



RESEARCH METHODOLOGY

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PREFACE TO THE REVISED EDITION

This second edition is a thoroughly revised version emphasizing on greater clarity and understanding of the concepts, methods and application of research techniques. The approach is broad based covering the interests and requirements of researchers in different branches of knowledge in social sciences, humanities and commerce and management. The special features of this new edition include more illustrations, greater coverage and in-depth analysis and explanation to most of the topics. All chapters are meticulously revised incorporating latest techniques and theories, especially methods for multivariate analysis.

Authors hope that this new edition will be appreciated and invite from the researchers any new ideas and objective criticism of the contents of this edition to improve and enhance the value of this publication. Authors thank the publishers for their sincere efforts and care in the publication of this edition. We also thank all those well-wishers who have contributed to the enrichment of the contents of this edition.

We are grateful to God for this inspiration and effort, which we hope, will satisfy the inquisitiveness of young budding researchers.

AUTHORS



SYLLABUS

SEMESTER 2 Credit-4 Code: RM01C04 Hrs 90

Objectives: *To help the students to understand how to do research in the area of commerce and management.*

- MODULE-1:** Research — Meaning — Significance — Objectives — Types of Research — Research Methods vs. Methodology — Steps in Research. (15 Hrs)
- MODULE-2:** Research Problem — Definition — Nature — Formulation — Techniques of Defining the Problem — Research Design — Meaning — Needs — Types of Research Design — Variables — Dependent and Independent Variables — Extraneous Variables — Intervening Variable — Dichotomous Variable — Research Proposal and its Preparation — Research Hypothesis — Types of Hypotheses. (20 Hrs)
- MODULE-3:** Sampling Design — Census and Sample Survey — Sample Frame — Sample Size — Methods of Sampling. (15 Hrs)
- MODULE-4:** Collection and Analysis of Data — Types of Data — Methods of Data Collection — Preparation of Questionnaire or Interview Schedule — Measurement and Scaling Techniques — Nominal Data — Interval Data, Ordinal Data — Ratio Data — Reliability Analysis and its Need — Analysis of Data — Uni-variate Analysis — Bi-variate Analysis — Multi-variate Analysis — Techniques of Multi-variate Analysis (Theory only) — Cross Tabulation. (30 Hrs)
- MODULE-5:** Research Reporting — Relevance — Characteristics of a Good Research Reports — Plagiarism, Organisation of Research Report – Types, Structure and Components – Contents, Bibliography, Appendices, Style Manuals – APA Style, MLA Style, ASA Style, The Chicago Manual of Style etc. (10 Hrs)

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1. *Statistical Methods for Research, Prof. K. Kalyanaraman, Prentice-Hall Pvt. Ltd.*
2. *Business Research, Collis, Palgrave Macmillian.*
3. *Research Methods for Business: A Skill Building Approach, Sekaran.*
4. *Management Research Methods, Velde.*
5. *Business Research Methodology, Dwivedi.*
6. *Research Methodology, Ramamoorthi.*
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12. *Bajpai, S.R., Methods of Social Survey and Research, Kitab Ghar, Kanpur.*



CONTENTS

Preface

1. FOUNDATIONS OF RESEARCH	1 – 21
1.1 What is Research?	
1.2 Scientific Method	
1.3 Research and Theory	
1.4 Conceptual or Theoretical Models	
Suggested Readings	
Questions	
2. SOCIAL SCIENCE RESEARCH	22 – 30
2.1 Social Science Research	
2.2 Objectivity	
2.3 Limitations of Social Science Research	
2.4 Ethics in Social Science Research	
Suggested Readings	
Questions	
3. TYPES AND METHODS OF RESEARCH	31 – 62
3.1 Classification of Research	
3.2 Pure and Applied Research	
3.3 Exploratory or Formulative Research	
3.4 Descriptive Research	
3.5 Diagnostic Study	
3.6 Evaluation Studies	
3.7 Action Research	
3.8 Experimental Research	
3.9 Analytical Study or Statistical Method	
3.10 Historical Research	
3.11 Surveys	
3.12 Case Study	
3.13 Field Studies	
3.14 Steps in Research	
Suggested Readings	
Questions	

4. REVIEW OF LITERATURE	63 – 71
4.1 Need for Reviewing Literature	
4.2 What to Review and For What Purpose?	
4.3 Literature Search Procedure	
4.4 Sources of Literature	
4.5 Planning the Review Work	
4.6 Note Taking	
Suggested Readings	
Questions	
5. PLANNING OF RESEARCH	72 – 121
5.1 The Planning Process	
5.2 Selection of a Problem for Research	
5.3 Formulation of the Selected Problem	
5.4 Case Study	
5.5 Hypotheses	
5.6 Concepts	
5.7 Measurement	
5.8 Research Design or Plan	
Suggested Readings	
Questions	
6. SAMPLING	122 – 166
6.1 Introduction	
6.2 Sampling Techniques or Methods	
6.3 Sample Design and Choice of Sampling Techniques	
6.4 Sample Size	
6.5 Sampling and Non-sampling Errors	
Suggested Readings	
Questions	
7. METHODS OF DATA COLLECTION	167 – 220
7.1 Meaning and Importance of Data	
7.2 Sources of Data	
7.3 Use of Secondary Data	
7.4 Methods of Collecting Primary Data: General	
7.5 Observation	

7.6	Experimentation	
7.7	Simulation	
7.8	Interviewing	
7.9	Panel Method	
7.10	Mail Survey	
7.11	Projective Techniques	
7.12	Sociometry	
7.13	Content Analysis	
	Suggested Readings	
	Questions	
8.	TOOLS FOR DATA COLLECTION	221 – 266
8.1	Types of Tools	
8.2	Construction of Schedules and Questionnaires	
8.3	Measurement Scale and Indices	
8.4	Pilot Studies and Pre-tests	
	Suggested Readings	
	Questions	
9.	FIELD WORK	267 – 274
9.1	The Nature of Field Work	
9.2	Selection and Training of Investigators	
9.3	Sampling Frame and Sample Selection	
9.4	Field Operations	
9.5	Field Administration	
	Suggested Readings	
	Questions	
10.	PROCESSING OF DATA	275 – 298
10.1	Introduction	
10.2	Preparation for Analysis	
10.3	Editing	
10.4	Coding and Classification	
10.5	Transcriptions of Data	
10.6	Preliminaries for Computerized Data Processing	
10.7	Tabulation	
10.8	Construction of Frequency Table	

- 10.9 Graphs/Charts/Diagrams
- Suggested Readings
- Questions

11. STATISTICAL ANALYSIS OF DATA

299 – 397

- 11.1 Statistical Analysis
- 11.2 Measures of Central Tendency
- 11.3 Measures of Dispersion
- 11.4 Measures of Association/Relationship
- 11.5 Multivariate Analysis
- 11.6 Hypothesis Testing
- 11.7 Tests of Significance
- 11.8 Time Series Analysis
- Suggested Readings
- Questions

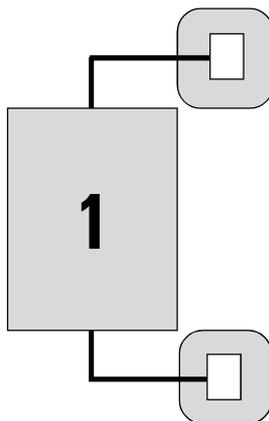
12. REPORT WRITING

398 – 448

- 12.1 Introduction
- 12.2 Types of Reports
- 12.3 Planning Report Writing
- 12.4 Research Report Format
- 12.5 Principles of Writing
- 12.6 APA Style of Using References
- 12.7 Documentation: Footnotes and Bibliography
- 12.8 Writing the Report
- 12.9 Typing the Report
- 12.10 Briefing
- 12.11 Evaluation of a Research Report
- Suggested Readings
- Questions

APPENDIX

449 – 460



FOUNDATIONS OF RESEARCH

1.1 WHAT IS RESEARCH?

Introduction

Curiosity or inquisitiveness is a distinctive feature of human beings. Curiosity to know about ourselves, our institutions, our environment, our planet, other planets, and the universe is inherent in us. Innumerable questions go on arising in our mind: What are the parameters of sound health of a person? How do problems of health arise? What are the remedies? What is the shape of the earth? How do solar and lunar eclipses arise? How is rain formed? Why are places like Ootacamund, Simla cooler than their nearby places? Is there any life in other planets? What are stars? Why day and night alternate? Why the mode of life and activities of human beings vary from place to place? Why there is no communal harmony in certain places? Why there is abject poverty in some countries like India and African countries? Why does the performance of similar organizations vary? What are the causes of various business problems like recession or industrial unrest? And so on. Whenever such questions arise we seek answers to them. Whenever we encounter problems, we try to find solutions to them. Seeking answers to questions and finding solutions to problems have been the basis of human progress. A systematic search for an answer to a question or a solution to a problem is called research.

Definition of Research

Research simply means a search for facts — answers to questions and solutions to problems. It is a purposive investigation. It is an “organized inquiry.”¹ It seeks to find explanations to unexplained phenomenon, to clarify the doubtful propositions and to correct the misconceived facts. How is this search made? What are possible methods or approaches?

1. Emory, C. William, *Business Research Methods*, Homewood, Illinois: Richard D. Irwin, 1976 p. 8.

The search for facts may be made through either (a) arbitrary (or unscientific) method or (b) scientific method.

Arbitrary method: Arbitrary method of seeking answers to questions is based on imagination, opinion, blind belief or impression. For example, it was believed that the shape of the earth was flat; a big snake swallows the sun or moon causing solar or lunar eclipse. Similarly, we form our own impressions about various phenomena and issues.

The arbitrary method suffers from serious weaknesses or drawbacks. It is subjective, the finding will vary from person to person depending on his impression or imagination. It is vague and inaccurate.

Scientific method: This is a systematic rational approach to seeking facts. It eliminated the drawbacks of the arbitrary method. It is objective, precise and arrives at conclusions on the basis of verifiable evidences. (For details, see topic 1.2 Scientific Method, below.)

Therefore, search for facts should be made by scientific method rather than by arbitrary method. Then only we may get verifiable and accurate facts. Hence *Research is a systematic and logical study of an issue or problem or phenomenon through scientific method.* An analysis of the definitions given by notable authorities may reveal the proper meaning and nature of the concept of research.

Kerlinger defines research as a “systematic, controlled, empirical and critical investigation of hypothetical propositions about the presumed relations among natural phenomena.”² The term “systematic, controlled, empirical and critical” describe the characteristics of scientific method. Whether research needs to be an “investigation of hypothetical propositions about presumed relations” is debatable. Research does not always call for a hypothesis. It may also be carried out for the formulation of hypotheses. It may also be designed to gather descriptive information on a phenomenon.

Emory defines research as “any organized inquiry designed and carried out to provide information for solving a problem.”³ This definition is an inclusive one. But it emphasizes the problem – solving purpose only. Research may also aim at finding answer to questions.

The Encyclopedia of Social Sciences⁴ defines research as “the manipulation of generalizing to extend, correct or verify knowledge...” This definition highlights the primary purpose of research, viz., arriving at generalization and the method of manipulation, which is an aspect of experimentation adopted for the purpose.

Best endorses the above purpose and method of research in his definition of research: “the systematic and objective analysis and recording of controlled observations that may lead to the development of generalizations, principles or theories, resulting in prediction and possibly ultimate control of events.”⁵

According to Black and Champion, “Scientific research consists of obtaining information through empirical observation that can be used for the systematic development of logically related propositions attempting to establish casual relations among variables.”⁶

2. Kerlinger, Fred W., *Foundations of Behavioural Research*, New York: Holt, Rinehart and Winston, 1973, p. 11.

3. Emory, C. William, *op. cit.*, p. 8.

4. *The Encyclopedia of Social Science*, Vol. IX, The Macmillan Company, 1930.

5. Best, John W., *Research in Education*, New Delhi: Prentice-Hall of India (P) Ltd., 1982, p. 18.

6. Black, James A., and Dean J. Champion, *Methods and Issues in Social Research*, New York: John Wiley & Sons, 1976, p. 6.

Clover and Balsley define research as “the process of systematically obtaining accurate answers to significant and pertinent questions by the use of the scientific method of gathering and interpreting information.”⁷ This simple definition refers to the systematic approach and scientific method to be adopted for finding answers to pertinent questions.

Young defines Research as “a scientific undertaking which, by means of logical and systematic techniques, aims to: (1) discover new facts or verify and test old facts, (2) analyse their sequences, interrelationships and causal explanations, (3) develop new scientific tools, concepts and theories which would facilitate reliable and valid study of human behaviour.”⁸ This exhaustive all-inclusive definition specifies all the major aims of research, viz., discovery of new facts, verification and testing of old facts, analysis of interrelationships and causal explanations and development of new tools, concepts and theories.

Characteristics of Research

The above definitions reveal the various characteristics of research:

1. Research is a *systematic and critical investigation* into a phenomenon.
2. It is not a mere compilation, but a purposive investigation; it aims at describing, interpreting and explaining a phenomenon.
3. It adopts *scientific* method
4. It is *objective* and *logical*, applying possible *tests* to validate the measuring tools and the conclusions reached.
5. It is based upon *observable experience or empirical evidence*.
6. Research is directed towards finding answers to pertinent *questions* and solutions to *problems*.
7. It emphasizes the development of *generalization, principles or theories*.
8. The purpose of research is not to arrive at an answer, which is personally pleasing to the researcher, but rather one, which will stand up the *test of criticism*.⁹

Objectives or Purposes of Research

The objectives or purposes of research are varied. They are:

1. Research *extends knowledge* of human beings, social life and environment. Scientists and researchers build up the wealth of knowledge through their research findings. They search answers for various types of questions: What, Where, When, How and Why of various phenomena, and enlighten us. The bodies of knowledge have been developed by research in general and pure or fundamental research in particular.
2. Research unravels the mysteries of nature; brings to light hidden information that might never be discovered fully during the ordinary course of life.
3. Research *establishes generalizations and general laws* and contributes to theory building in various fields of knowledge. Our knowledge of isolated events is connected together to draw

7. Clover, Vernon T., and Howard L. Balsley, *Business Research Methods*, Columbus, Ohio: Grid Publishing, 1979. p. 1.

8. Young, Pauline V., *Scientific Social Surveys and Research*, New Delhi: Prentice Hall of India, 1977, p. 30.

9. Good, V. Carter, *Introduction to Educational Research*, New York: Appleton-Century Crofts, 1959, p. 3.

generalizations and general laws. Law of gravitation, Law of demand, and principles of organization such as unity of command and scalar principle, the theory of consumer behaviour and motivation theories are some examples for such generalizations, laws and theories.

4. Research *verifies and tests* existing facts and theory and these help improving our knowledge and ability to handle situations and events. Merton argues: “Empirical research goes far beyond the passive role of verifying and testing theory...Research plays an active role, it performs at least four major functions.... It initiates, it formulates, it deflects, and it clarifies theory.”¹⁰
5. General laws developed through research may enable us to make reliable predictions of events yet to happen.
6. Research aims to *analyse inter-relationships* between variables and to derive *causal explanations*; and thus enables us to have a better understanding of the world in which we live.
7. Applied research aims at *finding solutions* to problems.... socio-economic problems (*e.g.*, social unrest, unemployment, poverty) health problems, human relations problems in organizations and so on. Thanks to the fruits of research, we have better quality of life, longer life span and better control over events.
8. Research also aims at *developing new tools, concepts, and theories* for a better study of unknown phenomena.
9. Research aids planning and thus contributes to *national development*. Research — social science research in particular — aids planning in the following ways:

Research brings out factual data on prevailing situations and problems for drawing up plans and schemes on a realistic basis. Research uncovers needed facts on which sound decisions can be made before committing resources. Studies open up the possibility of testing the validity of planning assumptions or premises. For example, in the first four Five Year Plans of India it was assumed that a fast rate of the general economic growth will by itself create fuller employment and produce higher living standards for the poor through the ‘trickle down’ effect of such growth. Evaluation studies have shown that this assumption was not correct and the strategy of development in the Fifth and subsequent Five Year Plans was modified, providing for special and deliberate programmes for eradication of poverty in rural areas.

Research studies enable the planners to evaluate alternative strategies and choose the most appropriate strategies for development of the various sectors like agriculture, industry, education, health, social welfare etc.

The benefit-cost evaluation studies of projects like irrigation projects throw out valuable lessons for improving the formulation of similar projects subsequently.

Evaluation studies of on-going programmes like family planning schemes, lead bank schemes, Integrated Rural Development Programme etc., point out their shortcomings and implementation problems and enable the planners to revise the schemes and implementation strategies appropriately.

10. Merton, Robert K., *Social Theory and Social Structure*, New York: Free Press, 1957, p. 103.

The dissemination of research finding creates a general awareness of the country's current situations and problems among the public, which inspire them to participate in formulation and implementation of development schemes.

The above possibilities can be realized provided social science research is geared to planning needs and the planners are responsive and sensitive to the research findings.¹¹

10. Analytical studies of internal and external environment of business and non-business organizations provide factual *data* for *rational decision making* – formulation of strategies and policies. Studies of their operational problems contribute to an improvement in their performance.

1.2 SCIENTIFIC METHOD

Meaning

Research is a scientific endeavour. It involves scientific method. “The scientific method is a systematic step-by-step procedure following the logical processes of reasoning.”¹² Scientific method is a means for gaining knowledge of the universe. As Karl Pearson emphasizes “the scientific method is one and same in all branches and that method of all logically trained minds ... the unity of all sciences consists alone in their method not in their materials; the man who classifies facts of any kind whatever, who sees their mutual relation describes their sequence is a man of science.”¹³ The facts may be related to any field. “It is not the facts themselves which make science”¹⁴ but the method by which they are dealt with. “Science is not wrapped up with any particular body of facts.”¹⁵ Science is independent of any particular subject matter. “It deals with knowable universe for its subject. It deals with physical as well as psychological processes, with man as much as with nature. It has to do with everything to which its method can be applied. What makes a science is not, of course, the nature of things with which it is concerned, but the method by which it deals with these things.”¹⁶ Thus, the scientific method does not refer to a field of specific subject of matter, but rather to a procedure or mode of investigation. It is “an objective, logical and systematic method of analysis of phenomena, devised to permit the accumulation of reliable knowledge. It is a systematized form of analysis¹⁷ ... It is characterized by an intellectual attitude. (See “Scientific attitude”, last part of this section, below).

Basis of Scientific Method

The scientific method is based on certain “articles of faith” these are:

- reliance on empirical evidence
- use of relevant concepts
- commitment to objectivity
- ethical neutrality

11. Dube, S.C., “Role and Function of Social Science”, in B.A.V. Sharma and others, *Research Methods in Social Sciences*, New Delhi: Sterling Publishers, 1984, p. 5.

12. Clover, Vernon T., and Howard L. Balsley, *Business Research Methods*, *op. cit.*, p. 13.

13. Karl Pearson, *The Grammar of Science*, Part I, London: A and C Black; 1911, pp. 10-12.

14. *Ibid.*

15. Thomson, J. Arthur, *Introduction to Science*, Oxford University Press (reprinted in India), p. 58.

16. *Ibid*, p. 25.

17. Lastrucci, *Scientific Approach*, Cambridge, 1967, p. 6.

- generalization
- verifiability
- logical reasoning process

Reliance on evidence: Truth is established on the basis of evidence. Conclusion is admitted, only when it is based on evidence. Scientific method involves a systematic process. The answer to a question is not decided by intuition or imagination. Relevant data are collected through observation or experimentation. The validity and the reliability¹⁸ of data are checked carefully and the data are analysed thoroughly, using appropriate methods of analysis. Conclusion is reached on the basis of the result of analysis.

Use of concepts: We experience a vast number of facts through our senses. Facts are things, which actually exist. In order to deal with them, we use concepts with specific meanings. *Concepts*¹⁹ are logical constructs or abstractions created from sense impressions, percepts and experiences. They are symbols representing the meaning that we hold. We use them in our thinking and communication. Otherwise clarity and correct understanding cannot be achieved.

Commitment to objectivity: Objectivity is the hallmark of the scientific method. It means forming a judgement upon facts unbiased by personal impressions. According to Green “Objectivity is the willingness and ability to examine evidence dispassionately.” The conclusion should not vary from person to person. It should be the same for all persons. A person of science must “above all things...strive at self-elimination in his judgement and provide an argument which is as true for each individual mind as his own.”²⁰

Ethical neutrality: Science does not pass normative judgement on facts. It does not say that they are good or bad. As Schroedniger says, “science never imposes anything, science states. Science aims at nothing but making true and adequate statements about its objects.”²¹

Generalization: Scientists are not concerned with isolated events, but with the commonality of a series of event. They aim at discovering “under the surface layer of diversity the thread of uniformity. Around a discovered uniformity a logical class and its observed pattern, a descriptive generalization is formulated.²² In formulating a generalization, we should avoid the danger of committing the *particularistic fallacy*,²³ which arises through an inclination to generalize on insufficient or incomplete and unrelated data. This can be avoided by the accumulation of a large body of data and by the employment of comparisons and control groups.

Verifiability: The conclusions arrived at by a scientist should be verifiable. He must make known to others how he arrived at his conclusions. He should thus expose his own methods and conclusions to critical scrutiny. When others test his conclusion under the same conditions, then it is accepted as correct. Such verification through replication may either confirm established conclusions or modify them or even invalidate them. For example, originally an atom was considered to be

18. See topic, 5.6 *Measurement*, below.

19. See Section 5.5 of chapter 5, below.

20. Karl Pearson, *op. cit.*, p. 6.

21. Schroedniger, *Mind and Matter*, Cambridge, 1958, p. 37.

22. Greenwood, Ernest, “Social Science and Social Work: A Theory of their interrelationships”, *The Social Service Review* XXIX, 1955, p. 20.

23. Thomas, W.I., *Source Book for Social Origins*, Chicago: University of Chicago press, 1909, pp. 22-26.

indivisible, but subsequent researches have proved that it is divisible and thus provided the basis for developing atomic energy.

Logical reasoning process: The scientific method involves the logical process of reasoning. This reasoning process is used for drawing inference from the finding of a study or for arriving at conclusion. For example, in a survey of the expenditure pattern on basic necessities forms a very high proportion of the total expenditure, it is concluded that lower the household income, the higher is the proportion spent on basic necessities. The logical reasoning process consists of induction and deduction.

Induction

Meaning: Induction is one of the methods of logical reasoning process. The inductive method consists of studying several individual cases and drawing a generalization. Therefore, induction involves two processes – observation and generalization. Conclusions from induction are tentative inferences and they are subject to further confirmation based on more evidence.

When followed: This method is followed when new facts are studied, new truths are uncovered and new generalizations are formulated from a research project. For example, in a farm management study it is proposed to test the hypothesis: “The application of recommended dosage of chemical fertilizers results in an increase in the yield per hectare.” A sample of experimental farms and control farms is selected in an area. In the experimental farms, chemical fertilizer is applied and in controlled farms it is not applied, but other conditions — quality of seeds, irrigation, cultural practice, etc., are the same. After the harvest the average yield per hectare is computed for experimental and control groups and the hypothesis is tested. The inductive method of reasoning is used in the analysis.

Essential conditions: Four conditions²⁴ are essential to satisfactory induction. They are:

1. **Observation must be correctly performed and recorded, data collected should be accurate.** Mistakes in conducting experiments or interviews and faulty recordings of the information can vitiate the value of any conclusions reached.
2. **Observations must cover representative cases drawn from a specific universe.** For instance, in a survey of job-satisfaction of bank executives the universe from which a sample has to be drawn should be defined exactly, say officers of public sector banks in a specific geographical area and all cadres of officers should be included in the sample and an appropriate sampling method like stratified random sampling has to be adopted.
3. **Observations must cover an adequate number of cases.** The size of the sample must be large enough to make it representative and to get reliable result. (See chapter 6, section-4).
4. **Conclusion must be confined to inferences drawn from the findings.** Conclusions reached after an analysis of data collected on a given study must be confined to the inferences drawn from the findings only. They should not be generalized to apply to types of cases not covered in the sample.

Types of induction: Theodorson and Theodorson²⁵ have identified two basic types of induction, viz., *enumerative* and *analytic*.

24. Clover, Vernon T., and Howard L., Balsley, *op.cit.*, pp. 14-15.

25. Theodorson, T., and A Theodorson, eds., *A Modern Dictionary of Sociology*, New York: T.Y. Corwell, 1969, pp. 199-200.

Enumerative induction is the most common form of induction used in social science research. In general, this type of induction involves generalization from samples and the generalizations are usually derived through the analysis of data.

Analytic induction involves case-by-case analysis of specific features. Cressy²⁶ outlined the step-by-step procedure of analytic induction:

1. Define the phenomenon to be explained.
2. Formulate hypothesis to explain the phenomenon.
3. Study a case to determine whether hypothesis fits in the case.
4. If the hypothesis does not fit the facts, either reformulate the hypothesis or redefine the phenomenon so that the case is excluded. (This definition must be more precise than the first one).
5. Examine a small number of cases to attain practical certainty; but whenever a negative case disproving the explanation is discovered, reformulate the hypothesis.
6. Continue this procedure of examining cases, redefining the phenomenon and reformulating the hypothesis, until a universal relationship is established.
7. For purposes of proof, examine cases outside the area circumscribed by the definition to determine whether or not the final hypothesis applies to them.

Deduction

Meaning: Deduction is reasoning process of applying a general accepted principle to a specific individual case falling under the general principle. It is regarded “as reasoning from the general to the particular.”²⁷ This reasoning establishes a “logical relationship between a major premise, a minor premise and a conclusion.”²⁸ A major premise is a previously established generalization or assumption; a minor premise is a particular case related to the major premise. The logical relationship of these premises lead to conclusion, *e.g.*,

Major premise	All men are mortal.
Minor premise	A is a man.
Conclusion	A is mortal.

Use: This deductive method of moving from the general assumption to the specific application is useful for solving problems. But it is not useful in arriving at new truths. The inductive process overcomes this limitation of deductive process.

Essential conditions: The conditions necessary for valid deduction are:

1. The general rule or assumption must be correct.
2. The general rule must be applied only to the cases, which properly fall under it.

The general rule or the major premise must be correct. If it is not correct, then the conclusion cannot be correct. For example, consider the following deduction:

26. Cressy, R. Donald, *Other Peoples Money*, New York: Free Press, 1953.

27. Clover, Vernon T., and Howard L. Balsley, *op. cit.*, p. 15.

28. Best, John W., *Research in Education*, New Delhi: Prentice Hall of India (P) Ltd., 1982, p. 4.

Major premise: All regular employees are insincere

Minor premise: Mohan is a regular employee

Conclusion: Mohan is insincere.

The conclusion is justified only if both the premises are acceptable as true. Since the major premise is not true, the conclusion is therefore defective, even if Mohan turns out to be insincere.

Relevance of Induction and Deduction: The logical processes of both induction and deduction are useful in research studies. Both are “inseparable parts of a system of reasoning. In other words, distinct processes of inductive and deductive reasoning do not exist.”²⁹ Both processes are often used simultaneously. There is a sequencing of induction-deduction processes, which is described by John Dewey as the “*double movement* of reflective thought.”³⁰ When a puzzling condition occurs, one seeks inductively to explain by a hypothesis. In turn, the hypothesis is used in the deduction of further facts, which can confirm or deny the truth of the hypothesis. For example, the chief executive of an enterprise observes that profits are lower than expected (fact). He asks, “What is the cause?” His tentative conclusion (hypothesis₁) is “lower profits are due to fall in sales.” He examines the sales records and finds that the actual sales volume is lower than the budgeted figure (fact). This fact confirms his hypothesis. Now he may raise a second question, “Why is sales volume low?” Recalling that there had been some problem of competition, he infers (hypothesis₂) “Competition accounts for a fall in sales.” He will analyse the market reports received from regional offices and verify the truth of this hypothesis. This process of fact/question/hypothesis/deducted fact/ confirmation/question, and so on may be continued till the final explanation is arrived at.

Requisites of a Good Scientific Method

The essentials³¹ of a good scientific method as summed up by the Advisory Committee on Economic and Social Research of the Council of Social Science Research are:

1. Careful logical analysis of the problem, separating its elements and whenever possible, formulating hypothesis;
2. Unequivocal definition of terms and concepts and statistical units and measures, so that others will understand exactly and be able to repeat the analysis and test the generalizations;
3. Collection of data pertinent to the problem under study;
4. Classification of data;
5. Expression of variables in quantitative terms whenever possible;
6. Rigorous and exacting experimental or statistical procedure in summarizing the data and in isolating the attributes or variables and measuring their relationship and inter-effects;
7. Sound logical reasoning as to the testing of hypothesis and drawing generalizations;
8. Statement in unassailable terms of the exact conclusion arrived at from the findings;
9. Specific and clear statement of generalizations to facilitate checking and testing by others;

29. Young, Pauline V., *op. cit.*, p. 111.

30. Dewey, John, *How We Think*, Boston: D.G. Heath & Co., 1910. p. 79.

31. Sharma, B.A.V., and others, *Research Methods in Social Sciences*, New Delhi: Sterling Publishers (P) Ltd., 1981, p. 54.

10. Complete elimination of personal equation; and
11. Complete and careful reporting of the research process, definitions and the methods of analysis so that others can check the analysis or test the generalizations with new sets of data.

The Components of Scientific Approach

The scientific approach has two components: the procedural and the personal.

Procedural component: The procedure of scientific method involves the following major steps:

1. Define the problem.
2. Establish hypothesis as to causes/explanations/solutions of the problem.
3. Collect the data.
4. Analyse the data to test the hypothesis and draw inferences.

The researcher must have a thorough knowledge of the subject matter of the problem so as to formulate a conceptual model for its study. He must operationalise the concepts to determine the data requirements. He must select appropriate methods for collection of data and use relevant statistical techniques and tests for testing hypothesis. All these steps³² require creative imagination, extraordinary care and patience.

The researcher's personal qualities: The researcher's qualities and attitudes are more important than the procedural steps. The researcher needs, as rightly emphasized by Eigelberner, "the scientific imagination to construct hypothesis, the resourcefulness, manipulative skill and persistence to carry through the experiment, the perspective which distinguishes the essential from the non-essential, and the reasoning which coordinated individual facts into a principle."³³ He must possess integrity, honesty, sincerity, poise and perseverance. He must also possess "the spirit of independence and the spirit of originality."³⁴

In short, a true scientist must possess "the devotion of a mother, the poise of a judge, the objectivity of a philosopher, the courage of a soldier, the perseverance and patience of a beaver, the fervor of a patriot and the vision of a prophet."³⁵

Scientific attitude: Above all, the scientific method calls for scientific attitude. The scientific attitude is based on a complexity of elements, viz.,

- ❖ Consistent thinking;
- ❖ Objective, dispassionate and unbiased devotion to collection and treatment of facts;
- ❖ Overcoming personal preconceptions and value judgments, because they not only have a distorting effect on the data but are also highly insidious;
- ❖ Avoiding, personal and vested interests-the scientist does not tailor his views to fit preconceived notions or preferences of men in power;

32. For a detailed discussion, see respective chapter, below.

33. Eigelberner, *Investigation of Business Problems*, p. 44, quoted by M.H. Gopal, *An Introduction to Research Procedures in Social Sciences*, Bombay: Asia Publishing House, 1964, p. 68.

34. Maurice Arthus, *Philosophy of Scientific Investigation*, Baltimore: John Hopkins University Press, 1943, p. 25.

35. Gopal, M. H., *op. cit.*, p. 73.

- ❖ Avoiding wishful thinking;
- ❖ Stubborn determination to analyse one's own system of thinking and taking nothing for granted without evidence, tests and proofs;
- ❖ "Faith in the universality of cause and effect."³⁶ Without this faith, a pursuit of scientific knowledge may be flouted whenever it interferes with special interest or prejudices;
- ❖ Ardent curiosity, fertile imagination and love of experimental inquiry;³⁷
- ❖ "Compassion and understanding"³⁸ — without these knowledge could be dangerous;
- ❖ Patience and self-control and ability to overcome wishful thinking; and
- ❖ Keeping an open mind.

All these elements are components of the scientific attitude. "These elements tend to correct not only factual error, but also mental, emotional and volitional frailties of a research worker."³⁹

1.3 RESEARCH AND THEORY

Research is closely related to theory. Theory provides a conceptual model for research. Research, in turn contributes to theory. What is theory? What are its uses to research? What does research do for theory? These questions are discussed in this section.

Meaning of Theory

In the popular usage, theory is perceived as speculative or unsubstantiated or unrealistic or ivory-tower ideas. This is a wrong notion. A theory in science is not the result of mere speculation. It is the gradual outgrowth of constructive study of the accumulated sorted facts.

Theory is more properly defined as "a set of systematically interrelated concepts, definitions, and propositions that are advanced to explain and predict phenomena (facts)."⁴⁰ Jack Gibbs defines theory as "a set of logically interrelated statements in the form of empirical assertions about properties of infinite classes of events or things."⁴¹ A theory may not only explain or predict phenomena, but also specify causal relationships among variables. In the latter sense, a theory may be defined as "a set of systematically related propositions specifying causal relationships among variables."⁴²

Strictly defined, a theory, as used in science, is a coherent "set of hypotheses", says R.B. Braithwaite, "which form a deductive system that is, which is arranged in such a way that from some of the hypotheses as premises all the other hypotheses follow."⁴³ Arnold Rose's view is similar to the above statement. He defines theory as "an integrated body of definitions, assumptions and general propositions covering a given subject matter from which a comprehensive and consistent set of specific and testable (principles) can be deduced logically."⁴⁴

36. Wolfe, A.B., *Conservation Radicalism and Scientific Attitude*, New York: The Macmillan Company, 1923, p. 203.

37. Dewey, John, *How We Think*, *op. cit.*, p. iii.

38. Bacon, Sir Francis, *The Advancement of Learning*, Oxford University Press, London: 1986, p. 100.

39. Young, Pauline V., *op. cit.*, p. 129.

40. Kerlinger, Fred N., *Foundations of Behavioural Research*, New York: Holt, Rinehart and Winston, 1965, p. 11.

41. Gibbs, Jack, *Sociological Theory Construction*, Hindsdale, III, Dryden Press, 1972, p. 5.

42. Black; James A., and Champion, Dean, J., *Methods and Issues in Social Research*, New York: John Wiley & Sons, 1976, p. 56.

43. Quoted in Pauline V. Young, *op. cit.*, p. 113.

44. Rose, Arnold, "Generalizations in the Social Sciences", *American Journal of Sociology*, July 1953, p. 52.

A few examples may clarify the meaning of theory.

- ❖ A frustrated person, who is unable or afraid to express his aggression directly toward the perceived source of his frustration, may divert his aggression into another channel.

This theory explains why a frustrated manager takes it out on a subordinate instead of his boss.

- ❖ The standard of living of a family is the function of its income, size and life style.

This theory provides a basis for studying consumer behaviour and formulating appropriate marketing strategies.

Criteria of Theory

Theories start out as ideas. It is the extent to which ideas conform to basic demands of proposition formulation that determines whether or not they will assume the stature of theory. The criteria to be met by the set of ideas are:

1. They must be logically consistent. There must be no internal contradictions.
2. They must be interrelated.
3. The statements must be exhaustive as to cover the full range of variations concerning the nature of the phenomena in question.
4. The propositions should be mutually exclusive.
5. They must be capable of being tested through research.

The set of ideas in social sciences generally fail to meet the above basic demands of theories. They are broadly grouped into general configurations referred to as “*frames of reference*,” “*perspectives*” or “*approaches*.”

Components of Theoretical Ideas

The major components of theoretical ideas in social science include:

1. **Assumptions and ideas:** They consist of untestable premises about the nature of selected aspects of social life.
2. **Frames of reference:** They identify the major dimensions of social life that will be subjected to empirical scrutiny.
3. **Concepts** are abstractions; e.g., group, motivations, democracy.
4. **Variables** are relational units of analysis that can assume designated sets of values, e.g., age, educational level, and income.
5. **Propositions** are statements between or among variables.
6. **Theory:** The end-product of the above components is a theory.

Theory vs. Fact

Theory and facts are interrelated. While a fact is an “empirically verifiable observation,”⁴⁵ a theory specifies the relationships between facts or order them in a meaningful way. Facts gathered at random like counting the grains of sand in sand pile, counting the number of vehicles plying on a

45. Good William J., and Paul K. Hatt, *Methods in Social Research*, New York: McGraw Hill Book Co., 1952, p. 8.

road, etc., cannot produce a body of knowledge. Only when related facts are gathered and studied, the development of science can take place.

Theory indicates the kinds of data to be gathered; it offers a conceptual scheme for systematizing a phenomenon; it summarizes facts into empirical generalizations; and it predicts facts.

Facts, in turn, help to initiate theories, they lead to the reformulation of an existing theory, they cause the rejection of theories, which do not conform, to facts; and they clarify and modify theories.⁴⁶

Theory and Fact belong to two different worlds — conceptual and empirical worlds respectively. Can there be a bridge between the two? The researchers use some techniques to bridge the gulf between theory and fact. One of them is conceptualization. Theory uses concepts for explaining a phenomenon. When new facts invalidate a theory; new concepts are developed to reformulate the theory. For example, when inflation cannot be explained in terms of the concept of demand-pull inflation, another concept of cost-push inflation is used for the purpose.

Another technique used for bridging theory and fact is the process of *classification or typology*. Classification is an attempt to impose some sort of order on an amorphous mass of facts. It is an attempt to trace interrelationships through the process of grouping. Scientists in various disciplines have made effective use of classification as a tool of analysis.

Adam Smith, a classical economist, for example, classified society into different kinds of producers, in his *Wealth of nations*, to show that exchange is beneficial to everybody. Karl Marx classified the society into ‘haves’ and ‘have nots’ and showed that exchange benefits only the former. Colin Clarke classified the economy into the primary, secondary and tertiary sectors in his study of the empirical laws of economic growth. (Conditions of Economic Progress, London, Macmillan, 1951).

Theory vs. Hypothesis

A hypothesis⁴⁷ is formulated before empirical evidences or facts are gathered. It deals with a narrow range of ideas. It is a preliminary assumption adopted for the explanation of phenomenon. A theory, on the other hand, is a generalization arrived at after verification and it deals with a broader range of facts. It is one of the sources of hypotheses.

The assembled facts are transformed by a researcher into constructs. The constructs are then assembled into a provisional hypothesis. When it is tested and verified and found to be true, it is designated as a scientific theory. When the theory is tested and accepted by scientists as correct under the same conditions, it is regarded as a law.

Role of Theory in Research

Theory serves research in many useful ways.

1. **Delimitation of Study:** Theory narrows the range of facts to be studied. It helps to select a few relevant aspects of a phenomenon. Any phenomenon may be studied from different angles. A co-operative society, for example, can be studied as an economic enterprise, or as a social organisation or as an instrument for the promotion of the welfare of weaker sections, or as a democratic institution or a member-unit of a federal structure. Each science/discipline deals with a specific aspect of a phenomenon. Only then can the work of a

46. For a detailed discussion of the rules of theory and fact, see *Ibid.*, pp. 9-16.

47. For a detailed discussion, See, Section 5.4 in Chapter 5.

discipline be reduced to manageability. Thus theory relating to a discipline delimits/ narrows the range of things, which come within its purview.

2. **Conceptual model:** Theory provides a conceptual framework for a study. Every science/ discipline is an organized body of facts — a structure of interrelated concepts with precise definitions. A researcher selects *a priori* a few facts from the theory and develops conceptual structure of their interrelationships — conceptual schemata — for the proper formulation of the selected problem.
3. **Summarization:** Another function of theory is to summarize concisely what is already known about the object of study. Theorizing integrates the major empirical generalizations of an era. From time to time in any science there will be changes in the structure of relationships between propositions. In each era, scientists move from older systems of theory towards a more acceptable new system. For example, in the discipline of management, by stressing social needs, the human relations movement improved on the classical approach, which treated productivity as a mere engineering problem.

It is through systems of propositions that many of our common statements must be interpreted. Facts are seen as parts of a framework rather than as isolated observations. Take a few examples: “the whole is greater than the sum of its parts”; “The management is culture-found”; “Indian society is caste-ridden and hierarchical.” These statements are apparently simple ones; but if we study them in depth we may find that behind each of them is a complex series of observations, a set of assumptions and a systems of propositions. “These are an implicit or explicit fact chain or theory which gives such ‘simple’ statements their full meaning.”⁴⁸

4. **Uniformity:** Theory states a general uniformity beyond the immediate observations. A person sitting under a mango tree may observe ripe mangoes falling on the ground. But beyond this observation, there is the general law of gravitation.
5. **Prediction:** Theoretical generalizations can be used to predict further facts. The most obvious is the extrapolation from the known to the unknown. For example, we may observe that in a modern civilized community there is a low birth rate. From this, we may predict that if modern way of life is introduced into a traditional rural or tribal community, its birth rate would decline.
6. **Gaps in knowledge:** Theory also points to areas, which have not been explored. If a theory states that professionalisation of management contributes to enterprises success, we can see where further facts might be sought. What are the variables of professional management? How can we explain the success of family-managed undertakings? Such gaps in knowledge are brought to light through the questions arising out of theory.

Contribution of Research to Theory

Since the relationship between theory and research is interactional, Research in turn, contributes to development of theory.

1. Research initiates theory: The findings of research may lead to the formulation of theories. Scientific experiments have led to the development of various theories in physics, chemistry etc.

48. Goode, William J., Hatt, Paul K., *Methods in Social Research, op.cit.*, p. 11.

similarly research in social sciences have contributed to the development of several theories, e.g., organizational theories, Herzberg Theory of Motivation.

In the course of conducting a research, the researcher may accidentally stumble upon unanticipated, anomalous and striking fact, which may lead to new theories. Some examples of such accidental findings are: the penicillium fungus inhibits bacterial growth; a pendulum of given length, in free motion, will swing back and forth in equal time.

2. Research tests an existing theory: One major function of empirical research is to test hypotheses deduced from existing theories. If a hypothesis is not confirmed by research, the theory from which the hypothesis is deduced, is re-examined and tested.

3. Reformulation of an existing theory: When a theory does not fit into new findings of research, it is rejected and reformulated to encompass the new findings.

For example, Elton Mayo's experiments in Hawthorne plant of Western Electric from 1927 to 1932 have led to the replacement of the old theory — 'A person is motivated by personal economic needs, to a new theory — 'A person is motivated by social needs, wanting rewarding on-the-job relationships, and more responsive to work group pressures.'

4. Research refocuses theory: Empirical research may give a new focus to the existing theory. When we find that the ineffectiveness of co-operative democracy in India cannot be understood in terms of political administration but rather in terms of socio-economic and cultural dimensions, we explore these latter dimensions by further study. It gives a new focus to the theory of co-operative democracy.⁴⁹

5. Research clarifies theory: Concepts are drawn from theory. But research cannot proceed on the basis of their theoretical meanings. For research purposes the concepts have to be operationalised, i.e., defined specially with concrete empirical indicators. For example, such concepts as 'intelligence', 'morale', 'democratic participation', 'operational efficiency', 'small farmer' have been clarified by researchers by constructing indices or scales for their measurement. Such clarifications and redefinitions lead to the discovery of new hypotheses. Then we have to sharpen our theories to test those hypotheses.

In short, theory and research may be separate distinct operating, but they are inseparable complementary components of scientific endeavour. To quote Blumer Herbert, "theory exercises compelling influence on research setting problems, staking out objects and leading enquiry into asserted relations. In turn, findings of fact test theories and in suggesting new problems invite the formulation of new proposals. Theory, inquiry and empirical fact are interwoven in a texture of operation with theory guiding inquiry, inquiry seeking and isolating facts and facts affecting theory. The fruitfulness of their interplay is the means by which an empirical science develops."⁵⁰

Use of Theory in Research

Theory may enter into a research study in different ways by:

- suggesting a problem for study,
- giving a hypothesis to be tested,
- providing a conceptual model for delimiting the scope of the study,

49. See Krishnaswami O.R., *Co-operative Democracy in Action*, Bombay: Somaiya Publications, 1976.

50. Herbert, Blumer, "What is Wrong with Social Theory", *American Sociological Review*, (xix), 4.

- ❑ helping selection of variables or identification of classes of data to be collected,
- ❑ making research findings intelligible.

One may also use the research findings to formulate new theoretical propositions or testing an existing theory. Thus, there is no fixed way of bringing theory into research process.

However, there are some general principles⁵¹ regarding the use of theory in research. There are:

1. A knowledge of the existing theory in one's area of research is essential for conducting research. One should become familiar with relevant theory without, of course, becoming lost in it.
2. Concepts are the crucial components of theory and so their clear definitions and operationalisations are essential to the designing of the study.
3. One should view theory as hypothetical proposition and not as conclusive fact. In this way one will be more alert to observations, which challenge the theory and thus be better prepared to revise it so as to fit the empirical observations.
4. One should pay close attention to all odd and puzzling unexpected observations as they are a source for new theoretical approaches.

To sum up, a researcher should use theory to plan and direct his lines of study, but use empirical observations to test and refine his theoretical propositions.

1.4 CONCEPTUAL OR THEORETICAL MODELS

Introduction

The body of knowledge relating to any subject is vast. When one reviews it for the study of a selected problem, one may get lost in it, unless one knows what is relevant and what is not relevant. How can this be determined? To aid in this difficult process, a conceptual model is developed, "Model building is a universal method of scientific research, in the same way that quantifying knowledge is a self-evident aim of research."⁵²

Definition of Model

Conceptual or theoretical model is a simplified *systematic conceptual structure of interrelated elements in some schematic form*⁵³ such as narrative statement or mathematical equation. It describes relationships between and among concepts and variables.

A model possesses five different characteristics: namely, level of analysis, boundaries, specificity, construct relationship statement, and assumptions.

Process of Model Building

The process of model building involves several steps, viz.,

1. identify the phenomenon to be represented by a model;
2. determine the nature and purpose of analysis for which the model is constructed;

51. Statement prepared by Herbert Blumer for *Scientific Social Surveys and Research* by Pauline V. Young, *op. cit.*, pp. 118-119.

52. Myrdal, Gunnar M., *The Challenge of World Poverty*, Harmondsworth: Penguin Books Ltd., 1970, p. 40.

53. Black, James A., and Dean, J. Champion, *Methods and Issues in Social Research*, New York: John Wiley & Sons, 1976, p. 68.

3. gain a thorough understanding of the phenomenon through observation or survey of available literature relating to it;
4. conceptualize its meaning and nature;
5. identify the important variables and attributes;
6. examine the nature of inter-relationships among them;
7. formulate the structure of the inter-relationships; and
8. present the structure in the form of a precise statement or mathematical equation, defining the concepts, stating the assumptions and using the rules of logic.

Thus, model building calls for high levels of logical skill and mathematical competence.

Conditions

A model must *satisfy* certain *conditions*.

First, a model should be (a) *explicit* in terms of construct definition and critical relationship among them, (b) *clear* about the operationalization of each construct and (c) *empirically* testable.⁵⁴

Second, there must be *one-to-one correspondence between the elements of the phenomenon* under study and the *elements of the model* representing it.

Third, the model must *preserve the important relationships* noticed in the phenomenon.

Fourth, the *causative factors* in the model must be well defined, for example, can we be able to explain inflation as resulting from an increase in the quantity of money without causal connection? The Keynesian theory gave the causal connection between inflation and investment and thus provided a rational base for explaining inflation.

Lastly, the model must *satisfy the principle of internal consistency*. One cannot assume that production equipment undergoes technical progress and still remains the same as was done in the neo-classical analysis of growth.

Typology of Models

Models may be broadly classified into (a) *abstract* models and (b) *real* models.

Abstract models represent high-level abstraction for making a simplified conceptual framework. They are divorced from application to real problems. *Real models*, on the other hand, represent a blueprint of real problems and are applicable to given situations.

The real models may be classified into (a) *Heuristic model* and (b) *Extensor model*. The former makes an exploratory suggestion and the latter extends it into detailed form nearer to reality, amplifying it.

Models, which depict the causal relationships between the variables, may be described as causal models.

Choice of Models

There are some principles or guidelines governing the selection of models relevant to the problems under study.

54. Argyris C., and D.A. Schon, *Theory in Practice*, San Francisco: Jossey-Bass, 1974.

The first principle is to choose initially a simple model, *i.e.*, Heuristic one in order to explore the area of analysis under simplified assumptions. The socio-economic situations are extremely complex in the real world. Therefore, it is desirable to select a few important variables and make simplified assumptions and then build up the model, covering those important variables only, because the analysis is likely to be complicated even with a few variables.

The second principle is to have an in built procedure for enhancing the scope so as to take it and enlarging the model for coming closer to the reality. Then the model becomes Extensory one, as it extends the scope of the initial model. If the simplified assumptions cannot be removed without breaking down the whole model, then the original model must be discarded and a new model developed.

The most obvious example is the use of the Cobb Douglas Function⁵⁵ in Production Economics. It relates output in manufacturing industries to labour and capital inputs, and it is expressed as $P = bL^aC^{1-a}$ where P = total output; L = Index of labour input C = Index of fixed capital; the exponents 'a' and "1-a" are the elasticity of production, *i.e.*, the percentage response of output to percentage changes in labour and capital respectively.

This model is based on the assumptions of malleability of capital and constancy of the share of wages in income. These assumptions are highly restrictive for analyzing production. When these are removed, the whole system breaks down.

Illustration: In order to illustrate research models, a model developed by Subrata Pandey⁵⁶ is given below.

The organisational effectiveness in a R&D organisation is determined by five sets of variables, viz., macroclimate (organizational climate), microclimate (job climate), personality of scientists, and their attitudinal and performance variables.

The organizational effectiveness is indicated by the scientists' rated performances. The interrelationships between and among the determinant variables are depicted in a schematic diagram. (See Exh. 1.1). All the variables were operationalised and measured by appropriate measuring tools.

Advantages

Models may be of great help in research.

A model is a guiding tool for the entire process of research from the conceptualization to analysis through the testing of hypotheses.

A model enables the researcher to identify and concentrate on important and relevant variables and attributes, instead of getting lost in irrelevant and unimportant details.

A model helps considerably in ensuring that the reasoning is sound, as the model builder has to define his concepts, state his premises and use the rules of logic in his exercise.

A model represents pictures of theories. As such, it enables the researcher to grasp more quickly and comprehensively the sorts of relations among variables postulated by theories.

A model enables us to comprehend precisely the direction of the relations among variables. Whether a given factor has positive or negative impact on another can be readily ascertained.

55. Varshney R.L., and K.L. Maheshwari, *Managerial Economics*, New Delhi: Sultan Chand & Sons, 1979, pp. 130-131.

56. Subrata Pandey, *A Study of Organisational and Individual Characteristics in R&D Organisations*, (Unpublished Ph.D. Thesis), Bangalore: Indian Institute of Science, 1986.

A model shows more clearly the boundaries or conceptual limits of theories. It tells us where a theory ends. We can concentrate on the phenomena to which it is applicable.

A model reminds us the need for abstraction in any systematic investigation.

In social sciences it is impossible to conduct strictly controlled experiments. A series of models can serve as a reasonable substitute for controlled experiments by acting as a mental laboratory for identifying new relationships and clarifying thought.

A model suggests the techniques of analysis, ways to interpretation of data and ways to draw conclusions.⁵⁷

Limitations of Models

Models are not unmixed blessings. They have some drawbacks and limitations.

A model building calls for high levels of logical skills and mathematical competence, persons who do not have these skills, cannot build useful models.

There is also the opposite danger. Those who have expertise in constructing models may go too far. They may be tempted to create abstract models unrelated to any real understanding of problems. Rigour is necessary for any analysis, but rigour is no substitute for relevance.

Another danger in the indiscriminate use of models is that abstract models have a tendency to pose themselves as reality. Models, which are analytical tools, then tend to become objects of worship.

Another problem associated with the use of model is that model builders who are usually craftsmen, and not theorists take too much for granted regarding meanings of concepts, which they use. "Concepts are intrinsically relational; they are not like the bricks that anyone can use in any construction."⁵⁸ Concepts used in each model must be defined afresh in terms of the relationships of that model. "To construct models in the air, out of uncritically conceived concepts that are inadequate to reality and not logically consistent" as rightly stressed by Gunnar Myrdal, "does not represent scientific progress, it come nearer to being an intellectual fraud."⁵⁹

Models may suffer from the problem of inadequacy of the functional forms of mathematics. In mathematical analysis, there are two basic functional forms: additive and multiplicative. There are situations in which either one is appropriate. For example, neither the existence of a strong union nor that of good profit would by itself be sufficient to explain wage increase obtained by workers.

Models constitute rather severe simplifications. In social sciences, for example, there is a tendency to present extremes or polar ends as dichotomies, e.g., good/bad; objective/subjective; formal/informal. Variables like these are, in fact, no discrete entities but continuous dimensions.

Models narrow the full implications of theories so much that fruitful avenues of exploration not portrayed explicitly may be ignored.

Models tend to convey the impression that all the logically consistent dimensions have been included. This, however, is not always the case.

Therefore, one should not rely on models mechanically, one should keep in mind the limitations of models.

57. Hausser, D.L., "Comparison of Different Models for Organisational Analysis", in E.E. Lawlee, *et al.*, (eds.), *Organizational Assessment*, New York: John Wiley & Sons, 1980, pp. 133-134.

58. Kurien, C.T., *A Guide to Research in Economics*, *op. cit.*, p. 14.

59. Myrdal, Gunnar M., *op. cit.*, p. 41.

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QUESTIONS

1. Define research and examine its characteristics.
2. "Search for facts should be made by scientific method rather than by arbitrary method." Substantiate.
3. Discuss the purpose of research.
4. How does research aid planning?
5. What is scientific method? What are its bases?
6. Does the term " scientific method" refer to a set of procedures or to 'science' as a subject? Discuss.
7. Can the scientific method involve reasoning process? Justify your answer.
8. Does the scientific method involve reasoning process? Discuss.
9. What is induction? When is it followed?
10. Describe the four conditions necessary to satisfactory induction.
11. Describe the process of analytic induction.
12. What is deduction? What are its essential conditions?
13. Compare and contrast induction and deduction, giving examples of each.
14. What are the essentials of a good scientific method?
15. Analyse the procedural and personal components of the scientific approach.
16. What is scientific attitude? What are its elements?
17. Distinguish between:
 - (a) arbitrary and scientific methods
 - (b) concept and construct
 - (c) theory and fact
 - (d) theory and hypothesis.
18. Define theory and discuss its criteria.
19. What are the uses of theory to research?

20. What does research do for theory?
21. What is a conceptual model? What are its requirements?
22. Describe the process of model building.
23. How should a model relevant to the problem under study be selected?
24. How do models aid research?
25. What are the limitations of models?

