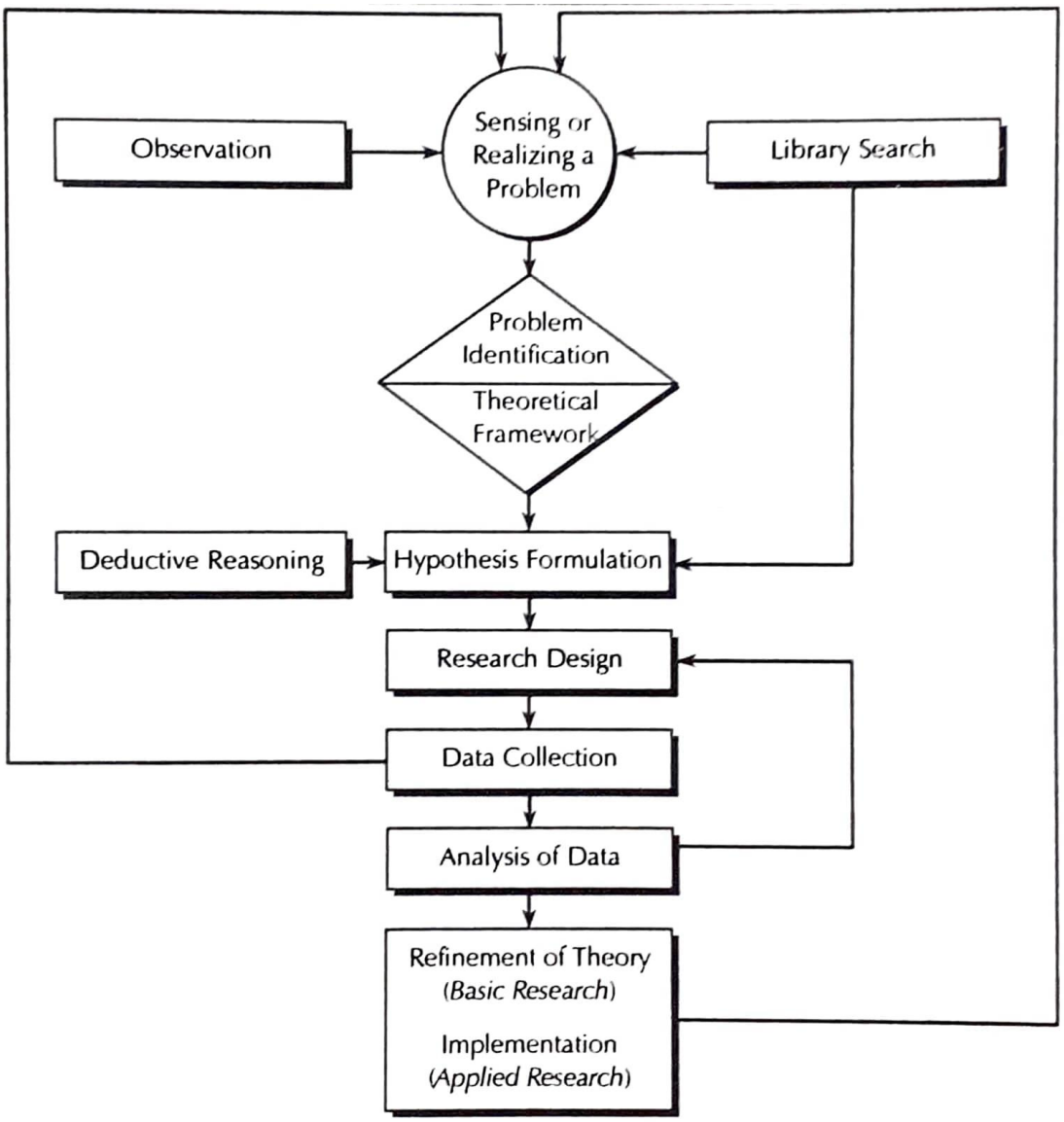
Scientific Research Process



Scientific research is systematic and follows the steps of the scientific method. From the inception of a research idea to the final report of results, the research process has several crucial steps. However, these steps do not provide a rigid pattern into which you must force your thinking. Thinking simply cannot be scheduled. An investigator does not tackle one step at a time, complete that process and then move on to the next step. Some steps can go simultaneously. Others need proper sequencing and logical arrangement.

Generally, research is understood to follow a certain structural process. There are eight steps in scientific method. These eight steps cover the total spectrum of a research endeavor, starting from problem formulation through to refinement of theory or practice. However, these steps may vary depending on the subject matter and the researcher, and also are interdependent with considerable back and forth interaction. These steps are diagrammatically shown in Figure. Brief description of each of these steps is given in the following paragraphs:

Sensing or Realizing Problem

The first step in any scientific inquiry is to identify an issue you want to study. There are many sources of research idea (observing the situation or sensing the problem). New problems keep on emerging in the environment. You somehow sense these developments occurring in the environment. At this stage, you may not know exactly what is happening, but you can definitely sense that things are not going on as smoothly as they should be.

Problem Identification

Once you increase your level of awareness of what is happening in the environment, you would then focus on the problem and the associated factors through further search of information. In this step, you try to identify what exactly are the problems or issues in the situation. There is a saying in research that "a problem well defined is a problem half solved". If the research problem is unclear and poorly defined, the result could be a lot of time and resources wasted on gathering OP potentially useless information and data.

Theoretical Framework

In the third step of scientific research, you make an attempt to integrate the information logically so that the reason for the problem can be conceptualized. The critical variables are examined and the association among them is identified. Putting all the variables and their association together, a theoretical framework is developed.

Hypothesis Formulation

In the fourth step of scientific research, hypotheses are formulated. Hypotheses are logically conjectured relationship between two or more variables expressed in the form of testable statements. Hypotheses for the study arc drawn from the theoretical framework as developed in Step 111. Research hypotheses are even more focused. They provide the specific answers to questions that the research will examine often in an empirical way. Hypotheses are particularly useful in quantitative research, where there is statistical analysis.

Research Design

The fifth step is devising the plan for the research. Once you have narrowed your research hypothesis, you must next decide on a design or plan of attack for your research. The research design is thus a strategy for conducting research. It describes the general framework for analyzing and evaluating data after identifying:

a) What you want to know, and
b) What has to be dealt with in order to obtain required information.

The decision of which design to use can totally depend on the nature of the research project. Once you have decided on which earth design to undertake for your project, you can then develop the collection methods and data

Collection of Data

Data collection, the sixth step in scientific research, is also known as fieldwork. At this stage, you have to administer the research instruments (questionnaire, interview schedules, observation schedules, etc.) to gather data as expected in Step V. However, the procedures used to obtain the data vary depending on the research design chosen and the source of the data. It is important to note that this step is the key part of the scientific research process and is crucial to the success of the research project. All of the research and planning effort so far is of little use if the data is incorrectly collected.

Data Analysis

After you have collected data, you must summarize and analyze them. Data analysis is in fact the statistical analysis of data that have been edited, coded and tabulated. It especially important in cases, where you have amassed large amounts of information from many respondents. You can analyze data in several ways, and some types of data are better analyzed with one method than another. In most cases, you will probably calculate some descriptive statistics that provide a "nutshell" description of your data and inferential statistics that assess the reliability of our data. With the use of these different statistical techniques, the hypotheses are tested.

Refinement of Theory or Practice

The final step involves interpretation and generalization of the findings into the larger body of knowledge about the phenomenon. In the case of applied research, specific implementation strategy is proposed to solve the problem identified by the study. Through research existing theories or practices are refined and modified.

By carefully following the major steps outlined above, you can reduce the possibility of making major errors and increases the possibility that meaningful research results will be obtained. Scientific research helps you to state your findings more accurately and with confidence.

Consider the following case as an example, which shows the nature and process of scientific research:

EXAMPLE *A dealer of a car producing company was concerned with the complaints received from the car users that the cars it produces have some problems with rating sound at the dash board and the rear passenger seat after a few thousand kilometers of driving.*

- *He obtained information from the company workers to identify the various factors influencing the problem.*
- *He then formulated the problem and generated guesses (hypotheses).*
- *He constructed a checklist and obtained requisite information from a representative sample of cars.*
- *He analyzed the data thus collected, interpreted the results in the light of his hypotheses and reached conclusions.*

In this example, the dealer went through a sequence of steps which were in order and thus systematic. Secondly, the dealer did not just jump at the conclusions. He used a step-wise scientific method of inquiry in reaching at conclusions. This research study, thus, met the important characteristics of research: first, it was a systematic process, and secondly it followed a step-wise scientific method of enquiry to reach at the conclusion.

The most characteristic feature of the scientific research process is its cyclical nature. Research usually starts with a problem and ends in a tentative empirical generalization. The generalization at the end of one cycle is the beginning of the next cycle. The cyclical process continues indefinitely, reflecting the process of a scientific discipline and the ongoing accumulation of scientific knowledge. The research process is also self-correcting. Tentative generalizations to research problems are tested logically and empirically. If these generalizations are rejected, new ones are formulated and tested.