

Research process

The research process is a systematic method of conducting research that helps the researcher move from an initial idea to a well-planned study. The research process consists of five major steps.

1.1 PROCESS OF RESEARCH

However, the following order concerning various steps provides a useful procedural guideline regarding the research process:

- (1) Formulating the research problem;
- (2) Extensive literature survey;
- (3) Developing the hypothesis;
- (4) Preparing the research design;
- (5) Determining sample design;
- (6) Collecting the data;
- (7) Execution of the project;
- (8) Analysis of data;
- (9) Hypothesis testing;
- (10) Generalisations and interpretation, and
- (11) Preparation of the report or presentation of the results, i.e., formal write-up of conclusions reached.

1. Formulating the Research Problem

There are two types of research problems, *viz.*, those which relate to states of nature and those which relate to relationships between variables. Defining a research problem is the foundational step of any scientific inquiry, beginning with the selection of a broad area of interest which is then refined to eliminate ambiguities. Once a general topic is chosen, the researcher must evaluate the feasibility of potential solutions before establishing a formal working definition. This formulation process involves two essential stages: developing a thorough understanding of the subject and rephrasing it into specific, analytical terms. To achieve this, researchers often consult with colleagues, experts, or academic guides who help narrow down general concepts into operational language. Whether in an academic setting or a professional organization, the goal is to transform a vague idea into a precise, manageable problem that can be systematically investigated.

2. Extensive Literature Survey

Once the problem is formulated, a brief summary of it should be written down. It is compulsory for a research worker writing a thesis for a Ph.D. degree to write a synopsis of the topic and submit it to the necessary Committee or the Research Board for approval.

At this juncture the researcher should undertake extensive literature survey connected with the problem. For this purpose, the abstracting and indexing journals and published or unpublished bibliographies are the first place to go to. Academic journals, conference proceedings, government reports, books, etc., must be tapped depending on the nature of the problem. In this process, it should be remembered that one source will lead to another.

The earlier studies, if any, which are similar to the study in hand, should be carefully studied. A good library will be a great help to the researcher at this stage.

3. Development of Working Hypotheses

The third step in the research process is the formulation of working hypotheses, which are tentative assumptions made to test the logical or empirical consequences of a study. Following an extensive literature survey, a researcher must state these hypotheses in clear, specific, and limited terms to serve as the focal point of the entire investigation. The hypothesis acts as a guide that delimits the scope of research, sharpens the researcher's focus, and determines both the type of data required and the methods of analysis to be used. Developing a sound hypothesis typically involves a combination of discussing the problem with experts, examining existing data for trends, reviewing similar studies, and conducting limited exploratory field interviews. While exploratory researches may not always require a formal hypothesis, it remains a fundamental requirement for most scientific inquiries, ensuring the study remains precise and manageable.

4. Preparing the Research Design

The research problem having been formulated in clear-cut terms, the researcher will be required to prepare a research design, i.e., he will have to state the conceptual structure within which research would be conducted. The preparation of such a design facilitates research to be as efficient as possible yielding maximal information. In other words, the function of research design is to provide for the collection of relevant evidence with minimal expenditure of effort, time and money. But how all these can be achieved depends mainly on the research purpose. Research purposes may be grouped into four categories, *viz.*,

- (i) Exploration,
- (ii) Description,
- (iii) Diagnosis,
- (iv) Experimentation.

A flexible research design which provides opportunity for considering many different aspects of a problem is considered appropriate if the purpose of the research study is that of exploration. But when the purpose happens to be an accurate description of a situation or of an association between variables, the suitable design will be one that minimizes bias and maximizes the reliability of the data collected and analyzed.

5. Determining Sample Design

All the items under consideration in any field of inquiry constitute a ‘universe’ or ‘population’. A complete enumeration of all the items in the ‘population’ is known as a census inquiry. It can be presumed that in such an inquiry when all the items are covered no element of chance is left and highest accuracy is obtained. But in practice this may not be true.

Even the slightest element of bias in such an inquiry will get larger and larger as the number of observations increases. Moreover, there is no way of checking the element of bias or its extent except through a resurvey or use of sample checks. Besides, this type of inquiry involves a great deal of time, money and energy. Not only this, census inquiry is not possible in practice under many circumstances.

For instance, blood testing is done only on sample basis. Hence, quite often we select only a few items from the universe for our study purposes. The items so selected constitute what is technically called a sample. The researcher must decide the way of selecting a sample or what is popularly known as the sample design.

6. Collecting the Data

In the research process, the step of Data Collection becomes essential when existing information is found to be inadequate for addressing the specific problem at hand. Researchers must select a data collection method that aligns with their available resources, including budget, time, and personnel. Primary data is typically gathered through two primary routes: experiments or surveys. In an experimental setup, the researcher observes and records quantitative measurements under controlled conditions to test the validity of the hypothesis. Conversely, in a survey, data is gathered from a target population to provide a broader understanding of the variables involved. Choosing the right method is a strategic decision, as the quality and appropriateness of the collected data directly determine the success of the research analysis.

7. Execution of the Project

The execution of the project is a critical phase in the research process that ensures the collected data is both dependable and adequate. To maintain systematic progress, the researcher must ensure the project stays on schedule and follows a rigorous plan. For surveys using structured questionnaires, data should be coded to allow for efficient machine processing. If the research involves personal interviews, the quality of results depends on the careful selection and thorough training of interviewers, often guided by detailed instruction manuals.

Throughout this stage, the researcher must maintain "statistical control" by conducting field checks to monitor interviewer performance and preparing for unanticipated factors that could affect accuracy. A major challenge in this phase is the non-response problem; when participants do not cooperate, researchers must use specific strategies, such as taking a sub-sample of non-respondents and employing experts to secure the necessary information. Ultimately, successful execution ensures that the final data meets predefined standards of quality and realism.

8. Analysis of Data

Once data collection is complete, the researcher moves to the Analysis of Data, a systematic process of transforming "unwieldy" raw information into meaningful insights. This stage begins with editing to improve data quality, followed by classification and coding, where data is organized into purposeful categories and converted into symbols or numerals for counting. These coded figures are then arranged into concise tables through tabulation, a step often handled by computers to manage large variables and save time.

The final part of analysis involves applying statistical formulas to calculate percentages, coefficients, and trends. To ensure the findings are reliable, the researcher performs tests of significance to determine if the results support or conflict with the original hypothesis. This rigorous technical procedure is what allows a researcher to draw valid, scientific conclusions from the raw evidence gathered during the study.

9. Hypothesis Testing

After analyzing the data as stated above, the researcher is in a position to test the hypotheses, if any, he had formulated earlier. Do the facts support the hypotheses or they happen to be contrary? This is the usual question which should be answered while testing hypotheses.

Various tests, such as Chi square test, *t*-test, *F*-test, have been developed by statisticians for the purpose. The hypotheses may be tested through the use of one or more of such tests, depending upon the nature and object of research inquiry. Hypothesis testing will result in either accepting the hypothesis or in rejecting it. If the researcher had no hypotheses to start with, generalizations established on the basis of data may be stated as hypotheses to be tested by subsequent researches in times to come.

10. Generalisations and Interpretation

If a hypothesis is tested and upheld several times, it may be possible for the researcher to arrive at generalization, i.e., to build a theory. As a matter of fact, the real value of research lies in its ability to arrive at certain generalizations. If the researcher had no hypothesis to start with, he might seek to explain his findings on the basis of some theory. It is known as interpretation. The process of interpretation may quite often trigger off new questions which in turn may lead to further researches.

11. Preparation of the Report or the Thesis

Finally, the researcher has to prepare the report of what has been done by him. Writing of report must be done with great care keeping in view the following:

1. The layout of the report should be as follows:
 - (i) The preliminary pages;
 - (ii) The main text,
 - (iii) The end matter.

In its preliminary pages the report should carry title and date followed by acknowledgements and foreword. Then there should be a table of contents followed by a list of tables and list of graphs and charts, if any, given in the report.

The main text of the report should have the following parts:

- (a) **Introduction:** It should contain a clear statement of the objective of the research and an explanation of the methodology adopted in accomplishing the research. The scope of the study along with various limitations should as well be stated in this part.
- (b) **Summary of findings:** After introduction there would appear a statement of findings and recommendations in non-technical language. If the findings are extensive, they should be summarised.
- (c) **Main report:** The main body of the report should be presented in logical sequence and broken-down into readily identifiable sections.
- (d) **Conclusion:** Towards the end of the main text, researcher should again put down the results of his research clearly and precisely. In fact, it is the final summing up.