Scientific Method: Characteristics, Types and Aims

Research is a process by which one acquires dependable and useful information about a phenomenon or a process. It may be broadly defined "as a systematic inquiry towards understanding a complex social phenomenon or a process". It follows the scientific approach to gain knowledge. The most important characteristic of this approach is its thrust on objectivity.

At the end of this unit, you will be able to:

- Describe the meaning of scientific method
- Explain the application of scientific method in social sciences
- Outline the characteristics of scientific method
- Discuss the aims of scientific research

Scientific Method: Meaning and Definition

It is obvious that it would be impossible to comprehend the nature and content of research without an appreciation of a method. The method used in scientific research is usually designated as scientific method. According to George Lundberg (1946), scientific method consists of three basic steps; systematic observation, classification and interpretation of data. Through these steps, scientific method brings about not only verifiability of the facts, but also it lays the confidence in the validity of conclusions. The definition requires some more explanations. First when Lundberg (1946) says that scientific method is systematic observation, he means, the scientific investigation is not ordered, it aims only at discovering facts as they actually are and not as they are desired to be and as such the investigators can have critical confidence in their conclusions. Second, the scientific method is concerned with „classes of objects" not „individual objects" specially university and predictability. The method makes it possible to predict about a phenomenon with sufficient accuracy. The scientific method could either be an inductive method or deductive method. Inductive method involves establishing generalizations, i.e. building generalizations inferred from specific facts, or drawing particular principles from general instances, while deductive method involves testing generalizations, i.e. it is the process of reasoning from general principles to particular instances.

Use of Scientific Method in social Science Social sciences primarily deal with human behaviour, which is, by and large, complex and dynamic in nature. One cannot, therefore investigate the human behaviour under guided conditions as in natural and physical sciences. This creates many problems to the researcher such as the problems of subjectivity and individualistic generalizations etc. The problem arising out of the nature and content of social sciences do not seriously diminish the importance of scientific method for social scientists. Notwithstanding the inherent defects of social sciences, scientific method can be acceptable with its own limitations for the study of social phenomena so far, as it helps to arrive at valid generalizations.

Characteristics of Scientific Method

Horton and Hunt (1984) have given following characteristics of scientific method.

Verifiable evidence - actual observations which other observers can see and check.

Accuracy- describing what really exists. It means truth or correctness of a statement or describing things exactly as they are and avoiding jumping to unwarranted conclusions either by exaggeration or fantasizing.

Precision- making it as exact as necessary or giving exact number or measurement. In scientific precision, one avoids colorful literature and vague meanings. Theoretical concepts must be defined with such precision that others can use those definitions to measure those concepts and test that theory. How much precision is needed in social science will depend upon what the situation requires.

Systematization- attempting to find all the relevant data or collecting data in a systematic and organized way so that the conclusions drawn are reliable. Data based on causal recollections are generally incomplete and give unreliable judgments and conclusions.

Objectivity- being free from all biases and vested interests. It means, observation is unaffected by the observer's values, beliefs and preferences to the extent possible and he is able to see and accept facts as they are, not as he might wish them to be. The research remains detached from his emotions, prejudices and needs, guards his biases. A bias is an unconscious tendency to see facts in a certain way because of one's wishes, interests and values.

Recording- jotting down complete details as quickly as possible. Since human memory is fallible, all data collected are recorded. Researcher will not depend on the recalled facts but will analyze the problem on the basis of the recorded data. Conclusions based on recalled unrecorded data are not trustworthy.

Controlling conditions- controlling all variables except one and then attempting to examine what happens when that variable is varied. This is the basic technique in all scientific experimentation-allowing one variable to vary while holding all other variables constant.

Replicability- It means that the results of the tests of hypotheses should be supported again and yet again when the same type of research is repeated in other similar circumstances.

Falsifibility- A theory must be stated in a way that it can be disproven. Theories that cannot be tested or falsified are not scientific theories and any such knowledge is not scientific knowledge. A theory that is specified in imprecise terms or whose concepts are not accurately measurable cannot be tested, and therefore is not scientific.

Parsimony- When there are multiple explanations of a phenomenon, scientists must always accept the simplest or logically most economical explanation. This concept is called parsimony. It prevents scientists from pursuing overly complex theories with endless number of concepts.

Types of Scientific Method

Followings are the types of Scientific Research

Exploratory Research

Exploratory research works on the existence of absence of a phenomenon. It also tries to find answer to problems that are not clear. Exploratory research can be conducted in many fields and can therefore be considered the most flexible and extensive research method.

Explanatory research

This type of research seeks to find cause and effect relationships among the various variables. Explanatory research is the study and transfer of complex ideas and information. Analyzing and synthesizing information from various sources to produce text is the most important purpose of the explanatory method to increase the reader's understanding of the subject and the research problem.

Descriptive research

In this type of research, the researcher studies the current state of the subject and describes and interprets the existing conditions and relationships. In other words, descriptive research examines a phenomenon by expressing a more complete definition and contrasting it with other phenomena. The main purpose of this type of research is to give an objective, realistic description of the characteristics of a situation or a topic.

Aims of Scientific Research

- To gain familiarity with a phenomenon or to achieve new insights into it.
- To portray accurately the characteristics of a particular individual, situation or a group.
- To test a hypothesis of a casual relationship between variables.

Problem Solving

Problem Solving refers the ability to use knowledge, facts, and data to effectively to solve problems. This does not mean researcher need to have an immediate answer, it mean researcher have to be able to think, access problems and find solutions.

Steps involved in problem solving

- Confronting the problem
- Collection of evidences

- Formulation possible solutions of hypothesis
- Evaluating the sustainability of solutions
- Arriving at conclusions

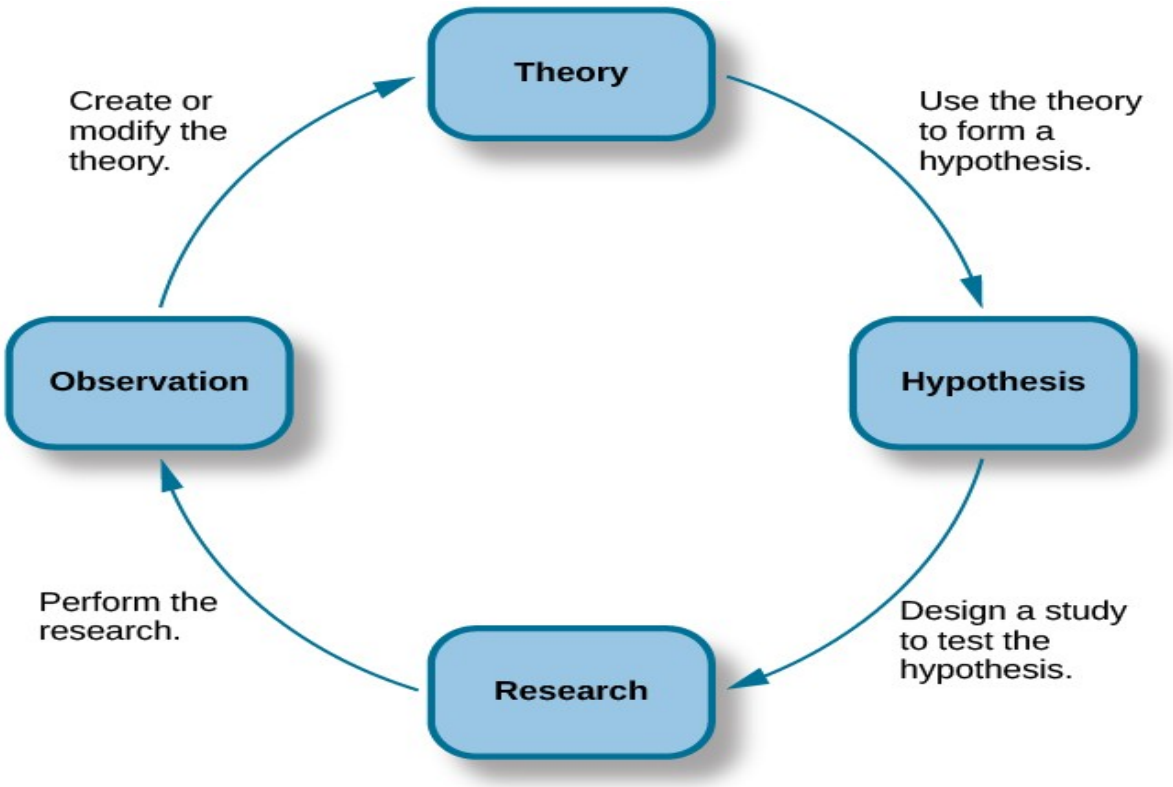
Theory Building

The process of building a concepts and their interrelationships that shows how/or whay a phenomenon occurs.

A theory is a well sustained explanation of some aspect of the natural world based o a body of facts that has been repeatedly confirmed through observation and experiment.

Prediction

It is a statement about a future event in research; predictions are usually stated as hypotheses i.e. clear statements which can be subjected to scientific verification.



Summary

This unit has described the main features of scientific method. Scientific method consists of three basic steps; systematic observation, classification and interpretation of data. Although scientific research method depends on the collection of empirical facts, yet facts alone do not constitute a

science. For meaningful understanding of facts must be ordered in some fashion, analyzed, generalized and related to other facts. So, scientific research is the creation of knowledge through the collection of empirically verifiable facts. Problem solving and theory building are the basic aims of scientific research.

Unit end Questions

1. What is scientific method of research?
2. Explain the application of scientific method in social sciences.
3. What are the characteristics of scientific research?
4. Discuss the aims of scientific research.

Suggested Reading

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