliability, validity and generalisation to ensure a reasonable quality in the collection of data and recording them.

Objectivity refers to the method of collection of data to obtain accuracy in recording the scores. The measuring instrument should also measure accurately without any subjectivity.

Reliability is the attribute of consistency in measurement. “A respondent is expected to give the same response to a particular item every time he is asked about it. In case, a respondent keeps on changing his response, then it would be difficult to decide as to which of the responses should be considered a genuine response.

There are different methods of determining reliability of responses given by a respondent. These include use of (a) check items (b) administering the same test repeatedly and (c) series of parallel forms.” (Krishan Kumar, 1999)

Validity pertains to the appropriate measuring instrument, it is taken to measure. For instance, a job satisfaction test should only measure job satisfaction and nothing else. There are different procedures adopted for establishing the validity of a test. These include validating the present data against ‘concurrent’ criterion of a future principle or a theory etc.

From the application of the above attributes, a research design should use appropriate measuring instruments to yield objective, reliable and valid data. The data analysis

### **3.6.1 Features of a Good Design**

A good design is often characterised by adjectives like flexible, appropriate, efficient, economical and so on. Generally, the design which minimises bias and maximises the reliability of the data collected and analysed is considered a good design. The design which gives the smallest experimental error is supposed to be the best design in many investigations. Similarly, a design which yields maximal information and provides an opportunity for considering many different aspects of a problem is considered most appropriate and efficient design in respect of many research problems. Thus, the question of good design is related to the purpose or objective of the research problem and also with the nature of the problem to be studied. A design may be quite suitable in one case, but may be found wanting in one respect or the other in the context of some other research problem. One single design cannot serve the purpose of all types of research problems.

A research design appropriate for a particular research problem, usually involves the consideration of the following factors:

- (i) the means of obtaining information;
- (ii) the availability and skills of the researcher and his staff, if any;
- (iii) the objective of the problem to be studied;
- (iv) the nature of the problem to be studied; and
- (v) the availability of time and money for the research work.

### **3.7 Literature Search**

Researcher takes the advantage of the knowledge which has accumulated in the past as a result of constant human endeavour. Research can never be undertaken in isolation of the work that has already been done on the problems which are directly or indirectly related to a study proposed by a researcher. One of the important steps in the planning of any research study is a careful review of the research journals, books, dissertations, theses and other sources of informations on the problem to be investigated. Therefore, a review of the related literature must precede any well planned research study.

### 3.7.1 Objectives of Literature Search

- (i) To enable the researcher to define the limits of his field;
- (ii) To avoid unfruitful and useless problem areas;
- (iii) To avoid unintentional duplication of well established findings;
- (iv) To give an understanding of the research methodology; and
- (v) To know previous recommendations.

After identification of a research topic (defining the topic) and formulation of the problem, carry out survey of the available literature. This step deals with identifying, locating and gathering information regarding the research topic, the kind of data to be gathered, the procedure to be followed and where it is to be gathered, would depend upon the type of the topic being investigated. To gather enough background information or contextual information, generally start with secondary sources, to find out how the previous researchers have done similar research, what sources and research methodology they adopted. Every secondary source of historical data would suggest other sources including bibliographic tools as given below:

- Monographs, journal articles;
- Bibliographic tools: Library catalogues, bibliographies, indexing and abstracting services, research guides, bibliography of bibliographies, etc.; and
- Reference sources: Encyclopedias, dictionaries, yearbooks and annuals, etc.

History is primarily based on the study of written or printed sources, now there is a flood of **electronic sources**, many of them available on the **Internet**. Typically, these are classified as primary, secondary and tertiary sources. These may be **published sources**, manuscripts (handwritten) or **nonprint materials**.

### 3.7.2 Primary Sources

A primary source is a document that contains the original statement on the topic being investigated by the researcher. These contain evidence that is closest to the event under investigation as recounted by observers and participants. Primary sources represent “the data which lie closest to the historical event. They are considered to include the testimony of eye-witnesses, or observations made with one or the other senses or by some mechanical device. In most cases, primary sources are the written record of what the writer actually observed or the first-hand expression of his or her thoughts” (Powell, 1991, p. 139). Thus, it is the direct outcome of the event or the record of eyewitnesses. It bears direct involvement with the event being studied, such as diaries, letters, speeches, and an interview with the person who personally experienced the event, original map, etc. It is not a copy, a repackage or summary of the original. The basic criteria to identify a particular source as a primary document is, just ask, “Is it a firsthand account”

These include the following:

- Documents generated by the events themselves such as archival records (governmental, institutional, commercial, ecclesiastical, etc), internal letters and memoranda (memos), speeches, summaries or minutes of conferences and meetings, photographs of people, buildings and equipment, statistical information (such as tally sheets and surveys), lists of holdings (goods, equipment, etc), and reports and statements

(mission statements, employees guidelines, rules and regulations etc);

- Documents produced to record events immediately such as chronicles, diaries, reports produced by journalists and interviews conducted by them, drawings and photographs, motion picture films, tape recordings and video recordings;
- Documents in supplementary forms produced much later in the form of oral sources, oral traditions and folklores, languages themselves, say fables, folktales, folklore etc are a good source; and
- Artifacts or realia such as inscriptions, seals, coins, medals, drawings, pictures, ruins of monuments.

### 3.7.3 Secondary Sources

A secondary source is the one derived or created from a primary source (that first reported the event being studied). It reports events based on use of primary and other secondary sources as bases of data collection. It contains information reported by a person who did not directly observe the event, object, or condition (Key, 1997, p. 1). Thus, these report events by a person other than a direct observer or a participant in the events. These are considered less useful than primary sources. A secondary source may be one or more steps removed from the primary source in terms of time, place or authorship. A source becomes a primary or secondary source depending upon its proximity to the actual event under investigation (Powell, 1991,p.140).

Examples of secondary sources are given below:

- Textbooks
- Encyclopaedias
- Monographs
- Articles in magazines.

A copy of an original document is a secondary source as it may not be an authentic one. In copying from the original document, certain errors or omissions can occur intentionally or unintentionally. The original might get modified at the stage of copying through editing or interpretation.

### 3.7.4 Tertiary Sources

These sources include bibliographies, catalogues and indexes that guide a researcher to primary and secondary sources.

### 3.7.5 Internet

In recent years, Internet has become a significant resource for research, a revolutionary communications delivery system. This is due to the growth of World Wide Web, an Internet interface having sound, graphical and video facilities. Many academic, professional, commercial and government organisations have established their web sites providing valuable data and information. There are libraries that have set up digital libraries, such as National Digital Library of Library of Congress, New York Library Digital Library etc. Lot of useful data is available along with trash and propaganda material.

**Subject directories** and **search engines** are useful in finding history sources. There are thousands of primary sources relating to history available on the web and gopher FTP files. The problem with many of these **web sites** is that often the basic information required by a historian to evaluate the accuracy, completeness and genuineness of the sources is missing, such as purpose of

the website, the location of the manuscript or printed source used for preparing the online document. Sometimes, the material is written from a particular point of view, or the facts may be misinterpreted to serve a particular end. More often, web sites set up by academic bodies and governments are considered more authoritative. Very often, it takes too much time to load the page. To have a fast search, cue would require a computer with a fast processor and a modem. It is much more difficult to search Internet for secondary sources than primary ones.

Searching is full of problems. Each **search engine** uses its own methodology for searching. On a particular topic (based on search of words and phrases), it may provide such a large number of documents that the searcher may have to spend too much of time to select the relevant ones, thereby losing patience. However, one must remember that more time is consumed, if one were to go to a library personally to locate the required document. It may or may not be available on the shelf. It could be in the hands of a reader or borrowed out. In case, the library has to get a document on inter-library loan, then it would take a few days or weeks to get it.

In searching information, one comes across some serious problems as given below

“One very frustrating problem: sometimes when you select a link, a message informs you that the server (computer) on which the material resides somewhere in the world is not accepting your request and suggests that you try again later. (An immediate retry sometimes gets results, sometimes not.) At times you will get a message stating that the site does not have a DNS number. (Sometimes an immediate retry proves the message wrong!) From time to time you will find that the material you want is available but, for one or more reasons, you have to wait a long time for it to load”. “A related problem, and one far more serious, is that links lead one to messages stating that the material requested is “not found,” meaning probably that, the link, when created, was good, but the document or directory is no longer on the Internet or has a different address. Sometimes this difficulty can be overcome by using a search engine to do a title search, sometimes not”.

### **3.7.6 Digital and Electronic**

Many special issues of scholarly journals have been brought out on various issues concerning digital libraries (for example. Communications of the ACM, April 1995; DESIDOC Bulletin of Information Technology, November 1997; Journal of the American Society for Information Science, September 1993, and October 1994; and SIGLINK Newsletter, February 1995 to name a few). Important amongst the many initiatives launched is the joint initiative of Advanced Research Projects Agency, National Aeronautics and Space Administration and the National Science Foundation of the USA who announced several digital library projects involving Carnegie Mellon University, Stanford University of Michigan (Ann Arbor), University of California (Santa Barbara), University of Illinois (Urbana Champaign) and University of California (Berkeley), to advance the means to collect, store and organise in digital format and to make it available for searching, retrieval, and processing via communication networks. Many other universities and also **OCLC** have undertaken projects involving digital libraries. The Library of Congress is making efforts to transform traditional print collections into versatile electronic resources under its National Digital Library Program, which aims to digitise 5 million items by the year 2000. Also, in the United Kingdom, the British Library, the ELINOR Electronic Library Project of De Montfort University, University of East Anglia, University of Bath, University College London, University of Wales, University of Ulster, University

of Surrey, etc. are making efforts towards electronic/digital libraries.

On the publishers front, in the recent past, many reference books and tools, literary works, religious books and scholarly periodicals were brought out in digital form. Almost all major databases like INSPEC, MEDLINE, BIOSIS, ERIC, CAB Abstracts, Compendex Plus, Metade, MathSci, ABI Inform, AIDSLINE, Agricola, Chemical Abstracts, NTIS, ASTI, etc. are available on CD-ROM and printed formats. On the journals front, many commercial publishers like Elsevier, WH Wilson, Silver Platter, Wiley, McGraw-Hill, Academic, Kluwer, etc. and professional societies like IEEE, IEE, ACM, ACS, American Institute of Physics, etc. are bringing out electronic versions of journals. There are many journals available on-line only through networks like Internet. In the near future we may expect increased number of digital publications.

In many libraries and information centres, the electronic information component added is steadily increasing. Their slow transformation to electronic libraries has been visible, at least in the case of elite institutions, through the functions and services offered and also in terms of enhanced information access to and increased demands by the library users.

### **3.8 Summary**

Research design has been defined by different social scientists in different terms. It is an important activity affecting the society as a whole. The purpose of Research design is to facilitate the smooth sailing of various research operations. Purpose, features and functions of design have been discussed in the lesson. Review of literature is significant aspect of research design. The lesson makes a useful explanation of Primary, Secondary and Tertiary sources of information.

### **3.9 Self-Check Exercise**

1. What is Research Design ?
2. List purposes of Research Design.
3. List components of Research Design.
4. Importance of Literature search.

### **3.10 Answer to Self-Check Exercises**

1. See Section 3.2
2. See Section 3.3
3. See Section 3.5
4. See Section 3.7

### **3.11 References and for further Reading**

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**INSTRUMENTS OF RESEARCH : SCHEDULE, QUESTIONNAIRE, INTERVIEW  
AND OBSERVATION**

**STRUCTURE**

- 4.0. Objectives
- 4.1. Introduction
- 4.2. Definition of Research
- 4.3. Instruments of Research
- 4.4. Schedule
  - 4.4.1. Differentiated from Questionnaire
  - 4.4.2. Merits of Schedule
  - 4.4.3. Demerits of Schedule
  - 4.4.4. Types of Schedule
    - 4.4.4.1. Observation Schedule
    - 4.4.4.2. Rating Schedule
    - 4.4.4.3. Document Schedule
    - 4.4.4.4. Interview Schedule
- 4.5. Questionnaire
  - 4.5.1. Advantages
  - 4.5.2. Disadvantages
  - 4.5.3. Purpose
  - 4.5.4. Designing the Questionnaire
  - 4.5.5. Typology
    - 4.5.5.1. Structured Questionnaire
    - 4.5.5.2. Unstructured Questionnaire
  - 4.5.6. Questions : Choice and Wording
  - 4.5.7. Distribution
  - 4.5.8. Validity and Reliability
- 4.6. Interview
  - 4.6.1. Difference between Interview and Questionnaire
  - 4.6.2. Objectives
  - 4.6.3. Advantages
  - 4.6.4. Disadvantages
  - 4.6.5. Types
    - 4.6.5.1. Structured Interview
    - 4.6.5.2. Unstructured Interview
  - 4.6.6. Interview Process

- 4.7. Observation
  - 4.7.1. Definitions
  - 4.7.2. Concept
  - 4.7.3. Advantages
  - 4.7.4. Disadvantages
  - 4.7.5. Guidelines
  - 4.7.6. Observation Devices
  - 4.7.7. Recording Observations
  - 4.7.8. Systematizing Data Collection
  - 4.7.9. Types of Observation
    - 4.7.9.1. Unstructured Observation
    - 4.7.9.2. Structured Observation
    - 4.7.9.3. Participant Observation
    - 4.7.9.4. Non-Controlled Observation
    - 4.7.9.5. Controlled Observation
  - 4.7.10. Validity and Reliability
- 4.8. Summary
- 4.9. Self-Check Exercises
- 4.10. References

#### **4.0. OBJECTIVES**

After study of this lesson, you would be able to :

- (1) Understand Instruments of Research;
- (2) Know various aspects of Schedule;
- (3) Understand various aspects of Questionnaire;
- (4) Know various aspects of observation; and
- (5) Pick up various aspects of Interview.

#### **4.1. INTRODUCTION**

Man has always been curious to know about the world around him. He has been gaining knowledge through everyday events; his first-hand experiences; and use of logical reasoning. All these contribute for developing his knowledge. In recent times a more efficient and effective approach to expand knowledge adopted by him, is the conduct of special, planned and structured investigations. This process is known as research that leads to the growth of knowledge.

#### **4.2. DEFINITION OF RESEARCH**

The term research has different connotations in different contexts. The *Webster's International Dictionary* defines research as "a careful critical enquiry or examination in seeking facts for principles, diligent investigation in order to ascertain something." This can lead to the discovery of new facts. According to Charles Busha, research, in the larger context is a "systematic quest for knowledge that is characterised by disciplined inquiry."

However, a large number of definitions of research are available which focus

on the nature, aim, purpose, result and use of research in the society.

#### **4.3. INSTRUMENTS OF RESEARCH**

There are various instruments of research available for collecting information. Some of the important instruments or tools of research use are :

1. Schedules
2. Questionnaire
3. Interview; and
4. Observation

These are discussed below in brief :

#### **4.4. SCHEDULE**

It is one of the important instruments of social research commonly used in surveys of various kinds. Schedule draws its data from self reports of respondents regarding their opinions, beliefs, attitudes, feelings, motivations, activities etc. Schedule includes standardized questions arranged in a definite order. The researcher seeks responses from all the individuals constituting the sample with a view to obtaining comparable results.

##### **4.4.1. Differentiated Questionnaire**

The schedule has so much in common with the questionnaire that they are often used synonymously. As a result the distinction between the two is blurred. However, the subtle difference between the questionnaire and schedule can be pointed out for the purpose of clarification.

The questionnaire involves a situation in which the respondent himself fills in the answers to questions included in the instrument. The instrument may be mailed or handed over personally to the respondent by the researcher.

The schedule, on the other hand, involves a face to face situation in which the researcher plays the role of an interviewer. Therefore, he/she asks the respondents all the questions included in the instrument, and also records the answers. This allows sufficient room for flexibility in the schedule.

In the case of questionnaire, the instrument has to be understood and used by the respondent unaided, which in the case of schedule, those administering it are supposed to have special training in handling it. Thus, the difference between the two lies in approach, especially in regard to the type of respondents effectively dealt with them, and the type of personnel required for research through them.

##### **4.4.2. Merits of Schedule**

Some of the merits of this instrument are as follows :

1. The comparative reliability and validity of data is more.
2. Interviewer/Researcher being personally present, there is possibility of gathering unbiased response as the misunderstandings, if any, can be clarified there and then. Complicated questions can be asked in a simplified manner during interview.
3. It helps to collect additional information.
4. It also helps to have an idea about the attitude of the respondents.
5. The non-response is much reduced.

#### 4.4.3. Demerits of Schedule

1. It is costly affair in terms of funds and time because of personal visit/s of the investigator to every respondent.
2. It may create administrative problems.
3. The presence of interviewer may prove a source of bias to the respondent.
4. The interviewer may unconsciously modify the respondent's attitudes and feelings in order to make them socially more reliable.

#### 4.4.4. Types of Schedule

In social science research the schedule could be of the following types :

##### 4.4.4.1. Observation Schedule

This schedule contains specific topics upon which the observer has to deal with the nature of information that has to be recorded. This type of schedule is therefore used for observation purpose.

##### 4.4.4.2. Rating Schedule

The use of this schedule is made to measure the attitude or opinion of the respondent. Generally, it is used in sociological or psychological research. The attitudes or opinions are measured through different ranks or scales.

##### 4.4.4.3. Document Schedule

It means schedule used for recording data from written documents like autobiography, diary or official records maintained by the Government. For example, the use of document schedule is made in preparing the source list of collecting preliminary information about the population.

##### 4.4.4.4. Interview Schedule

This type of schedule is used for interview purpose. It contains standard questions to be asked to interviewee for getting information from him.

#### 4.5. QUESTIONNAIRE

Questionnaire is most commonly and widely used in surveys as the data collection instrument. Questionnaire as survey method is used to elicit information from respondents which would otherwise be difficult to obtain. The important step in this method is to take care in the design of questions. The questions framed should be specific to hypotheses and related to the purpose of research. This will help to obtain valid and reliable information to test the hypotheses.

According to Goode and Hatt "Questionnaire refers to a device for securing answers to questions by using a form which the respondent fills himself."

##### 4.5.1. Advantages of the Questionnaire

A questionnaire, by its nature, according to Busha and Harter, has the following advantages :

- (i) It allows a wider range and distribution of the sample than the survey interview method.
- (ii) It provides great access to more educated respondents and to persons to

higher income groups.

- (iii) It provides an opportunity for respondents to give frank, anonymous answers.
- (iv) It allows greater economy of effort hence cheaper in cost.
- (v) It can be constructed so that quantitative data are relatively easy to collect and analyze.
- (vi) It helps in collecting background information about respondents, as well as original hard-to-obtain data.
- (vii) It facilitates the collection of large amounts of data in a short period of time.
- (viii) It allows the collection, in exploratory studies, of insightful information about a relatively unexplored problem area or subject.
- (ix) It can be completed at the leisure of respondents within the time limits set by the surveyor.
- (x) Through the preparation of a formal instrument, researchers are encouraged to define clearly the research problem, the implications of the problem, and the nature of the needed research data.
- (xi) In regard to ego-involving questions, it can enhance the collection of objective data.
- (xii) Because of its fixed format, it helps to eliminate variation in the questioning process.

#### **4.5.2. Disadvantages of the Questionnaire**

- (i) The major disadvantage is that questionnaires do not usually elicit so high percentage of returns. Sometimes, it is as low as only 10% which can lead to incorrect inferences.
- (ii) Another disadvantage is that many people have difficulty in expressing themselves in writing, especially when responding to open questions.
- (iii) A questionnaire can only be administered to respondents with considerable amount of education.
- (iv) The respondents can misinterpret a question or write answers unintelligibly.
- (v) A questionnaire by mail lacks motivation for respondents to answer since the surveyor is not present.
- (vi) The information received through questionnaire can not be readily verified for its accuracy and relevance.
- (vii) Poorly worded or direct questions might arouse antagonism or inhibitions on the part of respondents.
- (viii) There is no opportunity to supplement the respondents answers by observational data.

It can be stated on the basis of the above that the advantages and disadvantages of questionnaire method should be weighted and supplemented with

other data collection methods to overcome the disadvantages.

#### **4.5.3. Purpose of the Questionnaire**

The purpose of using the questionnaire determines its design. The efficiency and effectiveness of questionnaire designs must, therefore, be appraised in relation to the objectives, they are intended to achieve. Questionnaires must not be designed and assessed in isolation. Answers to the following type of questions help in the design and layout of the questionnaires :

- (i) What purpose is the questionnaire intended to serve? When and why, where and why, by whom and why and how and why will it be used?
- (ii) What entries are to be made on it, by whom, when, where, how and why? This should include information as to what is the basic merit of reporting on each questionnaire.
- (iii) Through what operations and procedures will the questionnaire pass and why? These operations include despatching, editing, coding, sorting, transcription, filling etc.
- (iv) How will these operations be carried out?
- (v) What is the degree of accuracy and quality desired in the various processing operations?

#### **4.5.4. Designing the Questionnaire : Major Steps**

Elias Awad has identified the following steps explaining the procedure for constructing a questionnaire :

- (i) Define the problem to be investigated, that is determination of the objectives the questionnaire is intended to serve.
- (ii) Decide what type of questions (closed or open-ended) should be used (unstructured or structured).
- (iii) Outline the topics for the questionnaire and then write the questions.
- (iv) Edit the questions for technical defects or biases that reflect personal values.
- (v) Sequencing of the questions in an orderly manner.
- (vi) The first draft should be subjected to pre-testing for modification and establishing reliability and validity.
- (vii) Do a final editing to ensure that the questionnaire is ready for administration. This includes a close look at the context, form, and sequence of questions as well as the appearance and clarity of the procedure for using the questionnaire.

A critical aspect of questionnaire designing is the formulation of reliable and valid questions. To do a satisfactory job, the investigator must focus on question content, wording and format. It should be evaluated for future use also.

#### **4.5.5. Typology of Questionnaires**

There are two major types of questionnaires on the basis of variable of

structure as discussed below :

#### **4.5.5.1. Structured Questionnaire**

It includes definite, concrete and pre-ordained questions limited to those necessary to clarify inadequate questions. Structured questions are useful because they offer the respondent a clearly delineated set of categories or a group of provided fixed responses. These questions may differ in the amount of structuring. The form of questions may either be closed or open. Closed-ended or pre-coded questions are called fixed response questions where respondent is offered a set of answers and asked to choose only one. Thus, these questions do not elicit unpredictable responses. For example, "How often do you use the library on average, for whatever purpose?"

*(Please tick as appropriate)*

- |                           |                     |
|---------------------------|---------------------|
| (a) More than once a week | (d) Less frequently |
| (b) Once a week           | (e) Not at all      |
| (c) Once a fortnight      |                     |

Structured questions reduce the time needed by the respondent and simplify the researcher's analysis of the data. They can also enhance reliability.

Structured questions also have some disadvantages. Busha and Harter believe that if questions are worded poorly, these can force persons to select artificial responses. Another disadvantage is that they can allow respondents to conceal ignorance where questionnaire items have not been prepared carefully.

However, on the whole, investigators tend to prefer structured questions.

#### **4.5.5.2. Unstructured Questionnaire**

Unstructured response questions are also called open-ended questions. These questions allow the respondents to answer the questions freely in their own words. They can be useful in exploratory studies in which various dimensions and facets of a problem are examined. However, the free responses coming forward through unstructured questions are generally difficult to analyse than those got by the structured questions.

For example : "What do you feel are the most important problems being faced by college libraries in India?"

It may, however, be mentioned that all questions be made as objective as possible.

#### **4.5.6. Questions : Their Choice and Wording**

The investigator must be clear what he wants to know. Any vague thinking is likely to produce vague or misleading questions.

- (i) Questions must be definite and precise. Include only those questions that have direct bearing on the problem of research.
- (ii) Questions with answers available easily in other sources may be excluded.
- (iii) Questions that are likely to obtain inaccurate responses should be avoided.

- (iv) Care should be taken while asking personal questions.
- (v) A great amount of care is required in formulating the questions.
- (vi) As words are likely to affect responses, respondents with limited vocabulary are likely to be suggestive.
- (vii) Special attention must be paid to library terminology. It is not fair to assume that every one knows what librarians mean by catalogues, bibliographies, classification, periodicals, and many more terms that we take for granted.

#### **4.5.7. Distribution by Mail or Personal Delivery**

Questionnaires are usually sent out through the mail to a selected sample. Sometimes personal delivery is also feasible; for example, to all users leaving the library on specified dates. But in most cases questionnaire is distributed in an impersonal way.

##### **4.5.7.1. Cover Letter**

The questionnaire should accompany a cover letter. The cover letter gives the recipient a lasting first impression which must connote clarity, purpose, and brevity. In few words, the cover letter explicitly or implicitly gives the following information : purpose of the research project, sponsorship, if any, how respondents were chosen, confidentiality or anonymity (when appropriate), time needed to complete the questionnaire, and the deadline for returning.

##### **4.5.8. Validity and Reliability**

John Best stated that validity and reliability are qualities that are essential to the effectiveness of any data-gathering procedure. Reliability, according to Busha and Harter is used to characterize stable, consistent and dependable research methods, instruments, data or results. So reliability is the quality of consistency that the instrument demonstrates over a period of time.

Validity, according to Swisher and McClure, is an assessment of the extent to which data collection procedures actually measure what the researcher intended them to measure. Validity can be looked at from two perspectives : one, the validity of making inferences from the subjects of the research.

The validity and reliability of these tests can be quantitatively assessed through certain statistical techniques. The importance of the questionnaire or interview topic to the respondent determines the frequency and validity of responses.

It can therefore be concluded that the adequacy of an information gathering tool such as questionnaire is far better than other methods.

#### **4.6. INTERVIEW**

Interview method, as a social research instrument, is used by contemporary researchers as the search for new information is not limited to the use of questionnaires only. As the purpose of survey is to acquire current information about the experiences and opinions of people, the interview serves as a useful tool. Young defines interview as "a systematic method by which a person enters more or less

imaginatively into the life of a comparative stranger." Goode and Hatt further amplify it by saying that "Perhaps no research technique is as close to the researcher's problem as the interviewer." G.W. Allport, in his classic statement, sums up this beautifully by saying, "if you want to know how people feel, what they experience and what they remember, what their emotions and motives are like, and reasons for acting as they do - why not ask them?"

The interview technique is a verbal method of obtaining data hence it is unique in itself.

#### **4.6.1. Difference Between Interview and Questionnaire**

- (i) In a questionnaire the information one obtains is limited to the written responses of subjects to pre-arranged questions. In an interview, since the interviewer and the person interviewed are both present as the questions are asked and answered there is opportunity for greater care in communicating questions and eliciting information.
- (ii) In an interview, the interviewer has the opportunity to observe both the subject and the total situation to which he/she is responding, while it is not possible in questionnaire method.
- (iii) The interview approach, simply stated, involves a person designated as interviewer asking questions in a face-to-face contact to the other person/s designated the interviewee/s who give answers to these questions.
- (iv) The interview method is more original because of verbal communication with the interviewee/s.
- (v) The limitations of the questionnaire method can be eliminated by adopting interview method.

#### **4.6.2. Objectives of the Interview**

Interview as a social survey instrument helps to obtain a wide range of data, ideas, experiences of the past and the present. It has the following objectives :

- (i) It assists in gaining access to objectives of data.
- (ii) It helps in providing opportunity for observation.
- (iii) It aims to determine facts which vary from person to person, and in particular circumstances.
- (iv) It aims to ascertain attitudes or trends in belief.

#### **4.6.3. Advantages of Interview**

- (i) The personal interviews, as compared to questionnaire, usually yield a high percentage of returns.
- (ii) The interview method can be made to yield an almost perfect sample of the general population because practically everyone can be reached by and can respond to this approach. On the other hand, questionnaire approach is limited only to the literate segment of the society.
- (iii) The information obtained through interview is likely to be more correct

as compared to that got by other techniques. The interviewer can on the spot clear-up any doubts or inaccuracies etc.

- (iv) The interviewer can collect supplementary information about respondent and his/her environments, which is of great value in interpreting results. Interview is a much more flexible technique as it allows for posing new questions or check-questions if need be. Its flexibility makes the interview a far superior technique for the exploration of certain areas.
- (v) The interview is the more appropriate technique for revealing information about complex, emotionally laden subjects or for probing the sentiments that may underlie an expressed opinion.
- (vi) A personal interview may take long enough to allow the respondents to become oriented to the topic under investigation. Thus recall of relevant information is facilitated.
- (vii) The language of the interview can be adapted to the ability or education level of the interviewee. Therefore, it is comparatively easy to avoid misinterpretations or misleading questions.

#### **4.6.4. Disadvantages of Interview**

- (i) As a research instrument, interview method is costly in terms of money, time and energy.
- (ii) A thorough training and skill of interviews are required for collecting qualitative and quantitative information.
- (iii) Any bias in the minds of the interviewers may distort information.
- (iv) Some actions of the respondents are easily observed but not easily visualized.

#### **4.6.5. Types of Interview**

A brief discussion about the following two types of interview is given below :

**4.6.5.1. Structured Interview :** It involves the use of a set of pre-determined questions set out on a printed schedule and records the answers in the appropriate way. Structured interview mostly involves the use of fixed alternative questions. The alternative questions or closed-ended questions are those in which the responses are limited to fixed, pre-determined alternatives. In structured interview the response rate may be higher. The danger of misunderstanding is less as the interviewer can explain it in language the persons interviewed will understand. There is also less danger of hasty and careless answering.

But, there are few disadvantages also :

- (1) Some interviewers tend to obtain different results from others.
- (2) The interview between person and person, even if it consists of formal questions and answers, is an extremely complex, and subtle process.
- (3) Difference of sex, age, colour and class can make rapport difficult.
- (4) The interviewers will react to different interviewees in different ways.

In practice, therefore, interviewing is one of the most demanding aspects of the research process.

**4.6.5.2. Unstructured Interview :** It may be useful for providing background for defining a conceptual model and stating an objective in an exploratory study. Unstructured interview is characterized by a far too greater flexibility of approach to questioning the respondents as it is informal. In this type of interview, the interviewer does not follow a system or list of the pre-determined questions. The arrangement and wording of the questions is determined on the spot by the interviewer. The interviewer may hold a conversation with the individual guiding the discussion along certain lines, but aiming to get a personal view-point rather than a set of responses. Respondents here are encouraged to relate freely and frankly their experiences. He must analyze what the respondent says quickly enough so that he can help him express his thoughts and can probe for further information when necessary. He must know how to deal both with respondents who do not "open up" in an interview situation, and with those who wander off the subject.

Although most library surveys be carried out by formal or structured interviews, yet for some purposes unstructured or semi-structured interviews are justified. For example, it may not be possible to elicit the information needs of the researchers in an industrial research institution by a structured interview schedule, since some of the concepts involved would require a great deal of explanation and interpretation.

#### **4.6.6. Interview Process**

For greater success, interviews must be conducted in an informal and relaxed manner. The interviewer must be well prepared to ask relevant questions before the questioning process begins. Skilled interviewers carefully frame their questions in advance.

Busha and Harter have offered the following questions for the conduct of successful interviews.

- (i) Be thoroughly prepared in advance; know well the topic and purpose of the survey to elicit desired research data.
- (ii) Be friendly and courteous, and put the respondent at ease throughout the interview session.
- (iii) Approach all respondents as individuals; assure them that their views are valuable and of significance to the survey.
- (iv) Ask only one question at a time in a concise and clear way.
- (v) Do not attempt to put words into respondent's mouth.
- (vi) Do not react to respondent's replies by expressing approval, disapproval surprise or shock.
- (vii) Do not directly dispute respondents, even though you may know or suspect that their replies are inaccurate.
- (viii) Do not argue with respondents or condemn their views.

- (ix) Be neutral in recording responses so that the collected data are accurate and objective.
- (x) Express thankfulness to the respondents for their cooperation at the end of the interview.

#### **4.7. OBSERVATION**

It is the basic method of getting around. It is one of the most pervasive activities of daily life. Observation is a well established technique for data collection. The observation method is normally employed is measuring, testing, characterising human behaviour.

##### **4.7.1. Definitions**

W.I.B. Beveridge states that "observation involves noticing something and giving it significance by relating it to something else noticed or already known." Goode and Hatt stated that "observation may take many forms and is at once the most primitive and the modern of research techniques." P.V. Young has said that "observation is deliberate study through an eye, may be used as one of the methods for scrutinizing collective behaviour and complex of institutions as well as separate units comprising of totality."

##### **4.7.2. Concept**

Observation therefore is a primary tool of scientific enquiry. It becomes a scientific technique when :

- (i) it serves a formulated research purpose;
- (ii) it is planned systematically;
- (iii) it is subjected to checks and controls on validity and reliability.

Observation as a method is generally used in either laboratory or field research. Observational methods are primarily directed toward describing and understanding behaviour as it occurs. As a data gathering device direct observation may make an important contribution to descriptive research such as study about the behavioural patterns of library users.

##### **4.7.3. Advantages**

- (i) Through observational techniques, it is possible to record behaviour as it occurs, whether under any pressure, stress or strain.
- (ii) Some elements of human behaviour are so much a part of their habit that they escape awareness and resist translation into words.
- (iii) It is independent of people's willingness to report, when investigator meets with resistance or people are unwilling to be interviewed.
- (iv) In some situations observation is the only method to be used.

##### **4.7.4. Disadvantages**

- (i) People who are aware of being observed tend to change their behaviour.
- (ii) It is not possible always to anticipate a spontaneous event and so be ready to observe it.
- (iii) Observation can be very time-consuming, even when appropriate

events and situations are chosen.

- (iv) The subjectivity of the observer must always be taken into account.

#### **4.7.5. Guidelines for Observation**

The following guidelines for making observation have been suggested :

- (i) Obtain prior knowledge of what to observe.
- (ii) Examine the general and specific objectives of research problem to determine what to observe.
- (iii) Devise a method of recording results.
- (iv) Establish and define the various levels of proficiency categories and ratings used.
- (v) Observe carefully and critically.
- (vi) Attempt to rate specific phenomena independently.
- (vii) Become well acquainted with the recording instrument and the procedures of its use.

#### **4.7.6. Observation Devices**

**1. Diaries :** A diary is a record of selected actions, events and thoughts in a person's daily life. It can therefore be classified as consciously transmitted evidence.

**2. Note Books :** It is a record of events, actions noted by the observer.

**3. Schedules :** A schedule is a tabulated list of details or statements. It often provides a record of recurring events, time tables or plans for events according to prior arrangements.

**4. Photographs :** It is a record of many unseen objects.

**5. Maps :** It is a record of geographical habitation.

#### **4.7.7. Recording Observations**

In view of the above mentioned sources of recording, it is generally recommended that simultaneous recording of observation should be made to minimize the errors that result from faulty memory. There are other occasions when recording would be done sometime after observation. However, the recording of observation of the events, actions etc. should be done as soon as possible, while the details are still fresh in the mind of observer. It gives better results.

#### **4.7.8. Systematizing Data Collection**

A number of devices have been extensively used to aid in the recording of information collected through observation. These include check list, rating scales, score cards, scaled specimens which provide systematic means of summarizing or quantifying data collected by observation.

#### **4.7.9. Types of Observation**

Broadly these are as follows :

##### **4.7.9.1. Unstructured Observations**

This type of observation gives complete account of an event. But, it is not a desirable goal. The basic purpose of any observational technique is that it attempt to

summarize, systematize and simplify the representation of an event rather than provide an exact reproduction of it. Unstructured method of observation provides a more direct account of the phenomena under investigation. It also provides depth of information gained by the first hand knowledge of observer.

#### **4.7.9.2. Structured Observation**

This method of observation consists in a careful definition of categories under which the information is to be recorded, standardization of conditions of observations and selection of pertinent data of observation. According to Selltiz *et al.* structured observation is used mostly in studies designed to provide systematic description or to test causal hypothesis. The use of this method pre-supposes that the researcher knows what aspects of the situation under study are relevant to his research purposes. Accordingly he develops a specific plan for making and recording observation.

Structured observation according to Busha and Harter can produce current data about the actions of persons, or information about how phenomena occur in particular environments and under certain conditions. Generally, it involves the deliberate, systematic viewing of critical aspects of an operational process or the behaviour of particular groups of subjects. When the observer is well aware of the numerous activities and interactions pertaining to a phenomena, structured observation can be most effective in gaining access to original information.

#### **4.7.9.3. Participant Observation**

Edward Linderman who was critical of other methods introduced this concept in social science. He believed that if one wished to know what the subject was really doing one should watch him and not ask him. In participant observation, therefore, the observer maintains a face-to-face relationship with the observed. A participant observer is "an outsider who temporarily becomes an insider." The technique requires that the observer, to some extent, becomes a part of the thing observed. One of the advantages of participant observation is that the investigator need only have tentative hypotheses which can be refined during the course of the research. In participant observation the observer takes a role in the group observed and from the advantage point of active interaction in and with the group he makes his observations.

#### **4.7.9.4. Non-Controlled Observation**

It is that observation which is done in real life situations without the use of measuring instruments or other observational devices. P.V. Young calls this type of observation as unaided type of observation. The observer does not plan his study in advance. Such observations are reported in descriptive form. The non-controlled observation of a group tends to be directed toward such phenomena as : (i) the nature of cultural experience and activity of the group; (ii) the meaning of these experiences and the social values, attached to them; and (iii) the social systems that are the results of group experiences.

**4.7.9.5. Controlled Observation**

This is carried on in terms of pre-arranged plans and the use of pre-tested recording instruments such as schedules, rating scales, etc. when research workers take special vantage positions to unobtrusively observe phenomena in a direct manner, controlled observation can be accomplished. For example, observers in a large university library might pose as students and sit in the reference section to discretely observe activities of reference personnel and to record selected behaviour of both the users and the staff. The primary advantage of such observational strategies is the access to a variety of unanticipated research data.

**4.7.10. Validity and Reliability**

In order to achieve a satisfactory degree of validity in observation, some critical incidents of behaviour considered significant must be indentified. The knowledge and skill of the researchers may be supplemented by the judgement of experts in the field.

It is generally mentioned that the reactive effect of the intrusion of the investigator is a threat to the validity of the process of observation. This may be possible in case of a sole observer whose values, feelings, attitudes may distort observation. It may, therefore, be desirable to engage more independent observers. Again, randomly selected time samples of frequently occurring incidents say, of library catalogue use, may help yield more representative samples. This method of selecting different time periods over longer period would enhance both reliability and validity of observation.

**4.8. SUMMARY**

This lesson describes various instruments of research developed and used for collecting the information from the respondents for a survey. Explains in detail such instruments and tools of research as schedule, questionnaire, interview and observation. Discusses their types, advantages, disadvantages and more particularly, their validity and reliability, as data gathering techniques supported by examples where possible.

**4.9. SELF-CHECK EXERCISES**

1. Summarize advantages and limitations of interview and questionnaire.
2. For what purpose would you use interview rather than other data collecting instruments?
3. Differentiate between schedule and questionnaire.
4. Enumerate briefly the steps used in designing a questionnaire.
5. Define observation. Mention the guidelines for observation.
6. Explain the major instruments of research.

**4.10. REFERENCES**

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**4.11. ANSWERS TO SELF-CHECK EXERCISES**

1. See Section 4.7.9.5
2. See Section 4.5.1, 4.5.2, 4.6.3 and 4.6.4,
3. See Section 4.6
4. See Section 4.4.1
5. See Section 4.5.4
6. See Section 4.7.1 and 4.7.5
7. See Section 4.3

**SCIENTIFIC METHOD**

(Definition, components, steps, limitations: applicability in the field of Library and Information Science)

**Structure**

- 5.0 Objectives
- 5.1 Introduction
- 5.2 Definition
- 5.3 Components/ Steps in Scientific Method
  - 5.3.1 Identification of the Research Problem
  - 5.3.2 Review of Relevant Literature
  - 5.3.3 Design of Methodology
  - 5.3.4 Formulation of Hypotheses
  - 5.3.5 Data Gathering and Analysis
  - 5.3.6 Testing of Hypotheses
  - 5.3.7 Reporting Results of the study
- 5.4 Spiral of Scientific Method
- 5.5 Use of Scientific Method and its Value
- 5.6 Limitations of Scientific Method
- 5.7 Application of Scientific Method to Library & Information Science
- 5.8 Summary
- 5.9 Key Concepts
- 5.10 Expected Questions
- 5.11 References
- 5.12 Self Check Exercise
- 5.13 Answers to Self-Check Exercise

**5.0 Objectives**

This lesson will make the learner familiar with the experimental method of research and its applicability in the field of library and information science.

**5.1 Introduction**

Scientific method is a method of research and investigation. The term science is popularly used to denote a group of subject fields e.g. Physics, Chemistry, Biology etc. This interpretation of science may lead someone to conclude that scientific method is a method of study and research in science. While the method is chiefly used in the study of science as a subject group, it does not mean that it cannot be used for study and research in other subject fields viz. social sciences and humanities. It, therefore, must be born in mind, that the term scientific does not refer to research in

the field of science but to a procedure which is scientific.

## **5.2 Definition:**

Before defining what is scientific method and how does it work, it is essential to know what is science?

Meaning of the term 'Science'

The term 'science has been derived from the Latin word 'scire' which means 'to know'. Science is, therefore concerned with knowledge and has been defined by John T. Zadrozny as "systematic, objective, deliberate, and controlled search for insight and accurate knowledge about a realm of phenomena" as well as "a verified and valid body of knowledge."

## **Scientific Method**

Scientific method may be defined as a rigorously organized, systematic and meticulous method of research based on observation and experimentation which accepts only such conclusions as are probable by all available facts or evidences.

According to George L. Lundberg, "Scientific method consists of systematic observation, classification and interpretation of data. The main difference between our day to day generalization and the conclusion usually recognised as scientific method lies in the degree of formality, rigorousness and verifiability.

According to Bernard, "Scientific method consists of six processes that take place within it. These are testing, verification, definition, classification, organization, orientation which include prediction and application."

Gopal defines scientific method as "the search for truth on the basis of facts and for generalisation through a process of induction, deduction, verification, non-suppression of evidence and open mind."

From above, we may conclude that science is an objective, logical and systematic method of analysis of phenomena devised to permit the accumulation of reliable knowledge. On the other side, scientific method refers to a procedure or mode of investigation by which scientific and systematic knowledge is acquired.

## **5.3 Components/ Stages/ Steps in Scientific Method**

Scientific research requires logical approach consisting of various components/ steps. These are as under:

- 6.3.1 Identification of the research problem
- 6.3.2 Review of relevant literature
- 6.3.3 Design of methodology
- 6.3.4 Formulation of hypotheses
- 6.3.5 Data gathering and analysis
- 6.3.6 Testing of hypotheses
- 6.3.7 Reporting results of the study

### **5.3.1 Identification of the Research Problem**

A scientific inquiry starts with the identification of the problem whose solution is to be found. The problem identified must be defined in such a manner that observation or experimentation

in the natural world can provide a solution.

According to F. L. Whitney, "To define a problem means to put a fence around it, to separate it by careful distinction from the question found in related solution of need."

Thus the problem selected must be clearly stated and defined.

### **5.3.2 Review of Relevant Literature**

As part of the process of understanding the problem and its context, the relevant literature should be carefully reviewed and synthesized. Indeed, the selection of a specific area of exploration can often be the by product of extensive reading and study. In view of the importance of literature search to the completion of successful inquiries, this component of scientific research is regarded the most important one. A literature search is an attempt to identify, locate and synthesize completed research reports, articles, books and other materials about the specific problems of a research topic.

Other benefits of literature reviews are that they, (a) help to narrow and to more clearly delineate the research problem, (b) reveal overlooked conclusions and facts that ought to be taken into consideration before a research project is actually initiated; (c) suggest new approaches to the planning of investigations; (d) uncover methodologies that were used successfully by other research workers; (e) help in the determination of the degree to which particular problems have already been investigated; and (f) assist investigators to develop firmer understandings of theoretical implications of proposed inquiries.

### **5.3.3 Design of Methodology**

The next stage of research process involves the design of procedures and method by means of which the identified problem will be studied. For example, the following questions are among those that should now be posed and answered: What is the population and how large should the sample be? Where and when will the study be conducted? What are operational definitions of the variables relevant to the research problem? How will the needed research data be collected and analysed.

### **5.3.4 Formulation of Hypotheses**

The next process in the scientific method is the formulation of hypotheses. A hypothesis is a tentative generalization, the validity of which has got to be tested. It is based on accumulated previous knowledge. It enables the researcher to direct enquiry along the right lines. It suggests experiments and observation and helps to collect necessary evidence in order to discover the order of nature.

### **5.3.5 Data Gathering and Analysis**

After formulation of hypotheses, all possible data, relevant to the problem, is collected. Data may be gathered through observation method or experimentation. When the data have been collected, they are then analysed according to the methods specified. Often statistical techniques are used for the analysis of data.

### **5.3.6 Testing of Hypothesis**

On the basis of collected data, hypothesis is tested by applying the method of deductive inference. If all the facts or data support the hypothesis, it is accepted as the proper solution to the

problem. This is called generalization. It should however not be considered as the final truth. The solution thus found is treated only as the best answer to the problem on the basis of the data available at the moment. Later on, or after a span of time, some other facts may not be found in agreement with the generalization, then the scientific method again starts research on the problem.

### **5.3.7 Reporting Results of the Study**

Finally, results of the study are recorded and reported. These are made available to a potentially wide audience of peers, who can learn from, and build upon, the completed research project.

## **5.4 Spiral of Scientific Method**

Dr. S.R. Ranganathan has indicated that scientific method works like a never ending circle and has conceptualized a 'spiral of Scientific Method' in order to explain vividly the steps and phases involved in scientific methodology. He denoted for convenience the four cardinal points of the cycle; (1) Nadir (2) Ascendant (3) Zenith (4) Descendent

- (i) The Nadir marks the accumulation of facts experienced.
- (ii) The ascendant marks the accumulation of empirical laws derived from facts of experience.
- (iii) The zenith marks the fundamental laws sublimated from the empirical laws.
- (iv) The descendent marks the deduced laws implied in the fundamental laws.

The four cardinal points give rise to four quadrants in each cycle implied in the Spiral. These may be termed as four phases of research viz. empirical, hypothesising, deductive and verification. These are detailed below:

### **Empirical Phase:**

The first phase of research starts from Nadir and ends at Ascendant. In this phase, the investigator identifies a problem on the basis of his previous experience and knowledge of the world and the subject.

### **Hypothesising Phase:**

The second phase of research starts from Ascendant and ends at Zenith. In this phase, the investigator, on the basis of preliminary collection of data, formulates hypotheses through inductive reasoning and intuition.

### **Deductive Phase:**

The third phase starts from Zenith and ends at Descendent. In this phase deduced laws, latent in the normative principles are formulated.

### **Verification Phase:**

The fourth phase starts from Descendent and ends at Nadir. In this phase deduced laws are tested and generalization is made on the basis of all possible collected facts.

## **5.5 Use of Scientific Method and its Value**

Scientific method is the only way to increase the general body of tested knowledge and to eliminate arbitrary and ambiguous opinions. Scientific method springs from the desire to acquire truth, and when this desire is very strong in the community, the progress of scientific method becomes rapid and smooth. The method, however may not always lead to the final destination of truth but 'enables the large numbers to walk with sure steps'. It certainly minimizes the dangers

associated with novelty, adventure and uncertainty. It lays down policies and standards of moral judgment with a broader outlook than those of organic response or wild stimulus. It settles differences in a rational way, which is appealing to all. It is beyond a narrow outlook and subjective element.

### **5.6 Limitations of Scientific Method**

Scientific method is not free from limitations especially when it is applied in social sciences.

These may be mentioned as follows:

1. Scientific explanation is never complete. At every stage, there are some basic principles which remain unexplained in social sciences.
2. The conclusions arrived at by scientific method are not final. They are only relative to observed phenomena, facts discovered and reasoning developed.
3. Superstitions, cherished beliefs etc. are hostile to the growth of scientific method. Institutions, authoritarians, functionalists and mystics often undermine the respect of scientific method.
4. Scientific judgment is difficult and sometimes impossible when situation demands immediate action.
5. Growth of scientific method in a society where there is no desire for truth, or freedom for the expression of intellectual doubt, is surely hampered. Fear of offending established dogmas has been an obstacle to the growth of astronomy and other physical sciences.
6. In social sciences, the necessary time for reflection and material for experiment are often lacking for the proper development of scientific method.
7. Scientific researches in social field are often in the hands of those who cannot always oppose the established opinions or taboos.
8. No scientific method can guarantee certainty of achieving the goal and can prevent human life from being an adventure.
9. Scientific method involves abstractness.

### **5.7 Application of Scientific Method to Library & Information Science**

As opposed to natural sciences, library and information science is dependent on knowledge obtained through experience by trial and error. Knowledge has not been systematized into scientific laws and theories. Theories are essential as these can help to develop a sound philosophy of librarianship. It is only the application of scientific method of inquiry which can enable us to develop theories in various areas of librarianship.

Five laws of library science are fundamental laws. Every aspect of library and information science stems from these laws. They are the normative principles behind all library practices. Deduced laws have been derived from these laws for different branches of the field. Thus library and information science is amenable to the spiral of scientific method.

The possibility of application of scientific method in various areas of librarianship such as classification, cataloguing, management, book selection and systematic bibliography is vast. These are discussed below:

**Classification:** Theory of classification has evolved through various stages. From descriptive

theory we have reached the stage of dynamic theory. It is based on scientific approach. It provides the guiding principles which guide the classifier and classificationists.

**Cataloguing:** It is a significant area with scientific approach. Dr. Ranganathan has put forward a theory in his classified catalogue code. It contains a set of normative principles.

**Management:** In management, principles of management and various techniques such as operational research, systematic analysis, bibliometrics etc. have provided a sound basis.

**Book Selection:** There are certain aspects of book selection which have been systematized such as laying down of objectives, scanning of sources systematically, placing of orders at the earliest.

**Systematic Bibliography:** Compilation of bibliographies involves scientific approach.

There are certain areas of library and information science in which there is less scope for application of scientific method. These include reference service. It depends upon users' behaviour. There is only one area i.e. SDI which has its roots in scientific approach. In SDI, a profile is prepared, information is provided on individual basis and feedback is received.

**Why Library & Information Science is not a full-fledged Science:**

- (i) **Lack of Theories:** In the field of library & information science, no sound theories have been developed so far. We have recorded observation regarding different devices or tools but we have not progressed to the development of theories.
- (ii) **More of Empiricism:** There is more empiricism in library & information science. It is largely based on observation and less on experiment. As a general rule, the more empiricism in a subject of study, the less of science it would be. The same is true of library & information science.
- (iii) **Heterogeneous Set of Units:** In library and information science, we are concerned with documents, tools, buildings, users, staff, authority etc. Thus we have to deal with a heterogeneous set of units.

Documents, tools, buildings etc. are inanimate objects. Users, staff and authority are animate objects. They pose the same problems as faced in social science research. Human behaviour is relatively unpredictable and uncontrollable. In dealing with human beings, in certain cases, it becomes difficult to achieve verification of data.

**Conclusion**

In spite of the limitations, scientific method is equally applicable to library and information science research. However, scientific method cannot be applied here with the same ease, accuracy and preciseness as in natural sciences.

It is essential that scientific method is adopted in library and information science with the same zeal, enthusiasm and imagination as in natural sciences. The generation of a body of truly scientific knowledge about library and information science and librarianship's attainment of full, widespread professional and scholarly recognition hinge upon the following accomplishments: the development of solid structure of theoretical and practical knowledge, the willingness of librarians to question assumptions and to test hypotheses and conduct of rigorous and meaningful research by highly qualified persons within the profession. Placing more emphasis on scientific method will increase the store of librarianship's scientific knowledge.

Knowledge about numerous facets of library and information science can be obtained by asking questions, thinking of possible answers, and testing the possibilities by means of careful inquiry. In order to study phenomena relating to libraries, information or communication, some method must be devised to measure them or to perceive them with the senses or with the aid of special instruments. By asking questions about pertinent phenomena and then rigorously testing the answers, librarians and information scientists are more likely to produce scientific knowledge. This is not to imply that all library and information science knowledge generated as a result of research will be absolute or scientific; only those concepts, issues and questions within the field that are amenable to testing can be included within the realm of science.

### 5.8 Summary

This lesson discusses scientific method in detail - its definition, components/ steps, importance, limitations and applicability in the field of library and information science.

### 5.9 Key Concepts

1. Deductive: Using knowledge about things that are generally true in order to understand particular situations or problems.
2. Generalisation: A general statement that is based on only a few facts or examples.
3. Hypothesis: An idea or explanation of something that is based on a few known facts but that has not yet been proved to be true or correct.
4. Synthesis: The act of combining separate ideas, beliefs, styles etc.

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### 5.11 Self-Check Exercise

**Note:** Write the answers in the space given below each question and check your answers with the answers given at the end.

1. What is scientific method of research?

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2. Name the components of scientific method.

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3. Mention the areas of library and information science where the application of scientific method is vast.

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**5.12 Answers to Self-Check Exercise**

1. Scientific method is a method of research and investigation. It may be defined as a rigorously organized, systematic and meticulous method of research based on observation and experimentation which accepts only such conclusions as are probable by all available facts or evidences. It refers to a procedure or mode of investigation by which scientific and systematic knowledge is acquired.

2. The various components of scientific method are as under:

- (i) Identification of research problem
- (ii) Review of relevant literature
- (iii) Design of methodology
- (iv) Formulation of hypotheses
- (v) Data gathering and analysis
- (vi) Testing of hypotheses
- (vii) Reporting results of the study

3. The various areas of library and information science where the application of scientific method is vast are as under:

- (i) Classification
- (ii) Cataloguing
- (iii) Management
- (iv) Book Selection
- (v) Systematic Bibliography

## **HISTORICAL METHOD**

(Definition, steps, limitations: applicability in the field of Library and Information Science)

### **Structure**

- 6.0 Objectives
- 6.1 Introduction
- 6.2 Definition
- 6.3 Steps in Historical Method
  - 6.3.1 Formulation or identification of the problem
  - 6.3.2 Collection of data
  - 6.3.3 Formulation of hypotheses
  - 6.3.4 Criticism of historical data
  - 6.3.5 Interpretation of data
  - 6.3.6 Writing of the report
- 6.4 Limitations
- 6.5 Application of Historical Method to Library and Information Science
- 6.6 Summary
- 6.7 Key Concepts
- 6.8 References
- 6.9 Self Check Exercise
- 6.10 Answers to self check exercise

### **6.0 Objectives**

This lesson will make the learner familiar with the historical method and its applicability in the field of library and information science.

### **6.1 Introduction:**

The word 'history' means the search for knowledge and truth. The object of history is to describe past events, to discover the exact situation in which they appeared. The interest of the historian lies in the past, similar is the object and interest of the historical method. It is a method of research or investigation into the past of a subject or event through the study of documentary sources. It is not applied in history alone but in ascertaining past of all the subjects including sciences.

### **6.2 Definition:**

According to Lucey, "Historical method is a systematic body of rules and procedure for collecting all possible witnesses of an historical era or event for evaluating the testimony of these witnesses, for ordering the proved facts in their casual connections and finally for presenting the ordered knowledge of events.

*Jesse Shera* defines it as "a system of reasoning where by the historian proceeds from the

study of records (evidence) to an understanding of facts or relationships relevant to the period or problem he is investigating.

*G.J. Garraghan* in his work 'A Guide to Historical Method' defines historical method as "a systematic body of principles and rules designed to aid effectively in gathering source materials of history, appraising them critically, and presenting a synthesis of the results achieved.

Richard F. Clark in his work 'Logic' defines it as "a system of right procedure for the attainment of [historical] truth.

In short, historical method consists of (i) collection of probable sources of information (ii) examination of these sources for genuineness (either whole or part) (iii) the analysis of the sources or parts of sources proved genuine for their creditable particulars.

### **6.3 Steps in Historical Method:**

The main steps in the use of historical method are as under:

- 6.3.1 Formulation or identification of the problem
- 6.3.2 Collection of data
- 6.3.3 Formulation of the hypothesis if appropriate to the problem
- 6.3.4 Criticism of historical data
- 6.3.5 Interpretation of data
- 6.3.6 Writing of the report

#### **6.3.1 Formulation or Identification of the Problem**

Any research starts with a problem which is either formulated or identified. It may be formulated due to interest in the field of study or the person may disagree on a particular issue with other researcher. It may also be formed because of curiosity.

#### **6.3.2 Collection of Data**

After formulating the problem the next step is collection of data. For collection of data, a researcher uses two kinds of historical sources namely, primary and secondary.

Primary sources are original documents or remains, which consist of first hand information, containing data provided by actual witnesses to the incidents being studied. These are considered of fundamental importance and form foundation of historical research.

Primary historical sources consist of the following:

- (a) Documents or the records kept and written by actual participants or eyewitnesses of an event. These are (i) constitution; charters; laws; court decisions; official minutes or records; autobiographies; letters; diaries; genealogies; contracts; deeds; wills; permits; licenses; affidavits; depositions; declarations; proclamations; certificates; lists; bills; receipts; newspapers; advertisements; maps; diagrams; books; pamphlets; catalogues; films; pictures; inscriptions; recordings; transcriptions; reports; old sea scrolls; old manuscripts etc.
- (b) Physical remains or relics such as historical sites, pyramids, furniture, human remains- tools, clothing, pottery, weapons etc.
- (c) Orally transmitted materials such as folklore, legends, tales, traditions, customs, language etc.
- (d) Durable kinds of artistic materials such as inscriptions upon stones, stamps, coins, historical

paintings and portraits.

- (e) Handwritten material including papyrus rolls, bricks, manuscripts, diaries, memoirs etc.
- (f) Printed books, periodicals, papers and literature
- (g) Motion pictures, films, microfilms & recording
- (h) Personal observations

Secondary sources contain information transmitted by a person who was neither a participant nor an eye-witness to an original event. He or she may have talked with an actual participant or observer or read his narration. Secondary source is thus at least two steps removed from the event & hence there is likelihood of distortion of events. In view of this, a good historian relies upon primary sources as far as possible. He would use secondary sources to fill up the gaps in the primary sources.

### **6.3.3 Formulation of Hypotheses**

The most important part of the research is the formulation of hypotheses. Formulation of hypotheses gives definite point to the inquiry. If possible, hypotheses may be formulated as these tentatively describe the relationships between historical factors (variables).

### **6.3.4 Criticism of Historical Data**

In historical research, a researcher has to depend on the testimony of others for collection of data. In order to know the authenticity and validity of the sources, he must resort to historical criticism both external and internal.

External criticism aims at establishing the authenticity or genuineness of the source. In order to establish the genuineness of authorship or age of documents, one may have to use intricate tests of signature, handwriting, script, type, spelling, language, usage, documentation etc. A researcher must ensure that all the elements related to the data are not inconsistent with already known facts about its author, about the social and technological environment of the period to which the remains or the documents belong to. This way the authenticity of the documents must be established before these are used for research purpose.

Internal criticism aims at establishing the validity of the contents of the source. In order to establish the validity of the contents of a historical document one should look for the general reputation, intellectual honesty and competence of the author, and the environment or circumstances under which the document was written. In case it is established that the witness was suspected to have bias, then his testimony must be questioned severely and rejected.

### **6.3.5 Interpretation of Historical Data**

This step is considered very important. In this step, the collected data are logically arranged, analysed and interpreted for reaching a valid result. The interpretation of historical data may also lead to some kind of hypothesis and generalization, but hypothesis and generalisation in historical method are not exactly what these are in scientific method. In historical method generally we can form judgment instead of generalization. It can reach only conclusion but all conclusions are not 'generalisation'. Generalisation refers to a scientific law which has proved to be true in past, proved true in the present, and is expected to continue to be proved true in coming future. It is very specific and not broad. It is rejected even by a single evidence found against it. On the other hand, historical conclusions are very broad, these may not prove true in all cases and yet cannot be

termed as false. Historical generalizations are therefore only guidelines and not laws.

### **6.3.6 Writing of the Report**

Writing of the report means recording the facts and conclusions in a meaningful narrative form. Facts and interpretations are presented in a way whereby a reader can himself evaluate conclusions arrived at by the historian in the light of documented evidence made available by the scholar. Thus writing a report involves highest level of scholarship.

### **6.4 Limitations**

The major limitations of historical method are as under:

1. Collection of facts relating to very old events is a problem, as sufficient data may not be available in such cases. For example it is difficult to prove the existence of Ramayana or Mahabharata events due to non availability of sufficient data of that period.
2. Historical events take place in the past. Secondly these occur only once and cannot be reproduced or created for experimentation e.g. Battle of Panipat, Gulf-war cannot be repeated or artificially created for observation, and hence the veracity of many historical facts cannot be verified to the satisfaction of all.
3. Historical writings may be biased or prejudiced e.g. a patriotic Indian may fully blame General Dyer for Jallianwala Bagh incident but a British writer may describe the incident otherwise and throw the blame on Indians.
4. Repair and face lifting of historical monuments are carried out from time to time in order to maintain these. These may destroy their historic value and their observation may lead to faulty conclusion.
5. Invaders and rulers of different dynasties may sometimes change the shape and originality of a monument which may result in a faulty conclusion.
6. Calculations and measurement are not possible in this method. In spite of its limitations, the historical method is widely used in all the fields.

### **6.5 Application of Historical Method to Library & Information Science**

In the field of Library and Information Science, numerous historical enquiries have been conducted. Because librarianship embraces a wide diversity of areas and practices, the breath of historical studies in the field is extensive and apparently ever-expanding. In addition to the histories of various academic, public and special libraries, historians have approached topics such as library equipment, facilities and buildings, education for librarianship, important concepts and ideas that have influenced library practices and profession in general, and other library phenomena during particular times and in specific places.

The number and quality of historical works in the field of librarianship have increased since Arnold K. Borden, in 1931, emphasized the sociological beginnings of the library movement. Some of the studies about public and other libraries are the following: Shera's Foundations of the Public Library, Whitehill's Boston Public Library: A Centennial History, Williamson's William Fredrick Poole and the Modern Library Movement and Crollier's A History of the American Public Library Movement Through 1880.

During the twentieth century, the impact of science and technology on librarianship has contributed to increased interest in recent past events. Since the later part of the twentieth century,

each decade has witnessed the introduction of new communication media, innovations for acquiring, storing, organising and disseminating information. These have altered the roles, goals, objectives and methods of operations of libraries.

Some library historians are now investigating events and developments in the recent past such as (a) library utilization of a variety of new communication media and technological innovations such as telefacsimile devices, television, microforms, data processing equipment, computers, reprographic tools and audiovisual materials; (b) the impact of the Great Depression and World War II on libraries. Other subjects of contemporary historical studies have been (a) library services to disadvantage and culturally deprived citizens (b) the role of library associations and their impact on library development (c) overseas library technical assistance (d) women in positions of leadership in the profession (e) political leadership for library development.

Although historical enquiries have touched many areas of knowledge within librarianship, there is still need for the replication of past studies. When studies are repeated, the reliability of previous research data can be tested. Increasingly, library historians are realising that data and conclusions need to be verified and that new approaches to old topics can lead to (a) the application of different techniques of inquiry (b) the new interpretation of old and new data and (c) the generation of information that challenges, supports or expands existing historical knowledge.

Thus replication is important, it can make historical knowledge more scientific and thereby more certain.

The trend towards greater dependence on qualifications, measurement, statistical analysis of research data and hypothesis testing in research in librarianship is also affecting the writing of library history. Charles M. Dollar and Richard J. Jensen have written the *Historian's Guide to Statistics: Quantitative Analysis and Historical Research*. This guide is a useful source of information for historians who attempt to increase the rigour and precision of their studies. Computers are being used increasingly in the analysis of some raw historical data. Thus research workers are able to deal with larger information bases comprised of valuable social, political and economic data. More hypotheses or statements of the relationship between factors can be generated and tested as data are subjected to speedier, more rigorous and more accurate analysis. The testing of hypotheses contributes to the improved quality of library history.

Historical research relies upon the observations of others and sources of historical evidences. Most of the librarians are already familiar with techniques of bibliographical searches as well as the great variety of bibliographical tools, guides, government documents and other reference tools. With their knowledge of general content, organization, and services of libraries, librarians are also well prepared to ferret out many kinds of historical information. Thus librarians are in a better position to use historical sources or evidences than the inexperienced historians in other fields. However the authenticity and validity of the documents/ historical evidences must be established before these are used for research purpose.

To conclude, we can say that historical studies are of immense value in librarianship as these allow librarians to synthesise and to make generalisations from reconstruction of the past. This synthesis and generalization will not only recreate the past but can serve as an aid in understanding the present. According to Shera, the librarians should possess a "clear historical consciousness" because they

cannot function effectively when history is regarded merely as an esoteric aspect of knowledge.

Thus historical method of research is fully applicable in the field of Library & Information Science.

**6.6 Summary**

This lesson discusses the historical methods in detail - its definitions, steps, limitations and applicability in the field of Library & Information Science.

**6.7 Key Concepts**

- Ferret : To find by searching thoroughly
- Historical Consciousness : The ability to use senses and mental powers to understand the historical evidences.
- Replication : To produce exact copies of something

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**6.9 Self-Check Exercise**

Note: Write the answers in the space given below each question and check your answers with the answers given at the end.

1. Jesse Shera defines historical method as

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2. The main steps in historical research are:

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3. Give two limitations of historical method.

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### 6.10 Answers to Self-Check Exercise

1. Jesse Shera defines historical method as:  
"a system of reasoning whereby the historian proceeds from the study of records (evidence) to an understanding of facts or relationships relevant to the period or problem he is investigating."
2. The main steps in historical method are:
  1. Formulation or identification of the problem
  2. Collection of data
  3. Formulation of the hypothesis if appropriate to the problem
  4. Criticism of historical data
  5. Interpretation of data
  6. Writing of the report
3. The limitations of historical method are as under:
  1. Collection of facts relating to very old events is a problem as sufficient data may not be available in such cases.
  2. Historical events take place in the past and cannot be reproduced or created for experimentation.