Indira Gandhi
National Open University
School of Social Sciences

MEC-109
Research Methods in Economics

Block

1

RESEARCH METHODOLOGY: ISSUES AND PERSPECTIVES

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MEC-109 RESEARCH METHODS IN ECONOMICS

After completion of Master's degree in Economics, many of you may intend to start your career as professional economist. As professional economists, you would be required to carry out the task of analyzing many specific economic situations and indicate their impact on economic policy framework. Some of you may also pursue research degree programmes. In order to perform these tasks, you need to be quipped with the various constituents of Research Methods and the different techniques applied in data collection/analysis. The present course aims to cater to this need. The theoretical perspectives that guides research, tools and techniques of data collection and methods of data analysis together constitute the research methodology. Quantitative Research and Qualitative Research are associated with different paradigms. Accordingly approaches to social enquiry varies. Mixed methods by combining of at least one quantitative method and one qualitative method in measurement, collection or analysis of data is increasingly being used to strengthen the validity of research findings. The present course deals with all these aspects. The course comprises of 6 Blocks.

Block 1: This block deals with the theoretical perspectives/foundations guiding both quantitative and qualitative research. The essence of three paradigms i.e. positivism and post positivism. Interpretitivism and critical theory associated with different research strategies and methodologies have been discussed. This block covers the entire breadth of main trends of development in the philosophy of science and debates in the methodology of economics. The block has been divided into 5 units. **Unit 1** deals with the conceptual foundation related to Research Methodology and its constituents, approaches to social enquiry, research strategy, research process, an elementary idea of hypothesis and measurement scales of variables. **Unit 2** is devoted to scientific methodology covering Positivists' verification approach, Pauper's critical rationalism, and Thomas Kuhan's paradigm's shift approach. The fundamental differences between Popper's and Positivists' views at the one hand, and differences between Popper's view and Kuhan's views on the other, have also been explained. Model of scientific explanation broadly within the framework of positivist theory of scientific method constitutes the core of **Unit 3.** Basic rules of formal reasoning, models of explanation, role of logical reasoning in the formulation of research problem, and the problems involved in systematic explanation of phenomenon have been discussed in this unit. **Unit 4** presents the view of different economists about the models of explanation in economics in the positivists mainstream framework and a brief discussion on the alternative methods of explanation. **Unit 5** throws light on essentials of interpretativism and critical theory paradigm guiding the frameworks of qualitative research. Based upon different ontological and epistemological positions, these paradigms analyse the nature of reality differently.

Block 2 on research design and measurement issues sets the tone and context to provide balanced treatment to quantitative and qualitative research. The block comprises of three units. Research design and mixed methods, the characteristics of quantitative methods and qualitative methods, sampling design, the various issues relating to measurement of variables have been covered in this block.

Block 3: In order to validate the economic theory, we need their empirical verification. Further, in order to examine disparity in income, the inequality measures are important. Similarly in order to describe the development status of an area in terms of several dimensions, we need to develop skill to construct composite index numbers. For all these purposes, good exposure to methods of regression models, in-equality measures and composite index is required. **Block 3** meets this requirement.

Block 4: In order to analyse the quantitative and qualitative data, more analytical techniques like Multi Variate Analysis: Factor Analysis, Canonical Correlation Analysis, Cluster Analysis, Correspondence Analysis, and Structural Equation Models are being increasingly used under either mono method or mix methods. **Block 4** explains all these techniques.

Block 5: A large range of data analysis techniques are used in carrying out qualitative research. However, three important methods namely participatory methods, content analysis, and action research – relevant for conducting the qualitative research studies in the area of Economics have been covered in this Block.

Block 6: The availability of data is crucial for undertaking research. For this, one is expected to be familiar with the different databases, and sources, the concepts used in data compilation and the agencies involved in data collection. **Block 6** focuses on these aspects of database of Indian Economy.

UNIT 1 RESEARCH METHODOLOGY: CONCEPTUAL FOUNDATION

Structure

1.0 OBJECTIVES

After going through this unit, you will be able to:

- Explain the research methodology and its constituents;
- State the various philosophical perspectives that guide research in social sciences;
- Describe various research approaches and strategies that are applied to answer the research questions;
- Describe the various steps involved in the research process; and
- Discuss the various types of research designs appropriate for different types of research.

1.1 INTRODUCTION

Research plays a significant role in human progress. It inculcates scientific and inductive thinking and promotes the development of logical thinking and organization. The role of research in several fields of applied economics has increased in modern times. As an aid to economic policy, it has gained importance for policy makers in understanding the complex nature of the functioning of the economy. It also occupies special significance in analysing problems of business and industry. Social scientists study the relationships among many variables seeking answers to complex issues through research. In short, research aids the process of knowledge formation and serves as an important source of providing policy suggestions to different business, government and social organization. The knowledge of the critical perspectives or philosophy of science, techniques

of data collection and tools or methods of analyzing data are essential for undertaking research in a systematic manner. In this unit, we shall focus our attention on important constituents of research methodology i.e., research perspectives, research approaches and strategies and data types and its sources, hypothesis formulation and measurement scale of variables. At the initial stage of research, several questions may arise in your mind – what do we mean by research? How is the term 'research methodology' distinct from 'research techniques' or 'research methods'? Which type of research approach can be applied to a particular situation or context? What are the steps involved in the research process and how to design a research project? We shall take up these issues in this unit. Let us begin by explaining the term research methodology and its constituents.

1.2 RESEARCH METHODOLOGY AND ITS CONSTITUENTS

Research in common parlance refers to a search for knowledge. It can be defined as a scientific and systematic enquiry either to discover new facts or to verify old facts, their sequences, interrelationships, causal explanation and the adherence to natural laws governing them. It thus aims to discover the truth by applying scientific methods.

Research Methodology is a wider term. It consists of three important elements:

i) theoretical perspectives or orientation to guide research and logic of enquiry,

ii) tools and techniques of data collection, and

iii) methods of data analysis.

Research Methods, comprises of **research techniques** and **tools. Research techniques** refer to the practical aspects of collecting data and the way the information/data obtained/collected is organized and analysed. **Tools** are the instruments that are used for data collection and its analysis. It includes questionnaire/schedules, dairies, check lists, maps, photos, drawings etc. Census and survey methods are mainly used to collect quantitative data. In qualitative research, data is generated/complied by way of participant observation, semi structured interviews, life histories, experiments, pilot studies, scenarios etc. Data analysis involves a set of statistical techniques used in establishing relationships between the different variables and in evaluating the accuracy of the results.

Thus, methodology, methods and tools/techniques are three distinct elements of the research process. Any one of these three elements by itself may not be adequate in many situations. For instance, no data can be systematically collected without adequate knowledge of techniques of data collection. Similarly, data can not be explained without comprehending the philosophy or perspective behind the characteristics underlying the variables to which the data relates. A sound knowledge of statistical techniques is also necessary to analyse the data efficiently.

1.3 THEORETICAL PERSPECTIVES

Theoretical perspectives relate to theories of knowledge which lies within the domain of philosophy of social science. The key concept associated with the perspectives is the paradigm. Let us start to discuss with the concept of paradigm.

Paradigm: A paradigm is a comprehensive belief system, world view or framework that guides research and practice. It consists of

- At the basic or fundamental level, a philosophy of science that makes a number of assumptions about fundamental issues relating to nature and characteristics of truth or reality (ontology) and the theory of knowledge dealing with how can we know the things that exist (epistemology).
- World view, conceptual and theoretical framework that guides research and practices used in the field.
- General methodological prescriptions including tools to be used for information/data collection and data analysis to conduct the work within the paradigm.

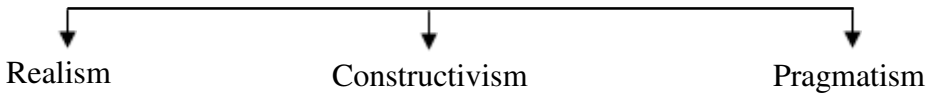
The exact number of world views and the names associated with a particular paradigm vary from author to another but four paradigms in the context of research approaches in social sciences, are important:

- Positivism and post positivism
- Critical theory
- Interpretivism
- Pragmatism.

The peculiar features of these paradigms are:

- They differ on the question of reality,
- They offer different reasons or purposes for doing research,
- They use different types of tools for data collection and sources of information also vary,
- They resort different ways of deriving meaning from the collected data,
- They vary in the relationship between research and practice.

Some authors have classified these paradigms into three categories by re-naming them as:



- Realism begins by assuming that there is a real world that is external to the experience of any particular person and the goal of research is to understand that world.
- Constructivism begins by assuming that everyone has unique experience and beliefs and it posits that no reality exists outside of those perceptions.
- Pragmatism considers realism and constructivism as two alternate ways to understand the world. However, the questions about the nature of reality are less important than questions about what is meant to act and experience the consequence of those actions.

The knowledge of all these perspectives enable a researcher to make a meaningful choice about

1) the research problem;
2) the research questions to investigate this problem;
3) the research strategies to answer these questions;
4) the approaches to social enquiry that accompany these strategies;
5) the concept and theory that direct the investigation;
6) the sources, forms and types of data;
7) the methods for collecting and analyzing the data to answer these questions.

The characteristics of positivism and post positivism as theoretical and methodological perspectives to scientific knowledge have been provided in the next unit i.e. Unit 2 of this course. Similarly the characteristics of interpretivisms and critical theory perspective to conduct social research will be taken up in Unit 5 of this course.

1.4 APPROACHES TO SOCIAL ENQUIRY

Broadly two types of approaches are used in conducting research in social sciences: quantitative and qualitative. The studies conducted within the perspective (framework) of positivism/post-positivism/realism generally resort the quantitative approach and are termed as 'quantitative research'. Quantitative research integrates purposes and procedures that are deductive, objective and generalized. Emphasis is laid on the construction of general theories which are applied universally. Well controlled procedures with large number of cases are followed in conducting the studies.

On other hand, the studies conducted within the perspective of critical theory and interpretivism paradigms are termed as qualitative research. By using induction as a research strategy, qualitative research creates the theory and discovery through flexible, emergent research designs. It tries to evolve meaning and interpretation based on closer contacts between researchers and the people they study. Thus qualitative research consists of purposes and procedures that integrate inductive, subjective and contextual approaches. Based on the above outlines on the types of research – we may say that there are two basic approaches to research viz., quantitative approach and qualitative approach.

Mixed methods research by combining quantitative methods and qualitative methods are being used in social sciences. Hence, mixed method design by integrating quantitative and qualitative approach has also emerged as an approach to social enquiry.

Quantitative approach can be further sub-classified into: inferential approach; experimental approach; and simulation approach.

In **Inferential approach**, database is established through survey method and inference is drawn about characteristics or relationship of variables. In **experimental approach**, greater control is exercised over research environment. Some variables are manipulated to observe their effect on other variables.

Simulation approach refers to the operation of a numerical model that represents the structure of a dynamic process. It involves the construction of an artificial environment in which relevant information/data can be generated. Given the values of initial conditions, parameters and exogenous variables, a simulation is run to represent the behaviour of the process over time.

Qualitative approach deals with the subjective assessment of attitudes, opinions and behaviour of respondents in the field. Results are generated either in non-quantitative form or in a form which are subjected to relatively less rigorous quantitative treatment. Various techniques like group discussions, projective techniques, in-depth interviews etc., are used. The typical characteristics of both these approaches may be summarized in the following Table:

Table 1.1: Typical Characteristics of Qualitative and Quantitative Approach

Characteristics	Qualitative Approach	Quantitative Approach
1) Typical data collection methods	Participant observation, semi-structured interviews, group discussion report cards etc.	Laboratory observations, questionnaire, schedule or structured interviews.
2) Formulation of questions and answers	Open/loosely specified questions and possible answers. Questions and answers are exchanged in two way communication between researcher and respondent.	Closed questions (hypothesis) and answer categories to be prepared in advance.
3) Selection of respondents	Information maximization guides the selection of respondent. Every respondent may be unique (key person).	Representativeness as proportion of population N. Randam sample selection, sample size according to assumptions about distribution in population N.
4) Timing of analysis	Parallel with data collection	After data collection
5) Application of standard methods of analysis	Descriptive methods of analysis are used. Mixed methods are also used.	Standard statistical methods are frequently used.
6) The role of theories in the analysis	Existing theories are typically used only as point of departure for the analysis. Theories are further developed by forming new concepts and relations. The contents of the new concepts are studied and illustrated. Practical application of theory is illustrated by cases.	A-priori deducted theories are opeationalised and tested on data. The process of analysis is basically deductive.

1.5 RESEARCH STRATEGIES

Four basic strategies can be adopted in social research depending upon the researcher's belief/reliance on perspective/paradigm about the nature of reality.

Paradigm	Research Strategy
Positivism	Induction
Post positivism/Realism	Deduction
Critical realism	Retroduction
Interpretativism	Abduction

Each strategy has different starting points (Lewis-Beck, 2004):

1) The inductive strategy begins with collection of data from which generalisation is made and can be used as an elementary explanation;

2) The deductive strategy starts out with a theory that provides a possible answer. The theory is tested in the context of a research problem by collection of relevant data;

3) The retroductive strategy starts out with a hypothetical model of a mechanism that could explain the occurance of a phenomenon under investigation;

4) The abductive strategy starts with laying the concepts and meanings that are contained in social quarters account of activities related to a research problem.

Check Your Progress 1

1) Distinguish between Research Methodology and Research Methods.

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2) How does the knowledge of research perspectives help a researcher to undertake research studies in social sciences?

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3) How is retroductive research strategy different from abductive strategy?

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4) Explain the term 'ontology' and 'epistomology'.

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1.6 RESEARCH PROCESS

Research process refers to different steps involved in a desired sequence in carrying out research. However, this does not mean that these steps are always in a given sequence. The various steps involved in research can be illustrated in a flow chart as shown in the figure below:

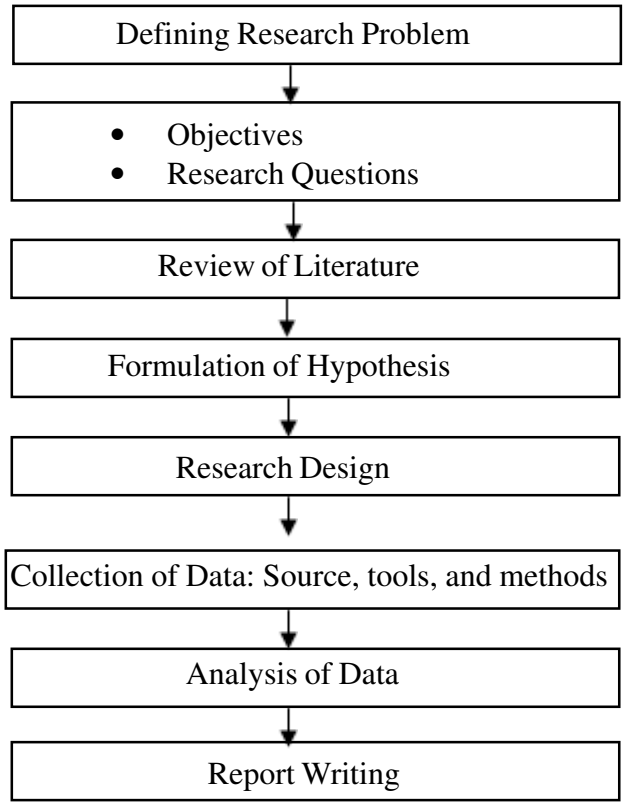


Fig. 1.1: Flowchart of Research Process

The above activities or steps overlap continuously rather than following the prescribed sequence strictly. The steps are not mutually exclusive. The order illustrated is meant only to provide a procedural guideline for research. The steps are briefly elaborated below:

a) **Defining the research problem:** Selecting and properly defining the research problem is the first foremost step. The problem to be investigated must be defined categorically. It is important to identify the general area of interest or a particular aspect of a subject matter desired to be studied. Initially, the problem may be stated in a borad way and later it can be narrowed down in operational terms. Essentially two steps are involved in formulating the

research problem: (i) Understanding the problem thoroughly; and (ii) rephrasing it into meaningful terms from operational/analytical point of view.

It is better to select the subject that is familiar with easy access to research material and data sources. Apart from the topic, following points need to be stated clearly in the research problem:

1) rationale behind the research problem;

2) the aims and objectives as per the requirements of the research questions. The statement of the objectives determines the data to be collected, hypothesis to be tested, techniques for data collection and analysis to be adopted, and the relations intended to be explored;

3) the research questions in the light of the objectives and the theoretical arguments/foundation on which it rests;

4) developing the ideas through discussions; and

5) re-phrasing the research problems identified in (i) above into a working proposition.

The **different steps** to be followed while defining the research problem, therefore are:

- statement of the problem first in a general way to be later sharpened with the help of literature review,
- understanding the nature of the problem, and
- surveying the available literature.

In addition to the above, the following points should also be observed while defining the research problem:

- Technical terms and words or phrases used in the research problem should be explicitly defined.
- Basic assumptions or postulates relating to the research problem need to be clearly stated.
- A clear and unambiguous statement of the investigation should be provided.
- The time-period required and the scope of the study must be duly stated.
- The sources of data and its limitations must be explicitly mentioned.

b) **Review of Literature:** The review of literature is meant to gain insight on the topic and gain knowledge on the availability of data and other materials on the theme of proposed area of research. The literature reviewed may be classified into two types viz. (i) literature relating to the concepts and theory

and (ii) empirical literature consisting of findings in quantitative terms by studies conducted in the area. This will help in framing research questions to be investigated. Academic journals, conference proceedings, government reports, books etc. are the main sources of literature. With the spread of IT, one can access a large volume of literature through internet.

c) **Formulation of Hypothesis:** Specification of working hypothesis (or hypotheses) is the next step of research process. A hypothesis is a tentative statement made which needs to be tested for its logical and empirical confirmation. Hypothesis can be formulated as a proposition or set of propositions providing most probable explanation for occurrence of some event or specified phenomenon. Hypotheses when empirically tested may either be accepted or rejected. A hypothesis must, therefore, be capable of being tested. A hypothesis stated in terms of a relationship between the dependent and independent variables are suitable for econometric treatment. The manner in which hypothesis is formulated is important as it provides the required focus for research. It also helps in identifying the method of analysis to be used.

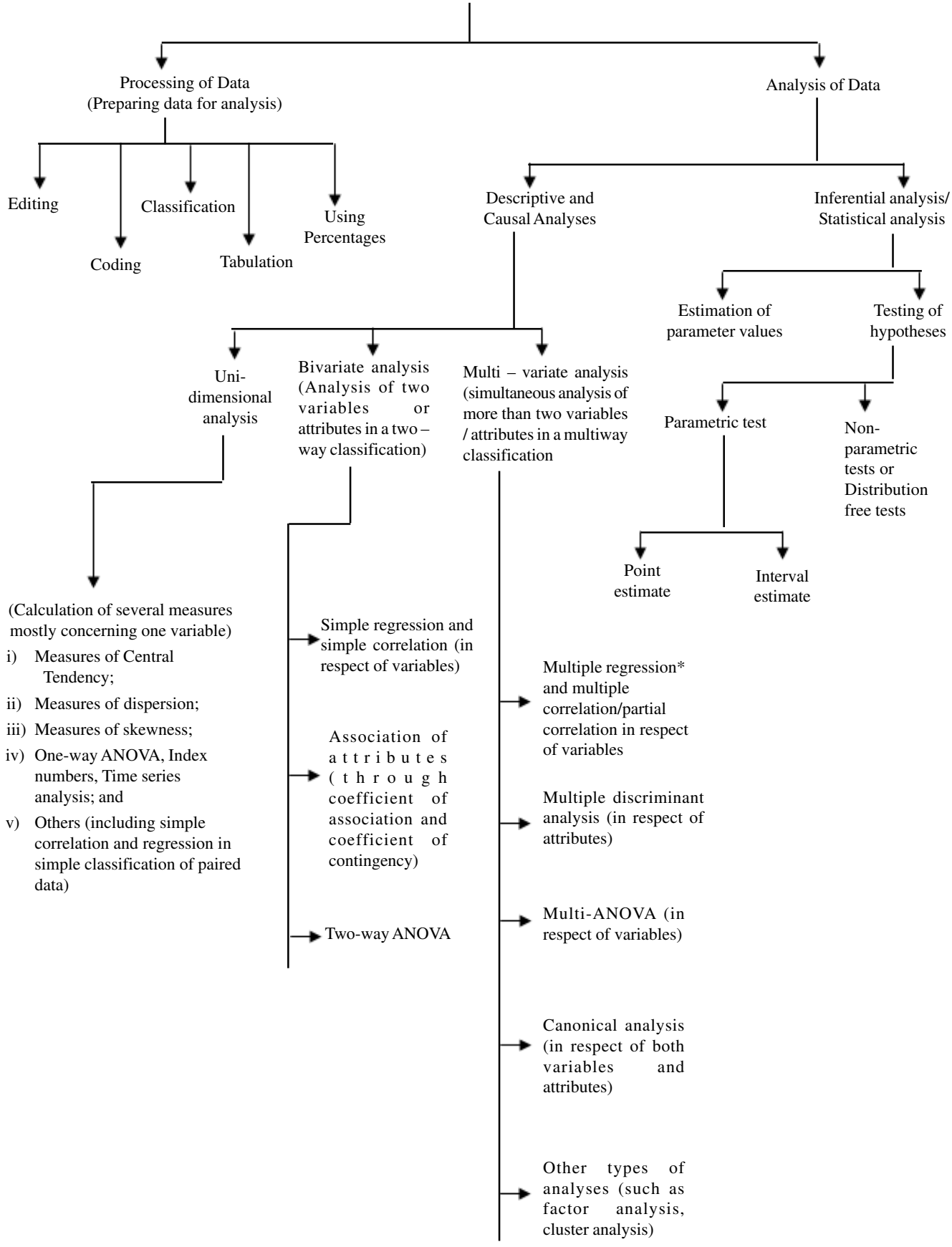
Prior thinking about the subject, examination of the available data and material related to the study, discussion with colleagues and experts help the researcher in formulation of hypothesis. Exploratory or descriptive research can be carried out even without hypothesis.

d) **Research Design:** Research design is the logical conceptual structure within which research is conducted. It is the blueprint for the collection, measurement and analysis of data. Detailed discussion on Research Design has been provided in Unit 6 of Block 2.

e) **Collection of Data:** Collection of data is an essential part of the research process. Data can be primary or secondary. Data collected by the researcher, say by a survey, is primary. The data already collected by some agency and available in some published form is secondary. There are two main techniques of data collection – (i) census and survey (ii) observation method. Primary data can also be collected by means of experiments (e.g., yield under certain conditions, observation at many time points of a certain phenomena, etc.). Intensive fieldwork methods include observation, interview, case study, etc. A survey is usually conducted by the canvassing of a questionnaire. Issues of data collection and sampling design have been discussed in detail in Unit 7 of Block 2.

f) **Analysis of Data:** Analysis involves steps like categorization, coding, tabulation, etc. The principle for classification or categorization of data has to be based on the problem under study or the hypothesis formulated. The category must be exhaustive and sufficient for classifying all responses. They must be distinct, separate and mutually exclusive. **Coding** involves grouping of responses falling under a particular category. **Tabulation** is a means of organizing the responses to facilitate comparisons bringing up the inherent relations between two or more variables. It is an orderly arrangement of data in columns and rows. Analysis and inference is usually aided by the application of different statistical and econometric techniques. Some of the major techniques usually employed in research have been reflected in the **summary chart 1.2**

Summary Chart 1.2
ANALYSIS OF DATA



Most of these analytical techniques have been covered in Units 9,10,11 and 12 of Block 3 and Units 13,14,15,16 and 17 of Block 4 of this course.

Report Writing: Originality and clarity are the two vital components of research report. It is the ultimate test of one's analytical ability and communication skills. It is an exercise involving the organization of ideas. The research report needs to be presented in such a manner that the readers can grasp the context, methodology and findings easily. The report comprise of two parts: the preliminary pages and the main text. In the preliminary pages, the report should indicate the title of the research study, name of the researcher (and his team members) and the name of the institution and/or the month/year of preparation of the report. This should be followed by a 'preface' in which the main context of preparing the report along with key findings must be presented. Towards the end of the 'preface', the important sources/persons can suitably be acknowledged.

The main text begins with an introductory chapter followed by the major aspects of the study organized into different chapters. The introductory chapter should contain a clear statement of the objectives of the study, rationale behind the study, a brief summary of the literature review, hypotheses tested (if any) and the definitions of the major concepts employed in the study. The methodology adopted in conducting the study must also be fully explained along with an explicit mention of the limitations of the study. The subsequent parts of the main text, should present the major aspects of the study arranged in a logical sequence splited into appropriate sections and subsections. The inter-connection between different sections should be properly maintained so that the report reads smoothly.

The implications of the results of the study should be stated towards the end of the report. The implications may comprise of:

i) the inferences drawn from the study;

ii) the conditions which may limit the extent of generalizations of the inferences drawn; and

iii) the questions that remain unanswered along with new areas for further research identified. The conclusion drawn from the study should be clearly related to the objectives/hypotheses stated in the introductory section.

The report may also include an 'executive summary' outlining the context and methodology, and major findings of the study. The 'executive summary' is placed right at the beginning (i.e. before the introductory chapter) so as to provide a concise picture of the entire report.

1.7 HYPOTHESIS: ITS TYPES AND SOURCES

Hypothesis are potential explanations that can account for our observations of the external world. They usually describe cause and effect relationships between a proposed mechanism or process (the cause) and our observations (the effect).

In quantitative research, there are two methods of hypothesis generation: deductive method and inductive method.

If hypothesis is generated from a theory, it is called deductive approach. On the other hand, if it is generated from observation, it is termed as inductive approach.

Deductive approach: Theory → Hypothesis→Observation→Confirmation.

Inductive approach: Observation→Pattern→Tentative Hypothesis→Theory.

In qualitative research, a hypothesis might be framed in terms of social setting having certain features, which through observation, can be confirmed or falsified. In survey or experimental research or otherwise hypothesis testing establishes the statistical significance of a finding.

1.8 THE NATURE, SOURCES AND TYPES OF DATA

For undertaking any meaningful research in terms of situational assessment, testing of models, development of theory, evaluation of economic policy, data is essential. The availability of data therefore, determines the scope of analysis. In any research, the researcher is expected to state the sources of the data used in the analysis, their definitions, and methods of collection.

The data may be of three types; Time series, Cross-section and Pooled.

1) **Time Series Data:** It is a set of observations on the values that a variable takes at different times. Such data may be collected at regular time intervals such as daily (i.e. prices, whether reports etc.), weekly (like money supply figures), monthly (i.e. consumer price index etc.) quarterly (i.e. GDP), annually (i.e. government budget etc.).

2) **Cross Section Data:** Cross-section data are data on one or more variables collected at the same point of time. For example the data on the census of population collected by the Registrar General of India.

3) **Pooled Data:** In pooled data, the elements of both time series and cross section are clubbed. For example, over a period of time say from 2000 to 2013, we have data on saving, investment and GDP across Indian states.

Panel, Longitudinal or Micro Panel Data: This is a special type of pooled data in which the same cross-sectional (say a family or firm) is surveyed overtime.

The Sources of Data: The data used in empirical analysis may be collected by a governmental agency (e.g. CSO, NSSO, RBI, Labour Bureau etc.), an international agency (e.g. International Monetary Fund (IMF) or a private organization. Such data is called secondary data because these are collected from secondary sources. The details about the kind of secondary data compiled by the different data collecting agencies have been presented in Block 6 of this course.

The data collected by the investigator or researcher through field work is termed primary data. Such data is collected by using different tools like questionnaire, schedule, interview etc. under quantitative approach and participant observation, open ended interview, group discussion, key information etc. (under qualitative approach). The methods for collecting the primary data have been discussed in Unit 7 of Block 2.

1.9 MEASUREMENT SCALES OF VARIABLES

Measurement is the process of observing and recording the observation that are collected. A variable can be measured at four levels: ratio scale, interval scale, ordinal scale and nominal scale. The suitability of analytic technique depends on the measurement scale. A particular econometric/statistical technique that may be suitable for ratio scale variables may not be suitable for nominal scale variables.

It is therefore desirable to know the distinctions among the four types of measurement scales. These are discussed below:

1) **Nominal Scale:** Under the nominal scale, the data is recorded into categories, without any order or structure. In other words, if against any question/ statement, response is recorded simply yes/no, then the scale will be nominal. It has no order and there is no distance between yes and no.

   The statistical techniques that can be used with nominal scales data are: Mode, cross tabulation – with chi-square. Other highly sophisticated modeling techniques available for nominal scale data are – logistic Linear Regression Model, Principal component analysis, factor analysis etc.

2) **Ordinal Scale:** In terms of power of measurement, ordinal scale comes next to nominal scale. Recording Ranks against various options/choices is the simplest ordinal scale. If you are asked by a researcher to rank 5 fruits from most favorable to least favorable, he is essentially asking you to create an ordinal scale of preference.

   Median, Mode, rank order correlation, non-parametric correlation and modeling techniques are used with ordinal data.

3) **Interval Scale:** In a situation when we not only talk about **differences in order** but also **differences in the degree of order**, it is referred to as interval scale. For example, if we are asked to rate our satisfaction with a piece of software on a 7 point scale, from dissatisfied to satisfied, we are using an interval scale.

   Mean and stardard deviation, correlation, regression, analysis of variance, factor analysis techniques can be used with interval scale data.

4) **Ratio Scale**: A ratio scale is the top level of measurement and satisfies the following properties:

   i) Measurement of each observation of a variable in numerals (quantitative terms) and hence possible to work out the ratio of two observations. For a variable X taking two values X_1 and X_2 the ratio will be X_1 / X_2.

   ii) Measurement of distance between two observation X_1 and X_2 i.e. $(X_2 - X_1)$.

   ii) Indication of the natural ordering (ascending or descending) of the elements of a variable. Therefore, comparison such as $X_2 \geq X_1$ or $X_2 \geq X_1$ are meaningful.

The statistical techniques used in interval scale can easily be used in ratio scale also. You will find elaborate discussion on measurement scales and scaling techniques in Unit 8 of Block 2.

Check Your Progress 2

1) In what way review of literature helps a researcher?

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2) What is meant by a hypothesis?

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3) Distinguish between time series data and cross section data.

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4) State the various measurement scales of data.

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1.10 LET US SUM UP

Research plays a significant role in human progress. It inculcates scientific temper and logical thinking. Research refers to a scientific and systematic enquiry aiming either to discover new facts or to verify the old facts. The theoretical perspectives, tools and techniques of data collection and methods of data analysis together constitute the Research Methodology. Broadly there are two basic approaches of research; quantitative and qualitative. Quantitative approach generates the data in quantitative terms. This can, therefore, be subjected to quantitative analysis. Subjective assessment of attitudes, opinions and behaviour are tackled by the qualitative approach to research. Research process involves seven steps – identification of research problem, review of literature, objectives, formulating the hypothesis, finalizing research design, collection of data, analyzing the data and report writing. Data can be of three types: time series, cross section and panel data. A variable can be measured at four levels: ratio scale, interval scale, ordinal scale and nominal scale. The suitability of analytic technique depends on the measurement scale. Hypothesis is a tentative explanation of any event or phenomenon in the external world. There are two methods of hypothesis generation: deductive method and inductive method. Thus, this unit provides an overview of the conceptual foundation of Research Methodology and enables the learner to comprehend the various processes involved in carrying out the research study.

1.11 KEY WORDS

Coding : A system of symbols, letter or words used in transmitting messages.

Epistemology : Epistemology refers to the theory of knowledge of how human beings come to have knowledge of the world around them – of how we know what we know. Broadly there are two theories: Rationalism and Empiricism.

Rationalism : Rationalism is based on the idea that reliable knowledge is derived from the use of "pure" reason.

Empiricism : Empiricism envisages that the knowledge of the world can be obtained only through direct sense-experience.

Experimental Testing Research : Research in which independent variables are manipulated.

Ontology : It is a branch of philosophy that is concerned with the nature of reality. It deals with the theories about what makes up reality.

Induction : Induction is a process for moving from particular statements to general statements. This logic is used in social sciences to produce theory from data.

Deduction : Deduction is a process used to derive particular statements from general statements. A hypothesis is deduced from a theory and is tested by empirical data.

Abduction : Abduction refers to the process of moving from the way social actors describe their way of life to technical, social scientific description of that social life. It has two stages: (a) describing these activities and meaning and (b) deriving categories and concepts that can form the basis of an understanding or an explanation of the problem at hand.

Retroduction : Retroduction refers to the process of going back from, below, or behind observed patterns or regularities to discover what produces them. This logic of enquiry focuses to locate the structures and mechanisms that have produced the regularity. These structures and mechanisms envisage the tendencies or powers of things to act in a particular way.

Research Hypothesis : Research hypothesis is a predictive statement that relates an independent variable to a dependent variable. Such a hypothesised relationship is usually meant to be tested by research method. Predictive statements, which cannot be objectively verified, or the relationships that are assumed which cannot be tested do not qualify as research hypothesis.

Tabulation : Setting out the data/information in tabular form.

1.12 SOME USEFUL BOOKS

1) Kothari C.R. (1985): *Research Methodology – Methods and Techniques*, Wiley Eastern Publication Chapter 1-3 pp 1 to 67.

2) LeWis-Beck Michael S; Bryman Aan, Tim Futing, Liao (Ed) (2004): *The Sage Encyclopedia of Social Sciences Research Method,* Volumes 1,2 and 3, Sage Publications, New Delhi.

3) David L. Morgan (2014): *Integrating Qualitative and Quantitative Methods,* Sage Publications, New Delhi

1.13 ANSWERS OR HINTS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) See section 1.2

2) See section 1.3

3) See section 1.5

4) See section 1.3

Check Your Progress 2

1) Review of literature enables the researcher to know about the availability of relevant material and data. It also helps in framing the research questions.

2) See section 1.7.

3) A set of values of a variable at different times is time series data whereas a set of values of one or more variables collected at a point of time is cross section data.

4) Various measurement scales of a variable are: ratio scale, interval scale, ordinal scale and nominal scale.

UNIT 2 APPROACHES TO SCIENTIFIC KNOWLEDGE: POSITIVISM AND POST POSITIVISM

Structure

2.0 OBJECTIVES

After going through this unit, you will be able to:

- Describe the aim of science as a cognitive enterprise;
- Explain the basic ideas of positivism;
- Appreciate the arguments or criticisms leveled against positivist philosophy of science;
- Explain the central tenets of Popper's philosophy of science;
- State the fundamental differences between Popper's and positivists' views about theory of scientific method;
- Assess Karl Popper's philosophy of science;
- Describe the essentials of Kuhn's philosophy; and
- Discuss the basic differences between the Popperian and the Kuhnian models of science.

2.1 INTRODUCTION

Science has not only shaped our mode of living in the world but also our ways of thinking about the world. It is for this reason it has acquired a central place in the intellectual life of our times. Because of its central place in the modern culture, three disciplines have emerged which has made science itself their object of inquiry. These three disciplines are: History of Science, Sociology of Science and Philosophy of Science. Whereas science studies the world natural or social

or psychological, these three disciplines study science itself. History of Science and Sociology of Science are essentially twentieth century disciplines. No doubt, Philosophy of Science has a great past built by the contributions of individual philosophies in different centuries. However, as a widespread and coordinated discipline, it is also an essentially twentieth century phenomenon.

History of Science is a study of the development of scientific ideas and institutions in a chronological order. Sociology of Science is the study of the relation between social factors and forces on the one hand and the growth of scientific ideas and institutions, on the other. In short, it is an inquiry into the relation between science and society. History of Science deals with science as a historical phenomenon and sociology of science is concerned with science as a social institution. Philosophy of Science is a study of Science as a cognitive enterprise, that is, as a knowledge-seeking activity. The enquiry we call **Philosophy of Science** addresses questions like "What is the aim of Science?", "What is the method of Science?" In what sense, if any, is Science objective, rational and progressive?"

It is obvious that answers to questions such as these are of importance in figuring out how if at all, and in what sense, if any, social sciences including Economics, can claim to be scientific.

2.2 POSITIVIST PHILOSOPHY OF SCIENCE

Positivism (which is also called "logical positivism") is a movement in Philosophy of the first half of the 20th century. Positivists debunked the whole of traditional Philosophy by attacking Metaphysics which was the most important branch of Philosophy. Metaphysics was so central to Philosophy that Philosophy was virtually identified with Metaphysics. Metaphysics sought to answer most general and basic questions like "What is Ultimate Reality?" "Does God exist? And is so what is God's relation with the world?", "Is there a soul?", "What is the relation between the mind and the body?", "Is man free or are human actions determined?" etc., Positivists maintained that Metaphysics was a spurious discipline because metaphysical statements (such as "Matter is Ultimate reality" or "Ultimate Reality is Spiritual" etc.,) are meaningless since they are not verifiable in experience. "A statement" they claimed "is meaningful if and only if it is verifiable." Apart from being anti-metaphysical, they were empiricists i.e., according to them, experience is the source of knowledge. They called themselves "Neo-Empiricists" to distinguish themselves from the Traditional Empiricists of 17th and 18th centuries like Locke, Berkeley and Hume.

2.2.1 Central Tenets of Positivist Philosophy

In science we start with particular observations regarding what is the case. Using the method of induction, we arrive at definitions which are statements about the essential nature of things. We, then, using the method of deduction, on the basis of definitions, arrive at demonstrations which show why things must be what they are. Thus, the aim of science is two fold: **Definition and Demonstration**. The method of science, broadly, is of two types: **Induction and Deduction**. All science must proceed from "What is" given to us in particular observations to "what must be" as shown by the demonstrations. The path of science is an arch whose two end points are observation and demonstration.

In the whole span of three centuries – from the beginning of the 17th century till the end of the 19th century – two views stand out prominently as answer to the question regarding the aim and method of science. The first view is called Induction. The second view is called **Hypothesisism,** according to which the method of science is the method of Hypothesis. **Francis Bacon** is the Father of Inductivism and **Rene Dercartes** is the Father of Hypothesisism. The two views provide two distinct models of scientific practice, which we may call **Baconian** and **Cartesian** models of Scientific practice.

Positivists worked out a well-knit philosophy of science. Here are some of the central tenets of the Positivist Philosophy of Science:

1) Science is qualitatively distinct from, superior to and ideal for all other areas of human endeavor (**Scientism).**

2) The distinction, superiority and idealhood that Science enjoys is traceable to its possession of method (**Methodologism**).

3) There is only one method common to all sciences, irrespective of their subject matter (**Methodological monism**).

4) That method which is common to all sciences, natural or human, is the method of Induction (**Inductivism**).

5) The hallmark of science consists in the fact that its statements are systematically verifiable.

6) Scientific observations are or can be shown to be "pure" in the sense that they are theory-free.

7) The theories are winnowed from facts or observations.

8) The relation between observation and theory is unilateral in the sense theories are dependent on observations whereas observations are theory-independent.

9) To a given set of observation based statements, there corresponds uniquely only one theory (just as from a given set of premises in an argument, only one conclusion follows).

10) Our factual judgments are value-neutral and our value judgments have no factual content (Fact-Value Dichotomy thesis); hence, science being the foremost instance of factual inquiry, does not have value commitments.

11) That all scientific explanation must have the following pattern:

$L_1 \ldots\ldots L_n$

$I_2 \ldots\ldots I_n$

Therefore, E.

Where $L_1 \ldots\ldots L_n$ is a set of laws, $I_2 \ldots\ldots I_n$ is a set of statements describing initial conditions and E is the statement describing phenomenon to be explained. That is to say, to explain a phenomenon scientifically is to deduce its description from a set of laws (which are called "Covering Laws") via a set of statements describing initial conditions. In sum, all explanation worthy to be called '**scientific**' must contain laws and involve deduction (Hence, this is called Deductive-Nomologism where 'nomological' means 'concerning laws').

12) The aim of science is either economical description of phenomena or precise prediction of facts and not providing an account of observations in terms of unobservables. Hence, scientific theories are not putative descriptions of the unobservable world. The aim of science has nothing to do with alleged reality of such a world (Anti-Realism).

13) Unlike other areas of activity, science is progressive in the sense that scientific change is always change for better, whereas other areas exhibit just change: the progress of science consists in the accumulation of observations on the one hand, and, cumulative growth of theories,on the other hand. The latter means that any new theory includes the old theory(plus something). Thus the growth of science essentially exhibits continuity.

14) Science is objective in the sense that its theories are based on 'pure' observations or facts which as theory free. Interpretations may be subjective but observations/facts are objective because they are free from interpretation/ theory.

15) Science is rational because the principle of Induction which is central to the method of science is rationally defensible, in spite of Hume's skepticism regarding its rational defensibility.

Positivists tried to justify the principle of Induction by invoking the concept of pure observation. According to them, theories are arrived at on the basis of the Principle of Induction. If we can show that theories are very closely related to pure observations, the Principle of Induction stands rationally justified. They tried to work out a whole project to demonstrate rational justification of the Principle of Induction on these lines.

2.3 ATTACK ON THE POSITIVIST PHILOSOPHY OF SCIENCE

It must be noted that the concept of pure observation is necessary for positivist philosophy of science for showing that science is objective and that science is rational. Hence, the centrality of this concept to the positivist philosophy of science. Therefore, the collapse of this concept to the positivist philosophy of science though other theses of positivist philosophy of science listed above also were demolished by its opponents. Let us briefly look at the arguments which demolished the positivist thesis of pure observations i.e., thesis at Sl.No.6 in the list above.

Firstly, observations presuppose some principle of selection. We need relevant observations. In science it is the problem that decides what is a relevant observation and thus provides the principle of relevance. Hence, there can not be observations without a – prior problem.

As Popper says "Before we can collect data, our interest in data of a certain kind must be aroused; the problem always comes first". It may be objected that we become aware of the problems because of observations and hence observations come first and therefore positivists are right. But this objection does not hold. Two persons might make same observations but one may come out with a problem and the other may not. Therefore, mere observations would not generate problems in science. Usually problems are generated when there is a clash between what

we observe and what we expect. Of the two persons making the same observations, one comes out with a problem because he sees a conflict between what he observes and what he expects whereas the other observer may have not expectation which conflicts with what he observes. The former believes in a theory which produces certain expectations which conflict with his observations and hence he comes out with a problem. In other words, a – prior belief in a theory is necessary for a problem to be generated and a – prior awareness of the problem is necessary for making relevant observations. Thus, theory precedes observations.

Secondly, in science observations are taken into account only if they are described in a language that is currently used in a particular science. An observation, however, genuine, is no observation unless it is expressed in a recognized idiom. It is the theory which provides the idiom or language to be used to describe facts or observations. It is relevant to quote the words of Pierre Duhem, a distinguished physicist and philosopher:

"Enter a laboratory. The table crowded with an assortment of apparatus: an electric cell, silk covered copper wire, small cups of mercury, spools, a mirror mounted on an iron bar; the experimenter is inserting into small openings the metal ends of ebony-headed pins: the iron bar oscillates and the mirror attached to it throws a luminous band upon a celluloid scale: the forward backward motion of this spot enables the physicist to observe the minute oscillations of the iron bar. But ask him what he is doing. Will he answer "I am studying the oscillations of an iron bar which carries a mirror?" No, he will say that he is measuring the electrical resistance of the spools. If you are astonished, if you ask him what his words mean, what relation they have with the phenomenon he has been observing and which you have noted at the same time as he, he will answer that your question requires a long explanation and that you should take a course in electricity".

Thirdly, most of the observations in science are made with the help of instruments. These instruments are constructed or designed in accordance with the specifications provided by some theories. These theories, one may say, form the software of these instruments. Belief in the reliability of these instruments implies the acceptance of these theories which has gone into the making of these instruments. This observations presuppose prior acceptance of theories.

Fourthly, observations in science need to be legitimized i.e., ratified by a theory. An example makes the point clear. We all know that Galileo used some telescopic observations to support the Helio-centric theory against the geo-centric theory of Ptolemy and his followers. His opponents did not consider the telescopic observations adequate. Why did they not? No doubt, they had belief in the reliability of telescope; they had no problem in using telescope for terrestrial purposes i.e., making observations of earthly objects. They opposed the extension of telescopic observations to the celestial sphere i.e., regarding heavenly bodies. Their argument was that the normal factors like background and neighbourhood which help our normal perceptions are absent in the sky. Further, it is impossible to directly verify whether telescopic observations of heavenly bodies are accurate. They rightly demanded from Galileo a theory of light which would justify the extension of the telescope from terrestrial to celestial sphere. Galileo had no such theory. But he rightly believed that such a theory could be provided in future so that telescopic observations would get justification. Thus, while the opponents of Galileo insisted that the telescopic observations be justified by an

optical theory at the same time as their acceptance, Galileo maintained that the justification could be provided subsequent to their acceptance. It may be noted that both sides accepted that the telescopic observations needed justification in term of a theory of light.

All this does not mean that observations are theory-dependent whereas theories are observation-independent. Observations and theory are interdependent though it is not easy to clarify what the nature of this interdependence is. However, positivists were wrong in claiming that observations are theory –independent. To say that observations are theory dependent is to say that observation is not a passive reception but an active participation of our cognitive faculties equipped with prior knowledge which we call theory. After all, observations are not 'given' but 'made'.

Check Your Progress 1

1) What is the aim of science?

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2) What do you mean by the term 'inductivism'?

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3) What are the features of hypothesis?

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4) Match the following:

	A		B
i)	The relation between observation and theory	i)	Value judgments
ii)	Factual inquiry under positivist approach does not have	ii)	Precise prediction of facts
iii)	The aim of Science is	iii)	Objective
iv)	Science is	iv)	Unilateral

5) Give two counter arguments against the positivist thesis of pure observation.

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2.4 KARL POPPER'S PHILOSOPHY OF SCIENCE

Karl Popper was the first to react against the positivist philosophy of science. In fact he started attacking it quite early. But his attack on positivists and his alternative to the positivist philosophy of science came to be widely known at the beginning of the second half of the 20th century. Popper's theory of science, particularly his theory of scientific method has won a lot of admirers among scientists and philosophers. As we know, positivists tried to work out a **sophisticated version of Inductivism**. Popper worked out a **sophisticated version of Hypothesisism**. We shall briefly consider his views on the nature of science.

According to Popper, the central task of philosophy is not to solve Hume's problem or problem of Induction as thought by Positivists. This is because (1) the problem of Induction cannot be solved, and (2) it need not be solved because the method of science is not the method of Induction. The central task of philosophy of science, Popper maintains, is to solve what he calls the problem of demarcation or Kant's problem i.e., the problem of identifying the line of demarcation between science and non-science. Popper maintains that **what distinguishes science from the rest of our knowledge is the systematic falsifiability of scientific theories**. This falsifiability is the line of demarcation between science and non-science. Falsifiability is the criterion of scientificity. A statement is scientific if and only it is falsifiable.

In accordance with what he considers to be the hallmark of scientific theories, Popper puts forward what he considers to an adequate model of scientific method. He characterizes his model of scientific method as **Hypothetico-Deductive model**. According to him, the method of science is not method of Induction but the method of **Hypothetico-Deduction**. What are the fundamental differences between these methodological models"? Firstly, **the inductivist model maintains that our observations are theory-independent and therefore are indubitable. That is to say, since observations are theory-independent, they have probability Value 1**. It also says that our theories are only winnowed from observations and therefore our scientific theories have the initial probability value 1 in principle. Of course, inductivists admitted that in actual practice, the theories may contain something more than what observation based statements say, with the result that our actual theories may not have been winnowed from observations.

Hence, the need for verification arises. Popper rejects the inductivist view that our observations are theory-free and hence rejects the idea that our observation statements have probability equal to 1. More importantly, he maintains that theories are not winnowed from observations or facts, but are free creations of human mind. Our scientific ideas, in other words, are not extracted from our observations; they are pure inventions. Since **our theories are our own**

constructions, not the functions of anything like pure observations, which according to Popper are anyway myths, the initial probability of our scientific theories is zero.

From this it follows that whereas according to the inductivists what scientific tests do is to mrely find out whether our scientific theories are true, according to Popper scientific tests cannot establish the truth of scientific theories even when the tests give positive results. If a test gives a positive result, the inductivists claim that the scientific theory is established as true, whereas according to Popper all that we calim is that our theory has not yet been falsified. In Popper's scheme no amount of positive result of scientific testing can prove our theories. Whereas the inductivists speak of confirmation of our theories in the face of positive results of the tests, Popper only speaks of corroboration. In other words, in the inductivist scheme we can speak of scientific theories as established truths, whereas in the Popperian scheme, a scientific theory, however, well supported by evidence remains permanently tentative. We can bring out the fundamental difference between verificationism (inductivism) and falsificationism (Hypothetico-Deductivism) by drawing on the analogy between two systems of criminal law. According to one system, the judge has to start with the assumption that the accused is innocent and consequently unless one finds evidence against him, he should be declared innocent. According to the other, the judge has to start with the assumption that the accused is a culprit and consequently, unless evidence goes in his favour, he should be declared to be a culprit. Obviously the latter system of criminal law is harsher than the former. The inductivist scheme is analogous to the former kind of criminal law, where as the Hypothetico-Deductive scheme is akin to the latter one.

The steps of Scientific Procedure

In the Popperian scheme we begin with a problem, suggest a hypothesis as a tentative solution, try to falsify our solution by deducing the test implications of our solution, try to show that the implications are not borne out and consider our solution to be corroborated if repeated attempts to falsify it fail. Thus, problem, tentative solution, falsification and corroboration constitute the steps of scientific procedure. Popper's theory of scientific method is called Hypothetico-Deductivism because, according to him, the essence of scientific practice consists of deducing the test implications of our hypothesis and attempting to falsify the latter by showing that the former do not obtain, whereas according to Inductivism the essence of scientific practice consists of searching for instances supporting the generalization arrived on the basis of some observations and with the principle of induction.

Popper claims that the Hypothetico-Deductive model of scientific method is superior to inductivist model for the following reasons:

Firstly, it does justice to the critical spirit of science by maintaining that the aim of scientific testing is to falsify our theories and by maintaining that our scientific theories are, however corroborated, going to permanently remain tentative. In other words, the Hypothetico-Deductivist view presents scientific theories as permanently vulnerable with the sword of possible falsification always hanging on their head. The inductivist view of scientific method makes science a safe and defensive activity by portraying scientific testing as a search for confirming instances and by characterizing scientific theories as established truths. According

to Popper, the special status accorded to science is due to the fact that science embodies an attitude which is essentially open-minded and anti-dogmatic. Hypothetico-Deductivism is an adequate model of scientific practice because it gives central place to such an attitude.

Secondly, Popper thinks that if science had followed the inductivist path; it would not have made the progress it has. Suppose a scientist has arrived at a generalization. If he follows the inductivist message, he will go in search of instances which establish it as a truth. If he finds an instance which conflicts with his generalization, what he does is to qualify his generalization saying that the generalization is true except in the cases where it has to be held unsupported. Such qualifications impose heavy restrictions on the scope of the generalization. This results in scientific theories becoming extremely narrow in their range of applicability. But if a scientist follows the Hypothetico-Dedectivist view, he will throw away his theory once he comes across a negative instance instead of pruning it and fitting it with the known positive facts. Instead of being satisfied with a theory, tailored to suit the supporting observations, he will look for an alternative which will encompass not only the observations which supported the old theory but also the observations which went against the old theory and more importantly which will yield fresh test implications. The theoretical progress science has made can be explained only by the fact that science seeks to come out with bolder and bolder explanations rather than taking recourse to the defensive method of reducing the scope of the theories to make them consistent with facts. Hence, Popper claims that the Hypothetico-Deductive model gives an adequate account of scientific progress. According to him, if one accepts the inductivists account of science one fails to give any explanation of scientific progress.

Thirdly, the **Hypothetico-Deductive** view according to Popper avoids the predicament encountered by inductivist theory in the face of **Hume's** challenge. As we have seen, Hume conclusively showed that the principal of induction could not be justified on logical grounds. If Hume is right, than science is based upon an irrational faith. According to Hypothetico-Deductivist view, science does not use the principle of induction at all. Hence, even though Hume is right, it does not matter since science follows the Hypothetico-Deductivism are so radically different that the latter in no way face any threat akin to the one faced by the former. In this connection, he draws our attention to the logical asymmetry between **verification**, the central component of the inductivist scheme, and **falsification**, the central component of the Hypothetico-Deductivist scheme. They are logically asymmetrical in the sense that one negative instance is sufficient for conclusively falsifying a theory, whereas no amount of positive instances are sufficient for conclusively falsifying a theory, whereas no amount of positive instances are sufficient to conclusively verify a theory. It may be recalled that Hume was able to come out with the problem of induction precisely because a **generalization** (all theories according to Inductivism are generalizations) cannot be conclusively verified.

How does Popper characterize scientific progress? According to him, one finds in the history of science invariable transitions from theories to better theories. What does the work 'better' stand for? It may be recalled that, according to Popper, no scientific theory, however, corroborated can be said to be 'true'. Hence, Popper drops the very concept of truth and replaces it by the concept of **Verisimilitude** (truth-likeness or truth-nearness) in his characterization of the

goal of science. In other words, through science cannot attain truth, i.e., though our theories can never be said to be true, science can set for itself the goal of achieving higher and higher degrees of Verisimilitude, i.e., successive scientific theories can progressively approximate to truth. So, in science we go from theory to better theory and the criterion for betterness is Verisimilitude. But what is the criterion for Verisimilitude? The totality of the testable implications of a hypothesis constitutes what he calls 'the empirical content' of the hypothesis. The totality of the testable implications which are borne out constitute the truth content of the hypothesis and the totality of the testable implications which are not borne out is called the falsity content of the hypothesis. The criterion of the Verisimilitude of a theory is nothing but truth content minus the falsity content of a theory. In the actual history of science we always find, according to Popper, theories being replaced by better theories, that is, theories with higher degree of Verisimilitude. In other words, of the two successive theories, at any time in the History of Science, we find the successor theory possessing greater Verisimilitude and is therefore better than its predecessor. In fact, according to him, **a theory is rejected as false only if we have an alternative which is better than the one at hand** in the sense that it has more testable implications and a greater number of its testable implications are already borne out. The growth of science is convergent in the sense that the successful part of the old theory is retained in the successor theory with the result the old theory becomes a limiting case of the new one. The growth of science thus shows continuity. In other words, it is the convergence of the old theory into the new one that provides continuity in the growth of science. It must also be noted in this connection that unlike the Inductivists or Positivists, Popper is a **Realist** in the sense, according to him, scientific theories are about an unobservable world. This means that the real world of the unobservable thought can never be captured entirely by our theories, evidence that through the gap between Truth and our theories can never be completely filled, it can be progressively reduced. Consequently, the real world of unobservable will be more and more like what our theories say though not completely so.

How does Popper establish the objectivity of scientific knowledge? Inductivists sought to establish the objectivity of science by showing that scientific theories are based upon pure observations. The so-called 'pure' observations were supposed to be absolutely theory-free. They are only 'given' and hence, free from subjective interpretations. Popper, as we have seen, rightly rejects the idea of pure observations. Consequently, he cannot accept the inductivist account of the objectivity of science. What engenders scientific objectivity, according Popper, is not the possibility of pure observation, but the possibility of **inter-subjective testing**. In short, science is objective because it is public and it is public because its claims are inter-subjectively testable.

To the question, "Which comes first, observation or theory?" the Inductivist answers 'observation'. Popper answers 'earlier observation or earlier theory'. To him the question is as illegitimate as the question, "which comes first, egg or hen?" which can be answered only by saying 'earlier egg or earlier hen?'

It will be convenient if we list the main theses of Popper's philosophy of science arranged in a manner with our list of the theses of the positivist philosophy of science:

1) Science is qualitatively distinct from, superior to and ideal for all other areas of human endeavour (**scientism**).

2) The distinction, superiority and idealhood that science enjoys is traceable to its possession of a method (**Methodologism**).

3) There is only one method common to all science irrespective of their subject matter (Methodological Monism).

4) That method which is common to all sciences, natural and human, is the method of Hypothetico-Deduction (**Hypothetico-Deductivism**).

5) The hallmark of science (i.e., the distinguishing mark of science) consists in the fact that its statements are systematically falsifiable (**falsifiability**).

6) Scientific observations are not and cannot be shown to be pure; that is, they are theory-dependent.

7) Theories are not winnowed from observations or facts; they are pure inventions of human mind i.e., only conjectures and not generalizations based on 'pure observations'.

8) The relation between observation and theory is one of interdependence.

9) To a given set of observation-statements there might correspond more than one theory.

10) Our factual judgements may have value commitments and our value judgements may have cognitive content (hence fact-value dichotomy is unacceptable); science is not value neutral but the value commitments can be critically discussed and therefore they are not subjective.

11) All scientific explanations must have deductive-nomological pattern and thus the thesis of Deductive-Nomologism is acceptable.

12) The aim of science is to provide an account of observable world in terms of unobservable entities and to provide accounts of those unobservable entities in terms of further unobservable entities. Unobservable entities are, therefore, real and our theories are putative descriptions of such real entities ('Realism').

13) Unlike other areas of human activity, there is progress in science which consists in going from one theory to a better theory. Here, 'better' means 'more true'. 'More to true' means 'the world of unobservables'. In short, science is progressive in the sense our successive theories in any domain of science exhibit greater and greater verisimilitude or truth-nearness i.e. the match between our theories and reality. Unlike positivists, Popper rejects the idea that progress of science is characterized by cumulative growth of theories. According to him, a new theory is entirely new and not an old theory plus an epsilon as Positivists thought. Thus, in Popper's scheme, the growth of science is essentially discontinuous. Of course, Popper makes some room for continuity also when he says that old theory (at least true part of it) is a limiting case of the new theory.

14) Science is not objective in the sense scientific theories are based on pure observations as positivists thought because there are no pure observations. Science is objective in the sense its theories are inter-subjectively testable.

15) Lastly, science is not rational in the sense the principle of Induction can be rationally justified as Positivists thought. The principle of Induction cannot be rationally justified; nor is it used by science. Science is rational in the sense it embodies critical thinking. Apart from insisting that our theories be falsifiable, science has institutional mechanisms for practicing and promoting critical thinking. What is rationality other than critical thinking? Positivists and Popper differ from each. The theses (1), (2), (3) and (11) are common to both Positivists and Popperians. Popper rejects most of other theses of Positivists, especially their central thesis which concerns the idea of pure observation. Finally, he agrees with the Positivists that science is uniquely progressive, objective and rational; but his notions of progressiveness, objectivity and rationality of science are entirely different from those of Positivists.

2.5 CRITICISM AGAINST KARL POPPER'S PHILOSOPHY OF SCIENCE

A serious lacuna in Popper's position concerns his idea of scientific progress.

First of all, according to Popper, the growth of science is essentially discontinuous in the sense that a new theory which displaces an old theory is not the old theory plus an epsilon because it is entirely new. Yet, he seeks to make room for continuity in the growth of science by insisting that the old theory is a limiting case of the new theory. In this connection he cites an example of Newtonian mechanics and Relativistic mechanics. The former is the limiting case of the latter in the sense that in a certain domain both give the same results. Thus the former is contained in the latter. Hence there is some continuity in the growth of science. But Popper overlooks the fact that such examples of an old theory being a limiting case of the new one are rare. For example, it is absurd to say that Phlogiston theory is a limiting case of oxygen theory or that Ptolemy's theory is limiting case of Copernican theory.

Secondly, Popper says that successive theories in any domain exhibit increasing verisimilitude i.e., truth nearness. That is, reality constituted by unobservable entities is more like what a new theory says than what its immediate predecessor says. This means that following Popper we have to say that the ultimate constituents of matter are more like fields as the present physical theory says than like particles (atoms) as claimed by Newtonian theory. This is unintelligible. What does it mean to say that the ultimate constituents of matter are more like fields than particles called atoms? Either they are like fields or like particles.

Thirdly, when Popper says a new theory is better than the old one (in the sense it is more true), he assumes that the two theories can be compared. This means that they have something common which makes them comparable. But this has been ably questioned by Thomas Kuhn who sought to show that when one fundamental theory replaces another, the two theories are so radically different as to make any talk of comparison between them highly questionable. We shall now turn to his views.

Check Your Progress 2

1) On what basis, according to Popper, a line can be demarked between science and rest of knowledge:

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2) Identify the main differences between Inductive Model and Hypothetico-Deduction Model.

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3) What are the Central components of Hypothetico-Deductive Model?

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4) In what sense, science is rationale?

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2.6 THOMAS KUHN'S PHILOSOPHY OF SCIENCE

Thomas Kuhn's work **The Structure of Scientific Revolutions** is a milestone in the history of the 20th century of philosophy of science. A brief exposition of his basic ideas are given below.

According to Kuhn, in the life of every major science there are two stages (1) **Pre-paradigmatic stage**, and (2) **paradigmatic stage**. In the pre-paradigmatic stage one finds more than one mode of practicing that science. That is, there was a time in the history of Astronomy when different schools of Astronomy practised Astronomy differently. So is the case with Physics, Chemistry and Biology. In that stage their situation was similar to that which obtains today in areas like art, philosophy and even medicine wherein divergent modes of practicing these disciplines co-exist. Today, we speak of schools of Art (e.g., painting), schools of Philosophy and systems/schools of medicine. But today we do not speak of Schools of Astronomy or Physics or Chemistry or Biology.

This is, according to Kuhn, in areas like art, philosophy and medicine that did not, and cannot make a transition from pre-paradigmatic stage to paradigmatic stage, which marks the disappearance of plurality, that is, disappearance of schools. In other words, the transition means replacement of plurality by monolith i.e., a uniform mode of practice.

Such a transition is made possible, Kuhn claims, by acquisition of a **paradigm**. When a science makes such a transition, we may say, it has bcome 'mature' or 'science' in the proper sense of the term. Astronomy was the first to make such a transition followed by Physics, Chemistry and Biology in that order. Social Sciences are still, according to him, in the pre-paradigmatic stage, though Economics is showing signs of such a transition. This is evident from the fact that in Social Sciences there is no consensus on fundamentals as we can see prevalence of distinct schools in every Social Science.

So, the transition to maturity is effected by acquiring a paradigm by a science. The question is "What is a paradigm?".

We all know that Ptolemy's *Almagest* Newton's *Principia* and Darwin's *Origin of the Species* are path-breaking works in the areas of Astronomy, Physics and Biology respectively. According to Kuhn, these works provided paradigms for these disciplines. They did so by specifying the exact manner in which these disciplines ought to proceed. They laid the ground rules regarding what problems these disciplines must tackle and how to tackle them. Hence, paradigms are Universally recognized achievements that for a time provide model problems and solutions to community of practitioners. Hence, in the **first** place, a paradigm specifies what that ultimate constituents of that sphere of reality, which a particular science is inquiring into, are.

Secondly, it identifies the model problems. **Thirdly**, it specifies the possible range of solutions. **Fourthly**, it provides the necessary strategies and techniques for solving the problems. **Lastly**, it provides examples which show how to solve certain problems. In other words, a paradigm is a disciplinary matrix of a professional group. Once a science possesses a paradigm, it develops what Kuhn calls, a 'normal science tradition'. Normal science is the day-to-day research activity purporting to force of nature into conceptual boxes provided by the paradigm. The practitioners of normal science, that is, a scientist who engages in day-to-day research, internalizes the paradigm by professional education. This explains the prevalence of textbook culture in science education.

Of course, scientific practice is not exhausted in terms of day-to-day research or 'normal science'. When a paradigm fails to promote fruitful, interesting and smooth normal science, it is considered to be in a crisis. The deepening of the crisis leads to the replacement of the existing paradigm by a new one. This process of replacement is called '**scientific revolution**'. Therefore, scientific revolutions are "the tradition-shattering complements to the tradition bound activity of normal science." Thus, once a science enters the paradigmatic stage, it is characterized by (1) normal science, and (2) revolutions. In sheer temporal terms, normal science occupies much larger span than revolutionary science. That is to say, science is revolutionary once a while and mostly it is non-revolutionary or normal. Also the scientific activity engaged in by most of the practitioners can be characterized aptly in terms of noral science. On account of this temporal and numerical

magnitude we can say that much of the scientific activity as we ordinarily encounter is normal though this normal course is occasionally interrupted by revolutions which change the form, content and direction of the process of the scientific activity, which is basically normal by which we mean a non-revolutionary committed and tradition bound activity. Normal science demands a through going convergent thinking and hence is preceded by an education that involves 'a dogmatic initiation in a pre-established tradition that the student is not equipped to evaluate'. "Normal science is an activity that purports not to question the existing paradigm but to (1) "Increase the precision of the existing theory by attempting to adjust the existing theory or existing observation in order to bring the two into closer and closer agreement", and (2) "to extend the existing theory to areas that it is expected to cover but in which it has never before been tried". In other words, normal science consists of solving puzzles that are encountered in forcing nature into the conceptual boxes supplied by the reigning paradigm.

It is in this way Kuhn attempts to account for the smooth, defined and directional character of day-to-day scientific research in terms of the features of what he calls "Normal Science". Normal Science has no room for any radical thinking. It is limited to the enterprise of solving certain puzzles in accordance with the rules specified by the paradigm. These rules are never questioned but only accepted and followed. The aim of scientific education is to ensure that the paradigm is internalized by a student. In other words, the professional training in science consists in accepting the paradigm as given and equipping oneself to promote the cause of paradigm by giving a greater precision and further elaboration. The day-to-day scientific research does not aim at anything fundamentally new but only at the application of what has already been given, namely the theoretical ideas and the practical guidelines for solving certain puzzles. It is in this sense that **normal science is a highly tradition-bound activity**.

As pointed out earlier, normal science purports to force nature into the conceptual boxes provided by the reigning paradigm by solving puzzles in accordance with the guidelines provided by the paradigm whose validity is accepted without question. During this process of puzzle solving, certain hurdles may be encountered. We than speak of "anomalies". That is, an anomaly arises when a puzzle remains puzzle defying every attempt to resolve it within the framework of the paradigm. But, appearance of one or two anomalies is not sufficient to overthrow a paradigm. The ushering in of the ear of a new paradigm has to be preceded by the appearance of not one or two minor anomalies, but many major ones. In order to declare a paradigm to be crisis-ridden, what is needed is an accumulation of major anomalies. But there is no clear cut and objective criterion to decide which anomalies are major and how many anomalies must accumulate to declare a paradigm to be crisis-ridden. In other words, there is no criterion which decides whether a perceived anomaly is only a puzzle or the symptom of a deep crisis. The issue will be decided by the community of the practitioners of the discipline through the judgment of its peers. Once the scientific community declares the existing paradigm to be crisis-ridden, the search for the alternative begins. Of course the crisis-ridden paradigm will not be given up unless a new theory is accepted in its place. It is only during this transitional period of search for the new paradigm that the scientific debates become radical.

During the process of search for an alternative, the scientific community has to make a choice between competing theories. In this choice, the evaluation procedures of normal science are of no help, "for these depend in part upon a particular paradigm and that paradigm is at issue." The issue concerning the paradigm choice can not be settled by logic and experiment alone. What ultimately matters is the consensus of the relevant scientific community. Kuhn points out, "that question of value can be answered only in terms of criteria that lie outside of normal science altogether, and it is that recourse to external criteria that most obviously makes paradigm debates revolutionary." Thus a paradigm choice cannot be explicated in the neutral language of mathematical equations and experimental procedures, but in terms of specific perceptions which a scientific community as a social entity entertains about what it considers to be the basic values of its professional enterprise. In other words, the ultimate explanation of a theory choice is not methodological but sociological. Hence in Kuhn's scheme, the idea of scientific community as a social entity is axiomatic. That is to say, according to him, "If the term "paradigm" is to be successfully explicated, scientific communities must first be recognized as having an independent existence". This means that one must explain scientific practice in terms of paradigms and paradigmatic changes and the latter are to be explicated in terms of a particular scientific community which shares the paradigms and brings about paradigmatic changes. Thus, the concept of scientific community is basic to the concept of paradigm. The concept of **scientific community** can be explicated in sociological terms. Hence, the ultimate terms of explication of scientific activity are sociological.

What is the relation between the old paradigm, which is overthrown and the new paradigm which succeeds it? Kuhn's answer to this question is extremely radical. According to him, in no obvious sense one can say that the new paradigm is better or truer that the old one. Kuhn maintains that the two successful paradigms cut the world differently. They speak different languages. In fact when a paradigm changes, to put it metaphorically, the world changes. With his characteristic lucidity he says, "the transition from a paradigm in crisis to new one from which a new tradition of normal science can emerge is far from accumulative process, one that is achieved by an articulation or extension of the old paradigm. Rather, it is a reconstruction of the field from new fundamentals, a reconstruction that changes some of the field's most elementary theoretical generalizations as well as many of its,… methods and applications." This apart Kuhn contends that the two paradigms talk different languages. Even if the same terms are used in two paradigms, the terms have different meanings. What can be said in the language of one paradigm can not be translated into the other language. Based on these reasons, Kuhn claims that the relation between two successive paradigms is incommensurable. No wonder Kuhn compares paradigm shift to gestalt shift. With this, the idea of scientific progress as a continuous process and the idea of truth as the absolute standard stand totally repudiated. Kuhn advances what might appear to be an undiluted relativism according to which truth is intro-paradigmatic and not inter-paradigmatic. That is to say what is true is relative to a paradigm and there is no truth lying outside all paradigms.

2.7 POPPER VERSUS KUHN

Some of the radical implications of Kuhn's position can be brought about by juxtaposing his views with those of Popper.

Firstly, the hallmark of science according to Popper is **critical thinking**. In fact science exemplifies critical thinking at its best. Since critical thinking considers nothing to be settled and lying beyond all doubt, fundamental disagreements and divergent thinking must and in fact do characterize science. As we have seen, according to Kuhn, what constitutes the essence of scientific practice is normal science and we have also seen why normal science is a highly tradition-bound activity, an activity made possible by a consensus among the practitioners who share a paradigm. Thus if Popper sees the essence of science in divergent thinking and fundamental disagreements, Kuhn sees the essence of science in convergent thinking and consensus. In other words, the hallmark of science according to Kuhn is tradition-bound thinking. In fact, according to Kuhn, what distinguishes science from other areas of creative thinking is that whereas in science one finds institutional mechanisms of enforcing consensus, the other areas suffer from perpetual disagreements even on fundamentals.

Secondly, if **Popper** considers the individual to be the focus of scientific activity, Kuhn bestows that status upon the scientific community. Both positivists and Popper looked upon science as the sum total of the work of individual scientists working in accordance with a method though the Positivists and Popper fundamentally differed on the characterization of that method. As opposed to this individualistic account of scientific enterprise, Kuhn propounds a collectivistic view of scientific activity. In Kuhn's scheme, it is the scientific community, which constitutes the pillar of stability and locomotive of change. This is borne out by the fact that according to Kuhn the scientific community has institutional mechanism, like peer review, by which it can settle all the issues such as whether an anomaly is a symptom of crisis, how many anomalies suffice to warrant the search for an alternative paradigm, what factors are to be considered in choosing a new theory for the status of the paradigm etc.

Thirdly, Popper and Kuhn differ fundamentally in their attitude towards the transition from one theory to another theory in science. According to Popper, we can explain every case of change of theoretical framework in terms of certain norms which science always adopts and follows meticulously. In fact, scientific rationality consists in following these norms. But Kuhn contends that an adequate explanation of change of theoretical framework must be in terms of the value judgments made by a community while making the choice. According to Kuhn, recourse to the so-called methodological norms explains nothing. From the point of view of Popper, Kuhn is an irrationalist because he sets aside methodological norms and seeks to explain theory change exclusively in terms of non-rational or sociological factors like value commitments of a professional group. Whatever be the merit of Popper's attack on Kuhn as an irrationalist, we can say that Kuhn's construct of scientific practice is sociological. That is to say, according to him, scientific activity can not be understood by trying to find out the absolute standards which have guided the scientific activity in all ages. It can only be understood in terms of the specific judgments which a community makes at a particular juncture regarding what it considers to be its value commitments as a professional group.

The above juxtaposition of Popper and Kuhn brings out the radical implications of Kuhn's views regarding the nature of scientific practice. However, in one respect Kuhn is very close to Popper. Both, like positivists, content that there is something unique to science though they differ in their explanation of what that uniqueness consists of. Positivists maintain that the hallmark of science is the systematic verifiability of its claims. According to Popper, the uniqueness of science consists in the systematic falsifiability of theories. Accounting to Kuhn, it is consensus which marks out science from other areas of human endeavour. That is to say, Kuhn, like Positivists and Popper, does not question whether science is really unique. That is to say, instead of raising critical questions about the status that science has acquired in the contemporary culture, Kuhn only seeks to provide an alternative account of how it has acquired that status. In that sense Kuhn's position is quite conservative.

In this unit, we had a brief look at the 20th century thinking on the nature of science. It is very difficult to decide which view is the correct one, though Positivist view has been shown to be highly inadequate. The question is "How should we practise social sciences so as to make them scientific"?

Some social scientists take the Positivist recommendation: "collect data, extract a generalization, verify the generalization and formulate a law". Those social scientists who are inspired by the Popperian view, take seriously the Popperian advice "Formulate a problem, provide a tentative solution, try to falsify it, if the solution survives treat it as a corroborated theory but not as a confirmed one". Still others go by Kuhn's view of science and think that the task of social sciences today is to arrive at paradigms in different social scientific disciplines. This will enable social sciences to overcome ideological commitments which generate differences even at a fundamental level. According to them, the consensus so generated will bring social sciences close to natural sciences.

Check Your Progress 3

1) Which two stages come in the life of every major science?

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2) What do you understand by the term 'Paradigm'?

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3) What is scientific revolution?

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4) How did Popper differ with Kuhn about essence of science?

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5) Match the following:

A	B
1) Individual as the locus of scientific study	i) Positivists
2) Explanation of theory in terms of value judgment	ii) Popper
3) Theory changes in terms of certain norms	iii) Kuhn
4) Verification as the hall mark of science	iv) Popper

2.8 LET US SUM UP

By virtue of shaping our mode of living and our ways of thinking about the world, science has acquired a central place in intellectual world. Three disciplines namely history of science, sociology of science and philosophy of science have made science itself their object of inquiry. Philosophy of science deals with broadly two questions: what is the aim of the science and what are the methods of science? Different scholars have answered these questions differently.

Regarding aims and methodology two views have been dominant. 'inductivism' by Francis Bacon and 'Hypothesism' by Rene Decartes. Positivism has been a movement in the philosophy of the first half of the 20th Century. Inductivitism, systematical verifiable statements, pure scientific observations, unilateral relationship between observation and theory, value neutral theory, precise prediction of facts as aim of science, progressive/objective/rational arguments as essentials of science are some of the important central tenets of positivism. The concept of pure observation in positivist philosophy has been attacked on several grounds.

Karl Popper and Thomas Kuhn are the two most important philosophers of mid 20th century. They offered alternatives to positivism and shaped the contemporary debate on theory of scientific knowledge. Popper rejected the central thesis of positivism i.e., idea of 'pure observation'. He propounded the Hypothetico-Deductive model as an adequate and superior model of scientific method. According to him, the scientific statements are systematically falsifiable. The scientific observations are theory-dependent. Theories are pure inventions of human mind. The theory and observation are interdependent. Science is not value

neutral and therefore values are not subjective. Science is progressive. Science is objective in the sense that its theories are inter-subjectivity testable. Science, according to Popper, is rational in the sense that it embodies critical thinking. Owing to commonality of views of Popper with those of positivists regarding scientism, methodologism, methodological monism and Deductive Nomologism, Popper is sometimes viewed as semi-positivist.

Karl Popper's ideas of scientific progress, verisimilitude and comparison of old theory with new theory have been criticized.

Thomas Kuhn sees the life of major sciences in two stages – Pre-paradigmatic stage and paradigmatic stage. In the pre-paradigmatic stage, more than one mode are practised. In the process of transition a discipline acquires the stage of paradigm. When a paradigm fails to promote fruitful, interesting and smooth normal science, It is considered in crisis. Deepening of crisis leads to replacement of the existing paradigm, which is termed as scientific revolution.

Thus, on the question how we should practise social sciences so as to make them 'scientific, three views have so far been propounded. Positivist recommendation is to 'collect data, extract generalization, verify the generalization and formulate a law'. Popper's view is "formulate a problem, provide a tentative solution, try to falsify it, if solution survives, treat it as a corroborated theory but not as a confirmed one'. Which one out these three is correct – is difficult to decide? Consensus on the three models will bring social science close to natural sciences.

2.9 KEY WORDS

Inductivism : A scientific method of knowledge focusing that scientific knowledge is generated by arriving at generalizations on the basis of pure observations using the principle of induction.

Hypothesisism : Hypothesisism is a method of knowledge which envisages that knowledge is created or generated by putting forth the hypothesis having test implications. Hypothesis is a statement describing the unobservable entities which lie behind observations.

Realists : Those who support Hypothesis are realist in connection with the status of theoretical/ unobservable entities.

Anti-Realists Inductivists are also called as Anti-Realists.

Paradigm : Paradigm refers to the scientific practice comprising of a particular a world view, concept, assumptions, theories, models used by the researcher in carrying out the research studies. The concept was introduced by Thomas Kuhn.

Deductive : Derivation of a conclusion by reasoning or by inference in which the conclusion follows necessarily from the premises.

Methodological Dualism : Referring to positivist belief in separation of the knower from the known or of the subject from object.

Methodological Monism : In contrast to the comparatmentalisation of dualism, monism view the world as a "seamless web". In terms of Gouldner's argument, the separation between the knower and the known must be overcome.

Pseudo Science : Pseudo science refers to any body of knowledge or practice, which purports to be scientific or supported by science but which is judged to fall outside the domain of science.

2.10 SOME USEFUL BOOKS

Mark Blang (1992): *The Methodology of Economics*, Cambridge University Press, London.

Uma Devi. S. (1994): *Economic Theory and Methods of Reasoning*, Har-Anand Publication, New Delhi.

Williams, M., & May, T. (1996): Introduction to the Philosophy of Social Research, London: UCL Press.

Kuhn, Thomas, (1970); *The Structure of Scientific Revolutions.* The University of Chicago Press: Chicago.

Popper, Karl (1972); *Conjectures and Refutations*: *The Growth of Scientific Knowledge*, Rutledge and Kegan Paul: London.

2.11 ANSWERS OR HINTS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) The aim of science is two fold: Definition and Demonstrations.

2) See Sub-section 2.2.1

3) See Sub-section 2.2.1

4)

A	B
i)	iv)
ii)	i)
iii)	ii)
iv)	iii)

5) See Section 2.3

Check Your Progress 2

1) On the basis of falsifiability of scientific theories.

2) Inductivist model's basic proposition is that observations are pure i.e. theory – independent and theories are derived from pure observations. In Hypothetico-deductive model, theories are perceived as our mental (own) constructions and are not the functions of pure observations.

3) Hypothetico-Deductive model's central components are: (i) theories are our own constructions reflecting unobservable entities, (ii) science is progressive in terms of increasing very similitude, (iii) science is rational in terms of critical rationalism and objective in terms of inter-subjectivity.

4) Science embodies critical thinking.

Check Your Progress 3

1) (i) Pre-paradigmatic stage, (ii) Paradigmatic stage

2) The constituents of reality, model problems, range of solutions, necessary strategies and techniques for solving the problems together constitute the paradigm.

3) The process of replacement of existing paradigm is known as 'scientific revolution'.

4) According to Popper, the essence of science lies in divergent thinking and fundamental disagreements whereas Kuhn sees essence of science in convergent thinking and consensus.

5) (1) ii, (2) iii, (3) iv, (4) i.

UNIT 3 MODELS OF SCIENTIFIC EXPLANATION

Structure

3.0 OBJECTIVES

After going through this unit, you will be able to:

- Explain the basic rules of formal reasoning;
- State the role of logical reasoning in the formulation of a research problem;
- Describe the basic rules of structural relationship between assumptions, theory and conclusions; and
- Appreciate the problems involved in systematic explanation of phenomena.

3.1 INTRODUCTION

Explanation has three meanings: **One** interpretation of explanation is to remove a perplexity or solve mystery i.e., 'puzzle solving'. The **second** meaning is to change the unknown into the known. The **third** interpretation of explanation is to give causes of phenomenon to be explained. The first two meanings are too relativistic and subjective. It is the third one emphasizing causal explanation

subserving regularity, and law like explanations that fits the meaning of scientific explanation. Here, we are concerned with one mainstream approach to science viz,. Positivism. We may begin this unit by recognizing the complexity of explaining subject matter of philosophy of science. The first two units make it clear, that there is no general agreement on Positivism as the only approach to pursue knowledge. It is at least over fifty years, since when various limitations and misconception of the rules and propositions of Positivism have been brought to light. But yet, paradoxically, the mainstream notion of science and scientific explanation is dominated by the **tenets** of Positivism. This is partly because of the rigorous and prescriptive nature of positivist propositions which remain simple and attractive, and partly because of the open ended and speculative nature of the alternative approaches. The enthusiasm with which many mainstream economists still prefer to refer to Economics as a Positive Science is yet another indication that alternative approaches in the Philosophy of Science have not yet percolated to Economics. Because of these reasons this unit on 'Models of Scientific Explanation', and the next one on 'Debates on the Models of Scientific Explanation in Economics' are essentially confined to Positivist Models of Explanation.

Let us begin with a broad unified view of Positivism in terms of certain rules. It will be followed by certain rules of deduction or formal logical reasoning that underlie Positivist Models of explanation. Afterwards, the various Models of Explanation and their limitations, will be discussed.

3.2 UNIFIED VIEW OF RULES OF POSITIVISM

Our emphasis is on the Models of Scientific Explanation under Positivism. Positivism is procrustean in nature. Its propositions, often contested, evolved over a long period. It passed through several stages, from radical empiricism to logical positivism to logical empiricism. And the propositions of Positivism at various stages varied. Nevertheless, we shall confine here to a unified view of Positivism.

Kilakowski provides such a unified view by simplifying Positivism into a set of four fules:

K_1 The Rule of Phenomenalism

The Rule emphasizes phenomena as the basis of knowledge. Sensory experience is the basis. The basis of knowledge is only the record of that which is actually manifested in experience. It is phenomenon not noumina. It is existence, not essence. Simply, it is facts and objective facts only that form the basis of knowledge.

K_2 The Rule of Nouminalism

Nouminalism refers to Insight representative of facts. Any insight formulated in general terms can not have any real reference other than individual facts. Therefore every abstract science is abridging the recording of experience, and gives no extra independent knowledge.

K_3 The Rule of Value-free Statements

Knowledge is value-free. The rule refutes to call value judgments and normative statements as knowledge. There is no room for good or bad or ethical judgments in statement of science or knowledge.

K_4 The Rule of Unity of Science

There is only one method of scientific knowledge. The Unity of science refers to a single fundamental form from which all other laws are ultimately derived.

3.3 SEARCH FOR THE CRITERION OF COGNITIVE SIGNIFICANCE

In the above summation of Positivism into a set of rules, K_1, Rule of Phenomenalism, may appear to be closer to the early inductivist phase of Positivism. The inductivist view of science emphasized observation of facts and to proceed towards by inductive inference to the formulation of universal laws about these facts. But Positivism underwent considerable sophistication to accommodate deductive reasoning as a part of scientific explanation.

Yet another aspect of Positivism which is important in understanding its approach to scientific explanation is the criterion of cognitive significance. According to Positivism, the basic criterion for distinguishing 'scientific knowledge' or meaningful statements from 'non-scientific' or meaningless statements is **testability.** In the early phase the emphasis was on of **verification** – only complete verification by observational evidence to be considered empirically meaningful. But soon it was found to be too strict, and also faced the problem 'induction'. Karl Popper suggested **falsification** testing instead of verification. But both verification and falsification tests are found to be too strict criteria, and alternatively, Rudolf Camap suggested **confirmation**. Confirmation is a relative concept. Instead of a single test for rejection or acceptance of a hypothesis, a series of positive results are supposed to increase the confirmation of it. Test instances confirmed or disconfirmed hypotheses, and hypotheses could be ranked according to their degree of confirmation relative to the available evidence. Later, emphasis shifted from testing individual theories to evaluation of competing theories on the basis of their relative degree of confirmation. But facts and testing remain basic ingredients of Positivist explanation.

3.4 RULES OF LOGIC OR RULES OF CORRECT REASONING

Just as facts and testing, rules of logic have become important part of the whole structure of scientific explanation under Positivism. Here we briefly review the main stay of deductive reasoning viz. 'syllogism' or 'rules of logic' or 'rules of correct reasoning'.

3.4.1 'Categorical Syllogism'

Two categorical statements if logically formulated, taken together would lead to a conclusion. The two statements should serve as the premises. If there is no premises, then there will be a fallacy or enthymeme.

For example, the following two examples stand for categorical syllogisms:

I)	All As are B	}	→ Major Premis
		} Premises	
	C is an A	}	→ Minor Premis
	Therefore, C is B		→ Conclusion
II)	All Politicians are corrupt	}	→ Major Premis
		} Premises	
	Blogg is a politician	}	→ Minor Premis
	Therefore, Blogg is corrupt		→ Conclusion

The following is an example of a fallacy of enthymeme because it leaves out the premises:

Blogg is a politician.

Therefore, he is corrupt.

3.4.2 Hypothetical Syllogism

Hypothetical Syllogism is referred to as **Modes Poneus**, affirming the antecedent. The major premise has if…….then form.

The following are two examples:

If A is true, (Antecedent)	**then B is true** (Consequent)	Therefore, B is true.
If Blogg is a politician, (Antecedent)	**then he is corrupt** (Consequent)	Therefore, Blogg is corrupt

Hypothesis statements may have a major Hypothesis (H) and auxiliary ($A_1A_{2.....}A_n$) hypotheses.

3.4.3 'Logical Truth' and 'Material Truth'

All statements which are logically true are not necessarily "materially true". For example:

All politicians have two tongues.

Blogg is a politician

Therefore, Blogg has two tongues.

The above statement is "logically true" but "materially" not true.

3.4.4 Deductive Fallacies

Deductive fallacies are those where premises do not lead necessarily to the stated conclusions. There are three main types of deductive fallacies:

1) Logical (formal) Fallacies (Fallacy of affirming the consequent)

Correct Reasoning or 'Modus Poneus'	**'Logical (Formal) Fallacy**
(Affirming the antecedent)	(Affirming the consequent)

If A is true, then B is true.	If A is true, B is true.
A is true.	B is true.
Therefore, B is true.	Therefore, A is true.

2) Verbal Fallacies (Fallacy of Composition)

The verbal fallacy involves a statement where something which is true of the part is also made true of the whole. For example, in case of people waiting to see a procession:

If one rises on one's tip-toes, one can see better.

If people rise on their tip-toes, they can see better.

3) Material Fallacies (All others): Material fallacies are of several kinds.

a) **Post hoc ergo propter hoc:** (After this, therefore because of this).

Because event B occurs after event A, then event B is necessarily caused by event A.

b) "Argument by Analogy": It refers to a statement where, "A is similar to B, therefore whatever is true of A is also true of B". For example, Singapore was backward in 1950s. It developed faster because of "open economy policies". India was backward in 1950s. Therefore, India would have prospered by 'open economy policies'.

c) "Appeal to Authority": It refers to a statement where the truth is sought to be asserted by referring to an authority. "A is true because (so & so) say it so". For example, "India is shining because Milton Friedman has said so".

Check Your Progress 1

1) What do you mean by the term 'Scientific explanation'?

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2) What is the difference between Phenomenalism and Nominalism.

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3) State the rules of logic. Explain 'categorical syllogism'.

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4) What is deductive fallacy?

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3.5 MODELS OF SCIENTIFIC EXPLANATION

"Men do not think they know a thing till they have grasped the 'why' of it"

- Aristotle

In the light of understanding of the basic building blocks of knowledge viz., facts, testing and formal logic, we shall now turn to the Positivist Models of Scientific Explanation. The basic building blocks of scientific explanation are theories. The status, structure and functions of theories and theoretical terms become essential part of scientific explanation. The aim of scientific research is not only to discover and describe events and phenomena in the world but also, and more importantly, to explain and understand **why** these phenomena occur as they do.

The early Positivists like Aguste Comte and Ernest Mach did not believe in any role to explanation in science. Mach believed that theories are mere heuristic devises and talked of theories being "eliminative fiction" useful only in organizing data. But Positivism has traveled a long distance since, and by mid-1950s was referring to explanation as the Chief objective of Science. "To explain the phenomena in the world of our experience, to answer the question "Why?" rather than only the question "What?" is one of the foremost objectives of all rational enquiry…". Explanation removes puzzlement and provides understanding. However, there exist considerable differences of opinion as to the function and the essential characteristics of scientific explanation.

What follows is the description of some of the basic models of scientific explanation within the positivist approach. First, we shall discuss the hypothetico-Deductive Model (H-D Model), and then turn to Covering Law Models encompassing the Deductive-Nomological (D-N) and Inductive-Probablistic (I-P) Models.

3.5.1 Hypothetico-Deductive Model

At a time when the Positivists were not ready to concede any role to theoretical explanation, **Carnap and Hempel**, in their writings, came out with a model – which later came to be known as **Hypothetico-Deductive (H-D) model** of explanation. The H-D model not only describes the structure of theories, but provides answers to the questions of the status and functions of theories, as well. H-D model explicitly addresses the problems of a theory's structure. The propositions in a deductive system are seen as being arranged in an order of levels. Higher-level hypotheses will refer to theoretical entities, all which need not be tested. Lower-level hypotheses describe observable phenomena and are tested against reality. H-D model addresses the problem of status of theoretical

terms which may not be testable directly, to gain meaningfulness indirectly by the successful confirmation of theory in which they are embedded.

In H-D model, theories as a whole are tested by comparing their deduced consequences (prediction) with data. Every theoretical term need not be given empirical counterparts via correspondence rules. H-D model also turns the old **realist-instrumentalist controversy** into a moot debate. **Realists** claim that all theoretical terms must refer to real entities and theories, which do not, are false. Instrumentalists insist that theories are only instruments for predictions. Only relevant question for them is whether theories are adequate for prediction. H-D model seems to accommodate both these concerns and defuse the controversy.

The H-D model rejects the earlier notion that theories have no role but are only instruments. H-D model emphasizes the following positive functions of theories:

1) They allow generality in the specification of scientific laws.

2) They possess 'a certain formal simplicity' which allows the use of 'powerful and elegant mathematical machinery'.

3) They can serve the practical function of allowing the scientist to discover interdependencies among observable.

4) They are convenient and fruitful heuristic (intellectual) devices, often serving an explanatory function of their own.

Thus, the H-D model without minimizing the importance of observable phenomena for scientific explanation, allowed far more substantial role for theories and theoretical terms than did their predecessors.

3.5.2 Covering-Law Models

Carl G. Hempel and **Paul Oppenheim** developed Deductive-Nomological (D-N) Model of scientific explanation and much later, Hempel extended it to include Inductive-Probablistic (I-P) Model. These two models together are referred to as Covering-Law Models of explanation.

3.5.2.1 Deductive-Nomological (D-N) Model

Hempel and Oppenheim in their paper entitled "Studies in the Logic of Explanation" advanced an account of scientific explanation, which later came to be known as deductive-nomological (D-N) model. They divided an explanation into two major constituents – the **explanandum** and the **explanans**. The **Explanandum** means the sentence describing the phenomenon to be explained (not that phenomenon itself). **The Explanans** mean the class of those sentences, which are adduced to account for the phenomenon. The explanans fall into two sub-classes, viz., certain antecedent conditions $C_1, C_2 \ldots\ldots C_k$ and certain general laws $L_1, L_2 \ldots\ldots L_3$. If a proposed explanation is to be sound, conditions of adequacy must be satisfied. The following four conditions of logical and empirical adequacy must be satisfied:

i) **Logical Conditions of Adequacy**

R_1) The explanandum must be a logical consequence of the explanans; in other words, the explanandum must be logically deduced from the

information contained in the explanans, for otherwise, the explanans would not constitute adequate grounds for the explanandum.

R_2) The explanandum must contain general laws, and these must actually be required for the derivation of the explanandum. Though not a necessary condition, the explanans must contain at least one statement which is not a law.

R_3) The explanans must have empirical content, i.e., it must be capable, at least in principle, of test by experiment or observation. The point deserves special mention because certain arguments which have been offered as explanations in the natural and in the social sciences violate this requirement.

ii) **Empirical Condition of Adequacy**

R_4) The sentences constituting the explanans must be true.

The characteristics of explanation discussed may be summarized into the following schema:

$\{C_1, C_2 \ldots\ldots C_K$ Statements of Antecedent$\}$

Logical Deduction

$\{$ conditions $\}$ Explanans

$\{$ $\}$

$\{L_1, L_{2\ldots\ldots} L_r$ General Laws $\}$

$\{E$ Description of the empirical phenomenon to be explained $\}$ Explanandum

Hempel and Oppenheim argued that the same formal analysis, including the four necessary conditions, applies to scientific predictions as well as to explanation. They went on to argue that an explanation is not fully adequate unless its explanans, if taken account of in time, could have served as a basis for predicting the phenomenon under consideration. Consequently, whatever is said about the logical characteristics of explanation or prediction will be applicable to either, even if one of them is mentioned. This resulted what is known as Covering-Law Model extended to the D-N Model of Explanation.

Extension of characteristics of explanation to prediction could formally be presented in the following schema:

$\{C_1, C_2 \ldots\ldots C_K$ Statements of Conditions$\}$

Logical Deduction

$\{$ $\}$ Predecens

$\{$ $\}$

$\{L_1, L_{2\ldots\ldots} L_r$ General Laws $\}$

$\{P$ Description of the empirical Prediction $\}$ Predecendum

The symmetry visualized between explanation and prediction has often drawn criticism.

3.5.2.2 Inductive-Probabilistic (I-P) Model

In 1960s Hempel developed Inductive-Probabilistic Model. In the I-P model the explanans consists of sentences describing the requisite initial conditions along with statistical laws and is expected to confer upon the explanandum highly logical, or inductive probability. The characteristics are similar to D-N Model. The symmetry holds and hence another Covering-Law Explanation.

Check Your Progress 2

1) Identify the basic blocks of knowledge.

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2) Explain how Hypothetico-Deductive Model defuses the conflict between the realists and instrumentalists.

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3) State two characteristics of Deductive-Nomoligical (D-N) Model.

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3.5.2.3 Critical Appraisal of Covering-Law (D-N, I-P) Models of Explanation

The Covering-Law Model of explanation offered by the D-N and I-P models are subject to a number of limitations. For convenience we shall confine here to the limitations of D-N model, some of which are also applicable to I-P model.

First is about the necessity of laws and theories in the pursuit of scientific explanation. Laws are distinct from ordinary statements. Ordinary statements or statement of mere facts refer to particular statements and express "contingent truths:, like "John went home and had dinner". Laws refer to universal statements and express "necessary truths". For example, "all objects are attracted to one another with a force inversely proportional to the square of the distances between them" is a universal and law like statement: However, there are many apparently

universal statements which are not really universal statements. These may be the ones that involve mere "accidental generalizations" like, "all coins in my pocket are nickels".

This distinction between laws and ordinary statements does not make laws as necessary requirement for explanation. Particularly in biology, astronomy and social sciences explanations need not be in the form of laws. Explanations may be in the form of questions and answers. The often cited example is: Why do Hopi Indians continue to perform rain making ceremonies even though their ceremonies do not normally produce desired result? The explanation is to reinforce group identity, but there is no law involved. Similarly: Why do all vertebrates' hearts beat regularly? The explanation is to circulate blood throughout the body which helps to maintain uniform temperature. This explanation again doesn't require any law like statement.

Second, explanation requires not only the factors one cites to be casually relevant but also that they be causes. D-N model is often satisfied by citing relevant causes. Causes explain effects, but effects do not explain their causes, and effects of common cause do not explain one another. Based on David Hume's famous guillotine of time, two contiguous events do not become cause and effect. Inferring event B as the effect of event A because it followed the later, amounts to the "Billiard Ball Model of Causation", where the ball reaching the pouch is seen, 'as if' the player knew all the laws of time and motion of the billiard ball.

Third, much of the criticism of Covering Law Model of explanation relates to the symmetry thesis, that explanation and prediction are inherently linked, and that only difference is the sequence. But critics point out that explanation need not predict. For example, Darwin's Theory of Evolution provides a great deal of explanation on the origin and evolution of species, but it does not predict anything. Similarly, prediction need not explain anything. For instance, prediction of weather does not explain anything.

Fourth, the D-N Model ignores the divergence between the norms and practices and thereby eliminates much of science from the ambit of explanation. Many functional or technological explanations get eliminated because they are not through any laws or regularities. Purposive behaviour needs explanation of motivation and in motivated behaviour future affects the present. Determining motives to be classified in antecedent conditions and not in causal relation. Hempel and Oppenheim also recognize the problems in applying their model of explanation in social sciences. Human behaviour often is characterized by uniqueness and irrepeatability. It depends upon situation and previous history of individuals.

Notwithstanding all these limitations, "many philosophers would still maintain that the D-N Model is an important starting point for studying scientific explanation and there is something right and important about it." (Hausman, 1994, p.9). Particularly in the mainstream economics, scientific explanation is strongly associated with Positivist models of explanation and thus D-N Model becomes an important reference point for the debates on explanation in economics.

3.6 EXPLANATION IN NON-PHYSICAL SCIENCES

There is a view that explanation in biology, psychology, and the social sciences has the same structure as in the physical sciences. But the causal type of explanation is essentially inadequate in fields other than physics and chemistry. And it is more so in the case of social sciences which involve explanation of purposive behaviour.

Hempel and Oppenheim point out to some of these limitation of applying models of scientific explanation to social sciences. First, events involving the activities of humans singly or in groups have a peculiar uniqueness and irrepeatability which make them inaccessible to causal explanation. Causal explanation presupposes uniformities and repeatability which may not hold for phenomena in social sciences.

Second, the establishment of scientific generalizations and explanatory principles for human behaviour is impossible because the reactions of an individual in a given situation depend not only upon that situation, but upon the previous history of the individual.

Third, the explanation of any phenomenon involving purposive behaviour calls for reference to motivations and thus for teleological rather than causal analysis. Many of the explanations which are offered for human actions involve reference to goals and motives. Motivational explanations often tend to have less cognitive significance.

Attempts to extend scientific models of explanation to non-physical sciences without closer understanding of the context often lead to inappropriate explanations. One possibility is that there are contexts or areas within social sciences like economics where there is room for application of scientific or to be specific, positivist models of explanations. But at the same time there are vast aspects of economics where such application may not be easily amenable.

Check Your Progress 3

1) State the difference between laws and ordinary statement.

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2) Describe two limitations of application of scientific models to social sciences.

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3.7 LET US SUM UP

Positivism as an approach to the pursuit of knowledge is procrustean in nature. It has passed through several stages from radical empiricism to logical positivism to logical empiricism. Its propositions, often contested, evolved over a long period. The main characteristics (unified view) of positivism lie in a set of its four rules-phenomenalism, nouminalism, the rule of value free statements and the rule of unity of science.

Testability under the positivism has been basic criteria for distinguishing scientific knowledge from non-scientific or meaningless statement. In early phase, emphasis was on verification. Later on Karl Popper suggested falsification testing in place of verification. Subsequently, emphasis shifted from falsification to confirmation.

Rules of logic have become important part of the whole structure of scientific explanation under positivism. There are two types of deductive reasoning-categorical syllogism and hypothetical syllogism.

Theories are the basic building blocks of scientific explanation. Hence the status, structure and functions of theories and theoretical terms are essential parts of scientific explanation.

The basic modes of scientific explanation within the positivist approach are: Hypothetico-Deductive Model (HD), Deductive-Nomological (DN) Model, and Inductive Probabilistic (IP) models. The DN and IP models are subject to several limitations. The application of scientific models to social sciences has several limitations; peculiar uniqueness of human activities, difficulty in scientific generalizations and explanatory principles for human behaviour, etc. Hence applications of scientific models to non-physical sciences without closer understanding of the context often lead to inappropriate explanation.

3.8 KEY WORDS

Deduction : Deduction is a process used to derive particular statements from general statements.

Empiricism : 'Empiricism' refers to distinctive approach that envisages that all knowledge comes from the senses.

Falsification : The concept developed by Karl Popper (1959) is a philosophy of Science also known as critical rationalism. It uses the logic of deduction to provide the foundation for the Hypothetico-Deductive Method. He rejected the idea that observation provides the formulation for scientific theories. Theories are invented to account for observation, not derived from them. Observations are used to try to reject false theories. Theories that survive this critical process are provisionally accepted but never proven to be true.

Induction : Induction is a logical process of moving from particular statements to general statements. This is used in the social sciences to produce theory from data.

Logical Positivism : An approach to philosophy of science that envisages that all meaningful statements are either empirical or logical in character. This means that they are either open to test by observational evidence or are matches of definition and therefore, tautological. According to this approach, no fundamental difference exists between natural and social sciences.

Modelling : Refers to a process of creating a simplified representation of a System or phenomena with hypotheses to describe the system or explain the phenomenon.

Theory : Refers to set of general laws that are related in networks and are generated by inductive or deductive form of logic. In other words, theory can be described as a set of propositions of different levels of generality.

Verification : Refers to the use of empirical data, observation, test or experiment to confirm the truth or rational justification of a hypothesis.

3.9 SOME USEFUL BOOKS

Brody, Baruch A. (1970); *Readings in the Philosophy of Science*, Prentice Hall Inc., Englewoodcliffs, New Jersey.

Bryant, C.G.A (1985); *Positivism in Social Theory and Research,* London, Macmillan.

Caldwell, Bruce J (1984); *Beyond Positivism: Economic Methodology in the Twentieth Century,* George Allen and Unwin, Boston.

Hausman, D.M (1994); *The Philosophy of Economics: An Anthology,* Second Ed., Cambridge University Press, Cambridge.

Popper, Karl (1959); *The Logic of Scientific Discovery,* Basic Books, New York.

Stewart, F. (1979); *Reasoning and Method in Economics,* McGraw-Hill Book Co., London.

3.10 ANSWERS OR HINTS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) Scientific explanation refers to give causes of phenomenon to be explained.

2) Phenomenon refers to a situation in which facts and objective facts based on experience forms the basis of knowledge. It is existence, not essence. On the other hand, nouminalism is insight representative of facts. It envisages that any abstract concepts used in scientific explanation must also be derived from experience.

3) Broadly there are two rules of logic. Categorical syllogism, and hypothetical syllogism.Logical formulation of two categorical statements serving as premises is categorical syllogism.

4) See Sub-section 3.4.4.

Check Your Progress 2

1) Facts, testing and formal logic.

2) See Sub-section 3.5.1

3) See Sub-section 3.5.2.1

Check Your Progress 3

1) Laws refer to universal statements expressing necessary truths whereas ordinary statement refers to particular statements of mere facts and express 'contingent truths'.

2) See Section 3.6

UNIT 4 DEBATES ON MODELS OF EXPLANATION IN ECONOMICS

Structure

4.0 OBJECTIVES

The unit aims at tracing the broad contours of the debate relating to bringing explanation in Economics closer to the Models of Positive Science. Patterning explanation in Economics on the lines of Positivist Models of Explanation has been a major methodological obsession in Economics. But the subject matter of Economics is not as easily amenable as physical science for application of rules of Positivism. After going through this unit, you will be able to:

- state the efforts made by mainstream economists to adopt the model of explanation of Positivism;

- explain the limitations, difficulties and differences in adopting 'scientific' models of explanation; and
- appraise the present state of explanation in Economics.

4.1 INTRODUCTION

The urge to model Economics or Political Economy as a science on the lines of physical sciences dates back to the period of Classical Economics. David Ricardo claimed that the principles of Political Economy were as accurate as the laws of gravity. Though Ricardo did not write much on the methods or models of explanation, his theories of political economy reflected **abstract-deductive thinking** which was claimed later as constituting basic methodology of Political Economy. It is 'Ricardo's habit of thinking' equated with hypothetico-deductive model of explanation that set the tone for the classical writers on methodology to carry forward the view of Political Economy as a pure science. We shall begin by briefly examining the views on the nature of Political Economy and its Method of Explanation in the Ricardian tradition as enunciated in the writings of N.W.Senior, J.S.Mill, J.E.Cairnes and J.N.Keynes. Then, we shall turn to Lionel Robbins who asserted that Economics was a pure positive science and emphasized apriorism as its method of explanation. This will be followed by T. Hutchison's insistence on empiricism if Economics were to be called science at all. The next two sections will discuss the foundations for present day mainstream practice of Economics in the form of 'instrumentalism' and 'operationalism' in the writings of Milton Friedman and Paul Samuelson respectively. Throughout, the focus is on the limitations of these approaches and the ad-hoc means by which problems are sought to be overcome. Though the unit is confined to the explanation in Economics in the Positivist mainstream, towards the end, a brief discussion of the alternative methods of explanation will be presented with a view to expose the student to the potential of plurality of methods of explanation in Economics.

4.2 CLASSICAL POLITICAL ECONOMY AND RICARDO'S METHOD

4.2.1 Ricardo's Method

The right method of economic enquiry as such was not discussed by Adam Smith. Smith's approach to methodology was, as it was analysed by later economists, somewhat *enigmatic*. There are instances which make some to point out that he was the first to raise political economy to the state of deductive science. But in the same breath there are many instances in his writings to as the founder of inductive historical method. Yet his overall approach often tends to be moral and ethical, distancing him from the attributes of any positivist explanation. For these reasons, on issues of methodology of Classical political economy, one invariably turns to David Ricardo.

Ricardo did not write on methodology of economics but his method explaining the principles of political economy is clearly discerned as positive, abstract and deductive, and it has come to be called '**hypothetico-deductive model of explanation'**. It vigorously denies that facts can speak for themselves and contends that it is theory that can make sense. Ricardo died in 1823, leaving behind the claim that political economy was a science. His **'Principles of Political**

Economy', which was a set of laws based on deductive reasoning, measures up to that claim. Questions were raised soon whether a deductive body of laws without empirical content could claim the status of science. The task of defending Ricardo's method and the claim of political economy as a science was left to his followers of classical political economy. The defence came from the writings of N.W.Senior, J.S.Mill, J.E.Cairnes and J.N.Keynes.

4.2.2 N.W. Senior

It was N.W.Senior in his 1927 lecture, which was later elaborated as **outline of the Science of Political Economy,** (1936), that first made a statement on the distinction between a pure and strictly positive science, and an impure and inherently normative *art* of economics. He went on to claim scientific status for the Ricardian system. Science of Political Economy, according to him, rests essentially on "a very few general propositions, which are the result of observation, or consciousness, and which almost every man, as soon as he hears them, admits, as being familiar to his thoughts". From this conclusions are drawn which hold true only in the absence of "particular disturbing causes".

Senior reduced these "very few general propositions" of political economy into the following four:

1) that every person desires to **maximize wealth with as little sacrifice as possible**;
2) that population tends to increase faster than the means of subsistence;
3) that labour working with machines is capable of producing a positive net product; and
4) that agriculture is subject to diminishing returns.

4.2.3 J.S. Mill

It is senior, who for the first time introduces the concept of '**economic man**' or 'maximizing man', as could be seen from the first proposition above. J.S.Mill, though staunch advocate of inductive method and a stout defender of methodological monism in science, was nonetheless sympathetic to Ricardo's deductive method of political economy. Mill, in his essay *on the Definition of Political Economy and on the Method of Investigation Proper* to It (1936), treats political economy as an "inexact science: and a 'separate science:, and thereby defends deductive method in economics. Elaborating on Senior's notion of 'economic man', Mill observes "political economy proceeds….under the supposition that man is a being who is determined, by the necessity of his nature, to prefer a greater proportion of wealth to a smaller in all cases…" Mill does consider "economic man" as fictional man to facilitate the propositions of political economy. The pages on 'economic man' in Mill's essay are followed immediately by the characterization of political economy as "essentially an abstract science; that employs "the method of a priori". The "disturbing causes" and "the tendency laws" in political economy necessitate *ceteris paribus* clauses.

4.2.4 J.E. Cairnes

J.E.Cairnes in his **Character and Logical Method of Political Economy (1875),** goes on to argue that political economy is a hypothetical, deductive science, and its conclusions "will correspond with facts only in the absence of disturbing

causes, which is, in other words, to say that they represent not positive but hypothetical truths". By late 19th century there were growing doubts on the method of political economy. J.N.Keynes tried to argue that what is referred to as deductive reasoning in political economy was indeed preceded by inductive inferences based on observation of human behaviour.

4.2.5 J. N. Keynes

J.N. Keynes, in **The Scope and Method of Political Economy (1890),** argued that deductive reasoning was indeed preceded by concrete observations. Deductive reasoning comes at a later stage drawing upon specific individual experiences. J.N.Keynes is known for comprehensive reconciliation of the classical methodological approaches.

The following observation stands as a testimony to his comprehensive understanding of the methodological approaches underlying a complex subject like economics. He observes "…economic science deals with phenomena that are more complex and less uniform than those with which the natural sciences are concerned; and its conclusions, except in their most abstract form, lack both the certainty and the universality that pertain to physical laws. There is a corresponding difficulty in regard to the proper method of economic study; and the problem of defining preconditions and limits of the validity of economic reasonings become one of exceptional complexity. It is, moreover, impossible to establish the sight of any one method to hold the field to the exclusion of others. **Different methods are appropriate, according to the material available, the stage of investigation reached, and the object in view; and hence arises the special task of assigning to each its legitimate place and relative importance".** One could read this even to this day, as a manifesto of methodological pluralism, that is increasingly thought of as appropriate for economics. This aspect is further discussed, when we turn to Sen on economic methodology.

Check Your Progress 1

1) Explain the characteristics of Ricardo's method of explanation.

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2) State the general prepositions advanced by N.W.Senior in support of scientific status of the Ricardion system.

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3) What is methodological pluralism?

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4.3 ROBBINS, POSITIVISM AND APRIORISM IN ECONOMICS

Lional Robbins in his classic tract, *An Essay on the Nature and Significance of Economic Science (*1935 ed.) presented the dominant methodological view point of the early twentieth century economic thought, which stressed **subjectivism, methodological individualism, and the self-evident nature of the basic postulates of economic theory**. His objective was to counter the criticism from the historical and institutional schools that basic economic propositions were not amenable for Quantification, therefore not testable and hence not eligible to be called a science. Robbins countered by suggesting that basic propositions of Economics were deductions from a series of postulates. Chief of these postulates include the assumption involving the experience of the way in which scarcity of goods shows itself in the world of reality and how individuals order their preferences. These are universally acknowledged facts of experience. Robbins offers a coherent account of the status of terms used in economic theory. The fundamental assumptions are combined with subsidiary hypotheses which allow us to apply the theory to actual situations.

For Robbins rationality as a postulate in economics doesn't merely mean maximizing behaviour, but implies consistency of choice. Rationality as consistency of choice is stated in the sense that if A is preferred to B and B to C, A will be preferred to C. Robbins asserts that the assumption of rational conduct, and with it the assumption of perfect foresight in Economics, are 'expository devices'. They are not realistic assumptions. According to Robbins, empirical studies may be of use for the short-term prediction of possible trends, but they do not provide the grounds for discovering 'empirical laws'. The proper uses of realistic (empirical) studies are three: to check on the applicability of theoretical constructions to particular concrete situations, to suggest auxiliary postulates to be used with the fundamental generalizations, and to bring to light areas where pure theory can be reformulated or extended.

Robbin's insistence on Economics being based on true postulates born out of experience, which need not be tested, brings him closer to *apriorism* of the Austrian School. Economic laws are derived from postulates based on a *priori* truths of experience and therefore there is no need for testing them. Robbins' claim that Economics is a pure theory and still a Positive science may be somewhat puzzling. His claim of Positivism for Economics appears to be based more on his insistence that Economic laws are value- free. He argued that there was no room for ethical considerations in Economics, and in that sense too it is 'pure theory'.

Robbins' claim of 'pure theory' or apriorism status to Economics provoked devastating criticism, especially from T. Hutchison. The point of criticism is the 'emptiness of the propositions of pure theory'. If Economics is to be called as a positive science, Hutchison insisted that it should be testable. Otherwise it would end up as a '*pseudo-science'.* Second, the assumption of '*perfect expectations'* is baseless and therefore the rationality postulate is unrealistic. Third, there is need for more extensive use of empirical techniques in Economics instead of merely claiming all postulates are prior truths. Finally, Hutchison calls the use of 'psychological method' (or introspection) as ground for asserting the fundamental postulates.

4.4 HUTCHISON AND LOGICAL EMPIRICISM IN ECONOMICS

Terence Hutchison's *The Significance and Basic Postulates of Economic Theory* (1938) marks a clear turning point in the Twentieth Century Economic methodology and laid the foundation for a clear logical positivist turn to the practice of Economics. Hutchison, in his book, sets out on search for and making clear the foundations of modern economic theory. He states that economics is a science and as such it must appeal to facts, otherwise one would be engaging in 'pseudo-science'. What sets apart the empirical propositions of science from those of other intellectual endeavours is their testability.

According to Hutchison, science contains statements which are either conceivably falsifiable by empirical observation or are not. Those which are not falsifiable are tautologies and are thus devoid of empirical content. The primary reason why the propositions of pure theory have no empirical content is that they are posed in the form of deductive inferences. In Economics, widespread use of *ceteris paribus* clause robs empirical content. Irresponsible use of *ceteris paribus* clause make microeconomic theory effectively unfalsifiable.

Hutchison examines the formal structure of economic theory which consists of a series of deductions from basic postulates. These deductions are analytical in nature. These analytical statements are logical statements without any empirical content. Therefore, pure economic theory is empty and thus there is need for more empirical content. Hutchison insisted on the need for testability, and falsification tests even for the basic assumptions. The insistence of testing not only the theory, but the assumptions as well, for validity sparked-off a wider debate in economics later. But the immediate response was to describe Hutchison as an 'ultra-empiricist'.

Hutchison's attempt to establish the analyticity of fundamental generalizations of economic theory and to wean economists away from pure theory did not succeed very much. But his proposal to make economics increasingly testable or falsifiable form; to increase empirical investigations of various aspects of economics, and the need for economists to abandon their psychological method received universal acceptance by economists.

One of the interesting aspects of Hutchison's contribution relates to the issue of testing assumptions as well as the theory or hypothesis. This provoked a debate between Hutchison and Fritz Machlup. Machlup believes that only deduced or 'lower level' hypotheses require 'verification', and he outlines how such testing could be carried out. While Hutchison does not require that every statement in a theory be tested, he does insist that each be 'testable' and one should be able to conceive how a test could be carried out. Further, Hutchison prefers that the behavioural postulates of economics reflect the actual observed and statistically recorded behaviour of economic agents. Machlup requires no such correspondence. The crucial behavioural postulate is the assumption of rational, maximizing behaviour. And Machlup is more reasonable in arguing that this assumption need not be tested directly, which was insisted by Hutchison, but indirect testing of the same could be done. Much before the debate on testing of assumptions sparked-off by Hutchison's contribution, Milton Friedman's

independent contribution suggested that testing of assumptions as such was not an important issue. However, such a proposition did lead to much controversy as we shall see in the next section.

4.5 MILTON FRIEDMAN AND INSTRUMENTALISM IN ECONOMICS

Milton Friedman's "The Methodology of Positive Economics", the lead article in his book *Essays in Positive Economics* (1953), is among the best-known pieces of methodological writings in economics. For over two decades the methodological prescriptions advanced in his essay became widely accepted among many working economists, in spite of wide controversy it generated. Rightly, as observed by Caldwell, it was a remarkable masterpiece of marketing certain notions of explanation as the basis of the methodology of positive economics. In what follows, we shall discuss in brief Friedman's contribution including some of the major points of criticism. Friedman sets out by stating that the purpose of his essay is to counter criticism of two pillars of neo-classical, economics viz.,1) the maximization behaviour and 2) The model of perfect competition. He goes on to establish the methodological foundations of neo-classical economics by posting his own version of positivism which later came to be branded as "instrumentalism".

4.5.1 Goal of Science

According to Milton Friedman, the ultimate goal of positive science "is the development of a 'theory' or 'hypothesis' that yields valid and meaningful …..predictions about the phenomenon". The criteria for acceptability of theory or hypothesis are three:

1) that theory / hypothesis be logically consistent and contain categories which have meaningful empirical counterparts;

2) that there are 'substantive hypotheses' which are testable; and

3) that "the only relevant test of the validity of a hypothesis is comparison of its predictions with experience".

Further, when an infinite number of hypotheses generally consistent with an observed set of facts generally exist, other criteria-simplicity and fruitfulness-be invoked to chose among competing hypotheses.

4.5.2 Relationship Between Significance of Theory and 'Realism' of Assumptions

Friedman is critical of those who instead of testing a theory for predictability, try to evaluate theory by the 'realism of their assumptions? For Friedman, disparaging a theory for having 'unrealistic assumptions' is ridiculous. He tries to show that most significant theories are actually characterized by descriptively inaccurate assumptions. He observes: "Truly important and significant hypotheses will be found to have "assumptions" that are widely inaccurate, descriptive representations of reality, and, *in general, the more significant the theory, the more unrealistic the assumptions*". (emphasis added).

Realism of assumptions does not matter except when certain hypotheses are derived from assumptions, and when there is no test available, realist description is in order. With these two exceptions, realism of assumptions do not matter for the following reasons:

1) Theory is supposed to lead to simplification of complex reality by abstraction. There is inverse relationship between realism and abstraction. The more realism one insists upon, the more abstract and the complex the explanation.

2) The uninformativeness of knowledge of discrepancies between assumptions and facts, makes one to treat realism of assumptions as of no importance. He cites the example of Galileo's Law of Falling Bodies:

   "*If* a body falls toward the earth in *vacuum*, its instantaneous acceleration is constant, $s=\frac{1}{2}gt^2$. The realism of vacuum need not be tested. Since the prediction is true, then the assumption be treated as *if* true. Turning to economic theory, Friedman cites the "Billiard Ball Player" example and where once the ball reaches the pouch one could assume as if the player knew all the laws of time and motion and extends it to profit maximization: 'under behave as if they were seeking rationally to maximize their expected returns……and have full knowledge of the data needed to succeed in this attempt".

3) The presence of 'undesigned' classes of implications can be avoided by *as if* assumption.

Milton Friedman concludes his essay by asserting unity of method in all positive sciences. For him there are no methodological differences between natural and social sciences. He regards economics as "objective" as physical sciences. His main conclusions are:

1) that realism of assumptions is "largely" irrelevant to validation of theories, which ought to be judged 'almost' solely in terms of their instrumental value in generating accurate predictions.

2) standard economic theory has an excellent predictive record as judged by countless application to specific problems.

3) the dynamics of competition over time accounts for this splendid track record.

4.5.3 Critical Appraisal of Friedman's Instrumentalism

Milton Friedman's methodological approach is criticized widely. The major criticism relates to the proposition that realism of assumptions does not matter. Friedman's assertion that not only the realism of assumptions is necessary but "in general, the more significant the theory, the more unrealistic the assumptions" is called by Samuelson as a flamboyant exaggeration, as the extreme version of "F-Twist" (meaning Friedman-Twist). It is one thing to say that proving realism of all assumptions is difficult, but altogether different to say that further the assumptions move away from realism, closer is the theory to predictions. Even Fritz Machlup, L. Qsoland and Nagel, who were generally in defence of Friedman's methodology, would insist on the realism of at least second order assumptions. It is pointed out that direct evidence about assumptions is not

necessarily more difficult than testing a theory. Test assumptions may yield important insights into the theory. Caldwill points out that philosophically, Friedman's insistence on prediction not explanation may result in correlation not causation, i.e., it may result in "measurement without theory". Blaug points out that accurate predictions are not the only relevant test of the validity of a theory and it would be impossible to distinguish between genuine and spurious correlations. Further, Friedman's instrumental attitude to theories, ignores 'truth value' of theories as many philosophers of science would insist upon.

Check Your Progress 2

1) Identify the important features of methodological view point of L. Rabins.

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2) What is the important contribution of Hutchison in the area of logical empiricism?

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3) Which criteria have been laid down by Milton Friedman for acceptability of theory or hypothesis?

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4) Identify the basis of the major criticism against Friedman's instrumentalism proposition.

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4.6 PAUL SAMUELSON AND OPERATIONALISM

Paul Samuelson's methodological contribution, though not comparable to his substantial work in economic theory, does offer certain insights into the turn of economics towards logical empiricism. Samuelson is against a **priorism**. He is more akin to logical empiricism of Hutchison's kind. He does show the influence of Popper's variety of 'rational reconstruction'. His contribution to economic methodology could be seen in terms of two theses, which he advances. One has come to be described as 'operationalism' and the other as 'descriptivism'. We shall elaborate these two theses.

4.6.1 Operationalism

According to him, economists should seek to discover 'operationally meaningful theorems'. Theories are strategically simplified description of observable and refutable empirical regularities. He begins with the criticism of Friedman for the latter's F-Twist on realism of assumptions and emphasizes the need for methodological clarity. He proposes the thesis of "logical equivalence" as the basis for methodological consistency. According to "logical equivalence:, theories are merely equivalent restatements of assumptions and conclusions, i.e., A=B=C, where A is defined as 'assumptions', B is defined as theory and C as consequences or predictions.

Theory (B) consists of "a set of axioms, postulates or hypotheses that stipulate something about observable reality… " The set is either confirmable or refutable in principle by observation. A theory has a set of consequences (C) which are logically implied by theory, and a set assumptions (A) which logically implies the theory. The degree of "realism", "factual conrrectness", "empirical validity" or "truth" of any one of A,B,C is shared by the other two. Referring to 'F-Twist', he observes first, it is a contradiction to maintain all consequences (C) are valid and the theory (B) and the assumptions (A) are not valid. Second, it is absurd to maintain, in case where only some of the consequences (C) are valid, that the theory (B) and assumptions (A) are important though invalid. The part of the theory set and assumptions set corresponding to the invalid part of the consequence set should be eliminated.

4.6.2 Descriptivism

Samuelson has certain exalted view of explanation, which he considers different from the usual notion in science. He observed, "scientists never" explain" any behaviour, by theory or any other hook. Every description that is superseded by a "deeper explanation" turns out …to have been replaced by still another description …." An explanation, as used legitimately in science, is a better kind of description and not something that goes ultimately beyond description. It is this emphasis and elaboration of 'description' that earns Samuelson's approach the title of 'descriptivism'. Why only description? First, a theory is just description of observable experience, a convenient mnemonic representation of empirical reality. Second, knowledge consists essentially of observational reports. A theory expressible in observational language is superior to those which are not. Explanations are ultimate. Apriorisms must be avoided; hence theories should be expressed in observational language. All known theories in science are expressible in terms of observational statements, i.e., basic statements.

Samuelson is criticized for not practicing what he preaches methodologically. Machlup, citing Samuelson's famous work on 'factor price equalisation', accuses him for not following his own norm of deriving "operationally meaningful theorem" based on unrealistic assumptions. Another famous criticism is that of Stanley Wong's against the methodological foundations of Samulson's revealed preference theory.

4.7 THEORY – ASSUMPTIONS DEBATE IN ECONOMICS: A LONG VIEW

The spectacular advance of modern science is usually attributed very largely to the development of deductively related statements known as theories. Theories in science brought improvements in order and clarity, broadened the scope of generalizations and scored extraordinary predictive success. However, economic theory does not command as much respect as theories in physical sciences. Ever since the classical economics, there has been criticism of unrealistic assumptions of economic theory. There have been reasoned replies from time to time. Jack Melitz (1965), in one of his classic papers on the theory – assumptions controversy, provides an account of the response to the criticism since late Twentieth century. Here is a brief summary, which helps us to understand the problems of explanation that persist in economics.

During 1880-1920 advocates of economic theory adopted a *moderate and conciliatory* stance. They agreed that economic theory made false assumptions, and admitted that the value of the theory depended greatly on the degree of accord between the assumptions and the facts. Yet they insisted, first, that the assumptions did correspond broadly with events. Second sacrifice of some accuracy for simplicity was justified in view of complexity of reality. Further, they emphasized importance of combining the use of simplifying assumptions with protective measures:

1) The need to pursue more inductive studies in all areas of economics.

2) The determination of reasonable proximity between major assumptions and facts before application of economic theory.

3) The alteration of assumptions to suit the particular case involved.

During 1920s and 1930s with notable advance of purely logical branch of economics, the advocates of economic theory lost appeal. The practitioners of economic theory with the support of Robbins and the Austrians turned to a *priorism*. There was a stance that economic theory is its own reward.

In 1948-1953, as we have seen earlier, Milton Friedman tried to supply a logical foundation for the developing attitude that the realism of assumptions is not a genuine, or only a secondary concern. False assumptions in economics do not result in a handicap. Assumptions must simply work, and yield reliable results. The criticism that assumptions in economics do not correspond with facts is besides the point. In 1955 Firtz Machlup joined forces with Friedman, claiming to bring with him the support of experts in the philosophy of science and the whole *tradition* of political economy. The result is that economics continues to live with a certain methodological inadequacy. The other reasons for this disquiet in explanation in economics are summed up in the next section.

4.8 AMARTYA SEN ON HETEROGENEITY OF EXPLANATION IN ECONOMICS

By now it is clear that explanation in economics is nowhere near being in a satisfactory state. In a broad based critique of contemporary economic

methodology, Amartya Sen (1989) draws attention to the heterogeneity of the subject matter of economics. Any attempt to think of mono-method for all the diverse concerns of economics is bound to cause the kind of disquiet that we experience today. He cogently argues for heterogeneity of methodological approaches in economics.

4.8.1 Heterogeneity of Substance and Methods of Economics

According to Sen, economics as a subject is concerned with many different types of problems. The diversity of the discipline of economics should be kept in view to achieve an adequate grip on the methodological issues in the subject. The subject of economics includes three diverse, though interrelated, exercises:

1) Predicting the future and causally explaining the past events.

2) Choosing appropriate descriptions of states and events in the past and the present, and

3) Providing normative evaluations of states, institutions, and policies.

These exercises are interrelated but each requires a different methodological approach. For instance, the method of scientific explanation that insists on prediction is concerned only with the first set of exercises. The 'methodology of economics' has to admit enough diversity to be able to deal with other classes of problems as well.

4.8.2 Testing and Verification

Testing and *Verification* are important for many types of economic analyses since they are concerned with causal relationships and with making predictions. But these are not suitable for all economic theories. For instance evaluative exercises are not open to testing. Normative evaluation is a different discipline from that of making predictions on the basis of causal hypotheses. Similarly, some descriptive propositions do not have predictive content, and "testing" would be the wrong operation to seek. As far as causal theories are concerned, the need for testing them with empirical information is fairly accepted in principle by economists. Conceptual and analytical issues need to be explored very substantially to understand what types of relationships might be involved. Analyses at this stage are not meant for testing and verification. Of course, one should not end at this stage and move up to the next where testing is possible.

4.8.3 Value Judgments and Welfare Economics

Sen draws attention to the fact that following Robbins value judgments are kept out of economics. "The decision to keep economics 'value-free' would, of course, militate against the subject of welfare economics as such". Welfare economics still is accepted as important and in this domain to keep economics value-free may not be a value that would be appreciated. In evaluative exercises in welfare economics descriptive methods becomes indispensable.

4.8.4 Formalisation and Mathematics

Mathematics helps to an extent in formal reasoning and helped in systematization of many economic propositions. However, there are severe limitations of formal language of mathematics. Not all economic propositions can be reduced into mathematics. Lack of balance often has resulted in certain degree of over-

formalization of economics. While recognizing the positive contribution of mathematics in lending rigour to certain economic propositions, the negative contribution is through over concentration on mathematics to the exclusion of other disciplines. Such excesses of formalization need to be corrected.

Check Your Progress 3

1) What do you mean by the term 'logical equivalence'?

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2) Do you agree that different methodological approaches are needed in Economics?

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3) To what extent mathematics should be allowed to use in systematization of economic proposition?

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4.9 LET US SUM UP

Keeping in view that the subject matter of economics is complex and heterogeneous, any single model of explanation is bound to face serious limitations. Yet there has been an ambition in the profession from the times of classical political economy, which has turned towards a kind of arrogance that economics is a science like any physical sciences and should conform to the rule of one methodological approach, viz., logical positivism. This has been subjected to severe criticism on its limitations.

The mainstream economics is not able to come out of this obsession "It is about the one methodological rule which has dominated economics since early 1960s. The rule at issue is the methodological requirement that economic models or theories, if they are going to be given serious consideration by practicing economists, must be shown to be testable, where successful test of theory is defined as a falsification of that theory. A testable theory is a falsifiable theory".

The exploratory lesson on explanation that we had should help a student of economics to move out of this obsession. It is not that abandon testing but we must abandon the habit of considering evaluation, description, and even advocacy as not being part of pursuing knowledge in economics. Heterogeneity of economics needs diversity of approaches if the disquiet of disaffection that pervades economics is to be overcome.

4.10 KEY WORDS

Determinism : A term used to describe an argument or methodology that simply reduces casuality to a single set of factors acting more or less directly to produce outcomes.

Hypothesis : Hypothesis refers to a tentative statement that can be tested by applying the methods of particular science.

Empiricism : Empiricism is generally regarded as being at the heart of the modern scientific method that our theories should be based on our observations of the world rather than on intuition or faith; that is, empirical research and a posteriori inductive reasoning rather than purely deductive logic.

Ideology : A systematic body of concepts about human life or culture; a manner or the content of thinking characteristic of an individual or group or culture; also refers to the integrated assertion and theories that constitute a socio-political programme.

Methodological Dualism : Referring to positivist belief in separation of the knower from the known or of the subject from object.

Methodological Monism : In contrast to the compartmentalization of dualism, monism views the world as a "seamless web". In terms of Gouldner's argument, the separation between the knower and the known must be overcome.

Nomothetic : Relating to discovery of general laws or relating to the discovery of universal law.

Pseudo Science : Pseudo science refers to any body of knowledge or practice, which purports to be scientific or supported by science but which is judged to fall outside the domain of science.

4.11 SOME USEFUL BOOKS

Blaug, Mark (1980); *Methodology of Economics*, Cambridge Univeristy Press, Cambridge.

Caldwell, Bruce (1982); *Beyond Positivism: Economic Methodology in the Twentieth Centrury*, George Allen and Unwin, London.

Friedman, Milton (1953); *Essays in Positive Economics*, University of Chicago Press, Chicago.

Hausman, Daniel M. (1994); *The Philosophy of Economics: An Anthology*, Cambridge University Press, Cambridge, 2nd Edition.

Melitz, Jack (1965); "Friedman and Machlup on the Significance of Testing Economic Assumptions", Journal of Political Economy, pp.37-60.

Sen, Amartya (1989); "*Economic Methodology: Heterogeneity and Relevance*", Social Research, Vol.56, No.2 (Summer 1989), pp. 299-329.

4.12 ANSWERS OR HINTS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) Positive, abstract and deductive briefly called hyupothetico-deductive model of explanation.

2) See Sub-section 4.2.2.

3) Methodological pluralism refers to comprehensive reconciliation of different methods and acceptance of the idea that different methods are appropriate depending upon the object in view, the stage of investigation reached and the material available.

Check Your Progress 2

1) Stress on pure theory bases on a priori truth of experience and without any need for testing, no room for ethical consideration, rationality as maximizing behaviour and as consistency of choice.

2) The insistence of testing both theory as well as assumptions.

3) See Sub-section 4.5.1

4) The proposition that realism of assumption does not matter.

Check Your Progress 3

1) Theories are merely equivalent restatements of assumptions and conclusions.

2) See Section 4.8

3) See Sub-section 4.8.4

UNIT 5 FOUNDATIONS OF QUALITATIVE RESEARCH: INTERPRETATIVISIM AND CRITICAL THEORY PARADIGM

Structure

5.0 OBJECTIVES

This unit introduces the two widely used and well-established paradigms namely, interpretive and critical theory. Unlike post-positivism, these paradigms are the pillars of qualitative research. After going through this unit, you will be able to:

- describe the essence of interpretive and critical theory paradigm;
- discuss their theoretical framework;
- elucidate the nature of reality and methodology underlying these two paradigms; and
- state the examples and applications of interpretive and critical theory paradigm in economics.

5.1 INTRODUCTION

As has been discussed earlier in Unit 1, you have come to know that a paradigm essentially refers to a comprehensive belief system or theoretical framework/ world view that guides research and practice in a particular field. At its basic level, it has a philosophy of science that makes a number of fundamental assumptions about the nature of truth and what it means to know. Unlike positivism, that is based on empiricism and deductive reasoning for verification of truth, interpretive and critical theory paradigms are based on **subjectivism** and **substantialism** for the search of truth. The underlying ontological and epistemological assumptions of interpretitivism and critical theory paradigms have been discussed in the subsequent sections. It is important to note that these two paradigms form the backbone of philosophical science of qualitative research.

Before embarking on meaningful research using qualitative approach, it is important to understand the meaning, nature of reality, methodology and the essence of these two paradigms. Let us begin with interpretative paradigm.

5.2 INTERPRETIVE PARADIGM

Interpretive research assumes "that our knowledge of reality is gained only through social constructions such as language, consciousness, shared meanings, documents, tools, and other artifacts" (Klein & Myers, p. 69). As the term indicates, interpretive paradigm looks for understanding of a particular context. Interpretivists believe that it is important to understand the context in which research is conducted for proper interpretation of the data. The interest of interpretivists lies not in the generation of a new theory, but to judge or evaluate and refine interpretive theories. Researchers using an interpretive approach aim to uncover meaning towards a better understanding of the issues involved. The underlying ontological assumption of interpretive paradigm is subjectivism as here reality is viewed as socially constructed and interpreted. Epistemological assumption is that knowledge of reality is obtained from the accounts that social actors provide. Neuman (1997) affirms that "social reality is based on people's definition of it" (p. 69). From the previous assertions, it is apparent that interpretive researchers do not recognize the existence of an objective world. On the contrary, they see the world strongly bounded by particular time and specific context. Therefore, the epistemological question, "What is the nature of the relationship between the knower or would-be knower and what can be known" (Guba & Lincoln, 1994, p. 108) must be answered in a consistent way with the ontological view. The interpretive researcher's epistemological assumption is that "findings are literally created as the investigation proceeds" (Guba & Lincoln, p. 111). Moreover, they explicitly recognise that "understanding social reality requires understanding how practices and meanings are formed and informed by the language and tacit norms shared by humans working towards some shared goal" (Orlikowski & Baroudi, 1991, p. 14).

Interpretive research focuses on identifying, documenting, and 'knowing' – through interpretation of :

- world views,
- values,
- meanings,
- beliefs,
- thoughts and the general characteristics of life events, situations, ceremonies and specific phenomena under investigation,
- the goal being to document and interpret as fully as possible the totality of whatever is being studied in particular contexts from the people's viewpoint or frame of reference.

Interpretivists assert that all research is influenced and shaped by pre-existing theories and world-views of the researchers. The terms, procedures and data of research have meaning because a group of scholars has agreed on that meaning.

Research is thus a socially constructed activity. Three other approaches support the philosophy of interpretive paradigm. They are Verstehen, hermeneutics and phenomenology. Verstehen stresses on the understanding of the particulars of a situation, hermeneutics emphasizes on the importance of language and context in understanding and phenomenology on people's perception of the world.

Methodology

Foundationalism is an approach that asserts research can begin with **self-evident truths** which can serve as the starting point for our understanding of the world. Interpretivists are anti-foundationalists as they believe that the standards that guide research are **products of a particular group or culture**. They use a broad range of qualitative methods and gather thoughtful reflections of experienced practitioners. Interpretative approaches rely heavily on naturalistic methods (interviewing and observation) and their methods generally ensure an adequate dialogue between the researchers and the people with whom they interact to be able to construct a meaningful reality. These meanings emerge from the research process. Certain methodologies used in interpretive research are:

Naturalistic inquiry, that uses first-hand observation to understand human action and studies real-life situations as they unfold. It is non-manipulative and non-controlling, hence has lack of predetermined constraints on outcomes;

Phenomenologic methodologies, rely on descriptions of conscious experiences to develop understanding of the meaning of human action;

Constructivism, makes use of perception or self-experience in making and structuring knowledge;

Ethnographic inquiry, rely on self-experiencing the culture of participants in the field;

Symbolic interactionism, understands human action as per the meanings derived by the human beings for particular objects and people.

Some other methods for data-collection are surveys, interviews, field observation, witness accounts, focus group discussion. Interpretive research adds to the understanding of different contexts and situations. Interpretivists argue that research results should be applied to higher, conceptual level. From the data, a researcher tries to understand multiple perspectives on the same topic. For analyzing the meaning of data, interpretive researchers may use and conduct research by methods from another paradigm (eg. Post-positivism) also and doing so would lead to reinterpreting the meaning of results by another perspective.

With a philosophical alignment with interpretive naturalistic orientations, interpretive description acknowledges the constructed and contextual nature of human experience that at the same time allows for shared realities (Thorne, Reimer Kirkham, & MacDonald-Emes, 1997). Key axioms of naturalistic inquiry, such as those delineated by Lincoln and Guba (1985), provide philosophical underpinnings for research design, including:

1) There are multiple constructed realities that can be studied only holistically. Thus, reality is complex, contextual, constructed, and ultimately subjective.

2) The inquirer and the "object" of inquiry interact to influence one another; indeed, the knower and known are inseparable.

3) No *a priori* theory could possibly encompass the multiple realities that are likely to be encountered; rather, theory must emerge or be grounded in the data.

Research Strategy for Interpretivism

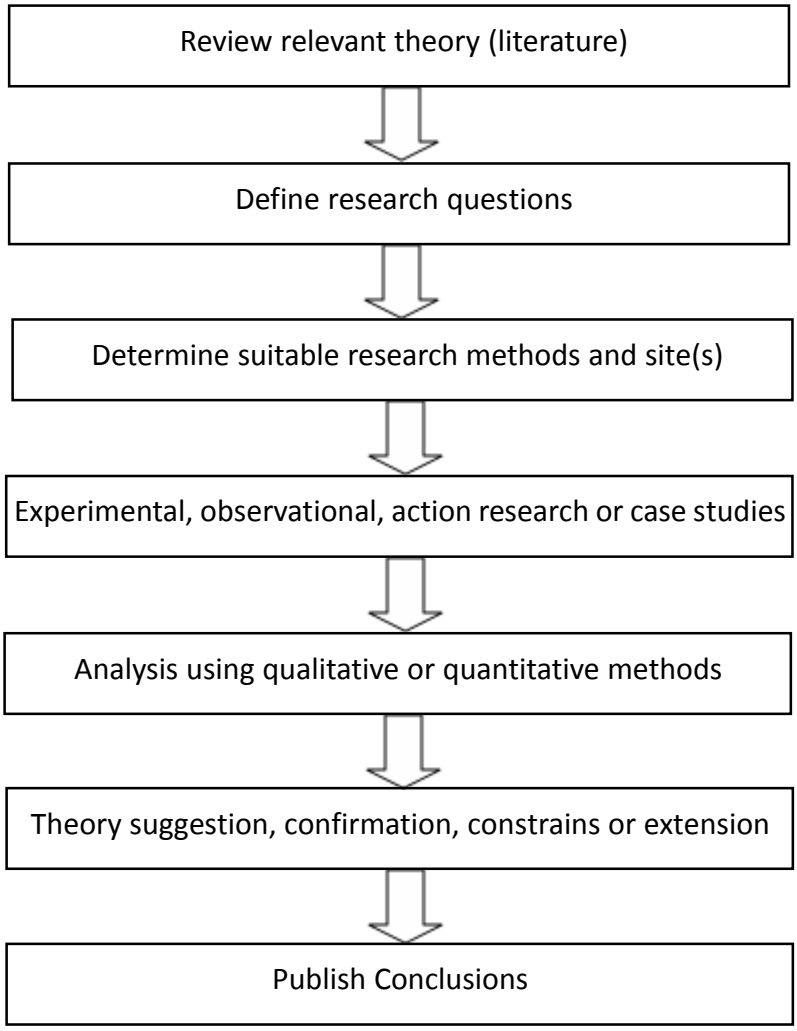
Broadly there are four distinct research strategies that work with different ontological assumptions. Abduction strategy best fulfills the needs of interpretive researcher as it starts with laying the concepts and meanings that are contained in social quarter's accounts of activities related to a research problem.

As interpretivists construct reality on the accounts of social actors present in a specific situation, it is important to take into account the different perspectives of each participant. One can understand the complexity of the issue through the following example, excerpts taken from Andrade, 2009.

Let's imagine a scenario at the beach in which a huge wave is approaching the shore. There is an excited surfer on top of the big wave and two scared children in a small inflatable boat right below the colossal wave. On the shore, a girl is admiring her boyfriend's dexterity and the petrified children's mother is watching the looming mass of water approaching the boat. On the adjacent cliff there is a relaxed monk meditating on the infiniteness of the universe, while enjoying the sea breeze and the sound of the sea. If we want to conduct research on what that wave means for beach-goers, our results will depend on who the respondent is. Interviewing one of the participants would give insights from that participant's perspective only, which may be insufficient, or even misleading, because their personal and intimate experiences with the wave are quite different from that of the others. If the interpretive researcher wants to create an integral and persuasive piece of research around this phenomenon, each participant's different perspectives should be included.

To conduct interpretive research on a certain setting, intense and long-term participant observation is required, followed by deliberate and long-term reflection on what was observed. Interpretive researchers start out with the assumption that access to reality (given or socially constructed) is only through social constructions such as language, consciousness and shared meanings. Interpretive studies generally attempt to understand phenomena through the meanings that people assign to them and interpretive methods of research in IS are "aimed at producing an understanding of the context of the information system, and the process whereby the information system influences and is influenced by the context. Interpretive research does not predefine dependent and independent variables, but focuses on the full complexity of human sense making as the situation emerges.

The life-cycle of theory-generation under interpretive paradigm has been depicted in the following flow-chart:



Criticism

Researchers who wish to use interpretive framework for their case-studies are cautioned not to lose theoretical sensitivity. Strauss and Corbin (1990, p. 41) describe theoretical sensitivity as the "awareness of the subtleties of meaning of data" and elaborate that "one can come to a research situation with varying degrees of sensitivity depending upon previous reading and experience with or relevant to that area." Ultimately, the researcher has to evaluate the relevance of their preliminary theoretical framework vis-à-vis the actual findings (Urquhart, 2001, 2007). The criteria to be kept in mind for using interpretive case studies aiming for theory-building can be seen in the appendix to the unit.

Differences of Interpretive paradigm from post-positivism can be broadly summarized in the table below:

Differences between Post-positivism and Interpretivism on Five major Issues

	Post-positivism	**Interpretivism**
Nature of reality	External to human mind	Socially constructed
Purpose of research	Find Universals	Reflect understanding
Acceptable methods and data	Scientific method	Subjective and Objective research methods are acceptable

	Post-positivism	Interpretivism
Meaning of data	Falsification Use to test theory	Understanding is contextual. Universals are deemphasized
Relationship of research to practice	Separate activities. Research guides practice	Integrated activities. Both guide and become the other.

(**Source:** Foundations of qualitative research by Jerry W. Willis (2007) p.95)

Check Your Progress 1

1) Explain how interpretive framework is a departure from post-positivism?

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2) Outline the methodology of interpretive research using a suitable example from your locality.

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3) How do the ontological and epistemological assumptions underlying interpretive paradigm guide the researcher to the methodology of research, data-collection and analysis?

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5.3 CRITICAL THEORY PARADIGM

Critical theories share some ideas of the interpretative paradigm, but what makes it different is that critical paradigm focuses on oppression. Critical social scientists believe it necessary to understand the lived experience of real people in context. Persons can perceive reality outside them and represent that reality with language. Also, reality is defined by the interaction between the knower and the known. Critical approaches examine social conditions and uncover oppressive power arrangements. 'Critical theory' is a term that can apply to a number of movements in the social sciences. As it is based on ideology of class conflict, the critical theorists whose objective is to find out power-relationships among the different sections of the society (between the doers and the oppressed), it is sometimes referred as 'ideologically oriented inquiry, neo-Marxism, materialism, the Frankfurt School and freireism. Critical theory was built on the foundation of Marxism which perceived conflicts between classes in society and believed that it could be reformed only via radical transformation of the society. The roots of the critical theory can be traced to the Frankfurt school or the Institute for Social

Research. It was established as a school of thought primarily by five Frankfurt school theoreticians; Herbert Marcuse, Theodor Adorno, Max Horkheimer, Walter Benjamin and Erich Fromm. The underlying ontological assumption of critical theory paradigm is substantialism wherein matter constitutes the reality. However, epistemologically people interpret reality differently in different times and places. Critical Theory is a theoretical tradition developed most notably by Horkeimer, Adorno, Marcuse at the Frankfort School. Their work is a critical response to the works of Marx, Kant, Hegel and Weber.

- **Historical ontology** – assumes that there is a 'reality' that is apprehendable. This is a reality created and shaped by social, political, cultural, economic, ethnic and gender-based forces that have been reified or crystallized over time into social structures that are taken to be natural or real. People, including researchers, function under the assumption that for all practical purposes these structures are real. Critical theorist believe this assumption is inappropriate.
- **Modified transactional or subjectivist epistemology** – we cannot separate ourselves from what we know and this inevitably influences inquiry. What can be known is inextricably tied to the interaction between a particular investigator and a particular object or group.

Purpose of Research

Research that aspires to be critical seeks, as its **purpose of inquiry**, to confront injustices in society. Following a tradition associated with Antonio Gramsci, critical researchers aim to understand the relationship between societal structures (especially those economic and political) and ideological patterns of thought that constrain the human imagination and thus limit opportunities for confronting and changing unjust social systems. Critical theorists are committed to understanding the complexity of such relations, however, and thus distance themselves from what they see as reductionist Marxist approaches. Critical theorists hold that these earlier approaches offered no ability to explain social change. Thus, in contrast to what they believe was an overemphasis on the determinative nature of economic and political structures, critical theorists are interested in social change as it occurs in relation to social struggle. Critical researchers assume that the knowledge developed in their research may serve as a first step toward addressing such injustices. As an approach with a definite normative dimension, the research aims for a transformative outcome, and thus is not interested in "knowledge for knowledge's sake."

Critical Theory is multi-disciplinary. It finds its applications in anthropology, economics, art criticism, education, history, psychology, political science, sociology and theology. An interesting question is why and where to apply critical theory paradigm in research. To begin with, research and practice are integrated activities in the critical paradigm. It not only studies power relationships which are critical factors in the society, the injustices and the inequities, the contradictions and the incoherencies, but also aims at helping and empowering those who are oppressed to free themselves from their oppression.

Critical theory paradigm should be applied where the objective of the researcher is to analyse the power structures in a set-up or social problems arising of such structures. For example, it can be used to understand wage inequities between male, female and child workers in the society.

Nature of reality: Critical theorists like post-positivists believe that reality is material and external to human mind but they interpret it differently. They question/critique the existing reality and analyze why such a reality exists and whether it contributes positively/negatively to human mind. Further, they also advocate evolving ways and means to reform the existing system if it is bifurcating the society into the have's and the have not's.

Methodology: Critical theorists suggest two kinds of research methodologies, namely ideology critique and action research, for undertaking research work. They rely on methods combining observation and interviewing with approaches that foster conversation and reflection. They try to challenge guiding assumptions and they begin this by asking people to reflect and question their current experience with regard to values identified. In doing research, they not only try to define a situation but change the situation.

As a research methodology, critical theory adopts an overtly critical approach to inquiry. It precedes with an attitude of suspicion, calling into question not only the data itself, but also the researcher, the research design and interpretation of findings. From a critical theory viewpoint, the task of the social scientist has three dimensions:

1) To understand the ideologically distorted subjective situation of some individual or group;
2) To explore the forces that has caused that situation;
3) To show that these forces can be overcome through awareness of them on the part of the oppressed individual or group in question.

The appropriate research strategy for critical research is **Retroduction** as it begins with a hypothetical mode of a mechanism that could explain the occurrence of a phenomenon under investigation.

- Critical theoretical approaches tend to rely on dialogic methods; methods combining observation and interviewing with approaches that foster conversation and reflection. This reflective dialogic allows the researcher and the participants to question the 'natural' state and challenge the mechanisms for order maintenance. This is a way to reclaim conflict and tension.

- Rather than naming and describing, the critical theorists try to challenge guiding assumptions.

- Critical theorists usually do this by beginning with an assumption about what is good (e.g. autonomy, democracy) and asking people in a social group, culture or organization to reflect on and question their current experience with regard to the values identified (e.g. To what extent are they an autonomous worker?)

- Critical theorists not only just try to describe a situation from a particular vantage point or set of values (e.g. the need for greater autonomy or democracy in a particular setting), but also try to change the situation.

"Objective" analysis

In their embrace of a normative perspective, Critical theorists make no claims that their analyses are "objective" in the sense usually meant by logical positivists. In fact, critical theorists argue that the subjective/objective dualism masks the ways in which both positions are limited by the social forces that inform all human action and analysis. Critical qualitative research acknowledges subjectivism in the sense that learnings and interpretations cannot be based on logic and scientific analysis only. While it affirms that knowledge can never be separated completely from the researcher's own experience, it rejects the notion that all analyses are relative. It asserts that rational analysis is fundamental to human emancipation, and hence embraces what Morrow (1994) calls critical realism

Data analysis and verification

Critical researchers assume that their task is to expose the hidden assumptions that guide both research respondent statements and often, initial analyses of data. Researchers therefore bring a level of scrutiny to their task that includes rooting out the meanings of what is left unsaid as well as that which is stated. The research is verified as other members of the research community offer corroboration that has come from their own research experiences.

Sample representativeness, typicality, and generalizability

In a response similar to that of constructivism, critical researchers employing qualitative research would note that we are not seeking to explain the "typical" person, but to analyze that person's possibilities and limits within a culture. In this approach, individuals are not seen as "types" or members of aggregate groups (although they may be both of these). Individuals instead are approached as beings that inhabit subject positions that are possible within a culture. Because individuals are members of society and must act within the society, they share certain understandings and meanings; if they did not, they could be considered insane, which in societal terms is the designation given to persons whose social realities have no seeming connection to those around them.

Validity

The test of validity in the case of critical constructivist research is directly related to its stated purpose of inquiry. The research is valid to the extent that the analysis provides insight into the systems of oppression and domination that limit human freedoms, and on a secondary level, in its usefulness in countering such systems.

Criticism

One of the charges against critical theory is its tendency toward elitism. With its proponents' commitment to the idea that research can bring about a better and more equitable world, critics charge that critical theorists tend to assume that they are not only more capable of analyzing a situation than most; they are better equipped to offer a prescriptive plan of action. Critics charge that this often brings theorists outside of their realms of expertise so that the insights they offer are naive and unworkable in the contemporary setting.

Further, critics charge that critical theorists can be unwilling to listen to the experiences of those most adversely affected by current policies and the status

quo, as they tend to focus their analyses on persons and institutions in positions of power and authority. This, critics note, causes critical theorists to be out of touch with the very persons they purport to be most interested in helping.

Differences between critical theory framework and post-positivism on five major issues are as given below:

	Post-positivism	**Critical Theory**
Nature of reality	External to human mind	Material and external to the human mind.
Purpose of research	Find Universals	Uncover local instances of universal power relationships and empower the oppressed.
Acceptable methods and data	Scientific method	Subjective inquiry based on ideology and values; both quantitative and qualitative methods are acceptable.
Meaning of data	Falsification Use to test theory	Interpreted through ideology; used to enlighten and emancipate.
Relationship of research to practice	Separate activities. Research guides practice	Integrated activities. Research guides practice.

(**Source:** Foundations of qualitative research by Jerry W. Willis (2007))

Check Your Progress 2

1) Is critical framework a departure from post-positivism and interpretivism? Give reasons in support of your answer?

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2) What points should be kept in mind while defining the methodology of critical research?

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3) Critical framework is sometimes known as the Frankfurt school. Why? Elaborate on the foundations of critical theory.

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5.4 APPLICATIONS IN RESEARCH: ILLUSTRATIVE CASES

Case 1: 'A study on 'invisible' labour-force in India

Invisible workforce comprises of care-workers who work daily for low/negligible wages however their work is critical to the success of the household/enterprise. Primarily constituting of housewives, nannies, cleaners, etc., these workers are engaged in 'care' work and their work is generally under-valued or over-looked. A news daily recently reported that as per Census 2011 figures nearly 160 million women in India aged between 15-59 years reported themselves as not working but were primarily involved in domestic work, care work and rearing families. In this case, the social actors are the housewives, nannies, cleaners, etc.

An interpretive researcher by using qualitative methods like phenomenology and symbolic interactionism would try to understand the root causes of such women not involved in economic work. Research could begin with penning down research questions like 'why the women have not taken up work outside home' or 'Are their social pressures for the women sticking to domestic work' or even 'Is the decision to work at home independent or curbed'. Next, the researcher can shortlist a region predominantly populated with invisible workers and use techniques of PRA/RRA to gather the requisite data. The perspectives on invisible work may differ among the social actors in this case too. For example if the researcher is probing the causes of invisible work he may observe that causes may be social, cultural or at times political too. It would be important to gather perspectives of not only unpaid care-workers but also their family members as to why they did not try to change their current situation, village head-men to understand whether it is due to lack of economic opportunities in the area and also to know whether illiteracy is the cause of invisibility of women workers.

Case 2: Absenteeism among students of primary school in rural areas

Universal primary education being one of the goals of Millennium Development Goals of UNDP, all developing countries are in the race of providing elementary and primary education to children in rural and urban areas. While enrolment in elementary and primary education has definitely increased in India in the last decade, but equally troublesome statistics have emerged quoting high incidence of absenteeism among students of primary school in certain rural areas. An interpretive researcher using qualitative methods and tools can take different perspectives of the social actors (read primary school children, teachers and parents) for absenteeism in primary schools.

Case 3: A study of employer's attitude towards distance/online-educated job applicants.

Distance educated youth are perceived to be less efficient and trained as compared to classroom educated youth. Instances of preferential bias have been observed in this respect often in the job market. An in-depth study on the employer's mindset can be undertaken by an interpretive researcher to explore the causes of the same. Extensive literature review is a pre-cursor to such research as that will underpin the historical causes of preferential attitude and negative perception of the employers. An interpretive researcher can employ actual observational techniques or use witness accounts of the interviews/interactions of the employer

with distance/online educated job applicants. Research questions may range from finding variability in the questions posed to such candidates from the ones who were educated in the traditional mode to quizzing grounds for negative perception of employers for the same. For example, a study quoted the following reasons for dislike of distance educated job applicants by an employer: lack of rigor, lack of face-to-face interactions, increased potential for academic dishonesty, association with diploma mills, concerns about online students' true commitment evident from regularly venturing to a college or university physical location, considered by some to be an important part of the educational experience.

Interestingly all of the above cases can also be studied in a critical framework as only the questions posed would change and power-relationships would be judged. Critical theory is also used subsequently after interpretive research as it is easier to critically analyze a problem after undertaking a deeper understanding of that problem. For example, after understanding the reasons behind the existence of invisible workers, a critical researcher may critically analyze the role of power relationships between the care workers and their families, social circle and the environmental factors leading to it. Awareness campaigns and policies may be designed to further empower them to be able to participate in the economic workforce and to allow labour statisticians to recognize their care work within the ambit of 'work'.

Check Your Progress 3

1) Using a suitable example from economics, select a theme and write a proposal in about 500 words using interpretative research methodology.

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2) Explain the scenario when both interpretative and critical theory framework can be applied in the same research? Do they supplement each other? Why or why not?

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5.5 LET US SUM UP

The three paradigms – postpositivism, interpretivism and critical theory – are the dominant guiding frameworks in the research literature in the social sciences. Interpretivism and critical theory are two of the contemporary frameworks of qualitative research besides positivism and post-positivism paradigms. Based upon different ontological and epistemological positions, these paradigms analyze nature of reality differently. Interpretivism is based on socially constructed reality

whereas critical research is based on the critique of social reality. These paradigms have emerged as a response to a perceived problem in society. Critical theory was a response to the complexities of modern nation states that often lead to domination and exploitation of one group by the other. Interpretivism proposed that we abandon the search for generalizable truths and laws about human behaviour and concentrate instead on local understanding.

5.6 EXERCISES

1) Consider the interpretivist philosophy of science. What to you see as the most significant departure from post-positivism and why?

2) Consider a topic of research in an area of interest to you. What would be the purpose of research on the topic if it were conducted from a post-positivist perspective? Critical or Interpretive?

3) What does interpretivism have in common with the critical paradigm? In your field which are more important: the commonalities or the differences?

5.7 KEY WORDS

Paradigm : A comprehensive belief system, world view or framework that guides research and practice.

Ontology : It is concerned with the nature of reality and inquires the characteristics of things that exist, is a major aspect of metaphysics- a branch of philosophy.

Epistemology : It is concerned how can we know? It is also a major aspect of metaphysics.

5.8 SOME USEFUL BOOKS/WEBLINKS

Willis, Jerry, W (2007), *Foundations of Qualitative Research: Interpretive and Critical Approaches*, Sage Publications, USA.

Clark, Lynn Schofield, *'Critical Theory and Constructivism: Theory and Methods for the Teens and the* New Media @ Home Project' retrieved online from http://www.ihrcs.ch/?p=92

'Critical theory paradigms' retrieved online from http://www.qualres.org/HomeCrit-3518.html

5.9 ANSWER OR HINTS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1) See criticism, Section 5.2

2) See Methodology, Section 5.2

3) See Section 5.2

Check Your Progress 2

1) See Section 5.3
2) See Section 5.3
3) See Section 5.3

Check Your Progress 3

1) See Section 5.4
2) See Section 5.4, yes they supplement each other.

APPENDIX I

Criteria for Interpretive Case study aiming at Theory Building

Criterion	Definition	Specific case study tactic	Grounded theory[1] principles
Construct validity	Establishing correct operational measures for the concepts being studied	• Use multiple sources for evidence • Establish chain of evidence • Have key informants review draft case study report	• Corroboration • Theoretical sufficiency
Internal validity	Establishing causal relationship as distinguished from spurious relationships	• Do pattern matching • Do explanation-building • Address rival explanations • Use logic models	• Theoretical coding
External validity	Establishing the domain to which a study's findings can be generalized	• Use theory in single case studies • Use replication logic in multiple case studies	• Theoretical generalisation
Reliability	Demonstrating that a study can be repeated with the same results	• Use case study protocol • Develop case study database	• Chain of evidence as afforded by grounded theory method

(Case study methodology criteria, Yin, 2003, p.24)

[1] The discovery of theory from data is known as grounded theory and it provides the opportunity for the researcher to theorise from evidence existing in the data.