

THE MAIN DISTINGUISHED STAGES IN SCIENTIFIC RESEARCH PROCESS

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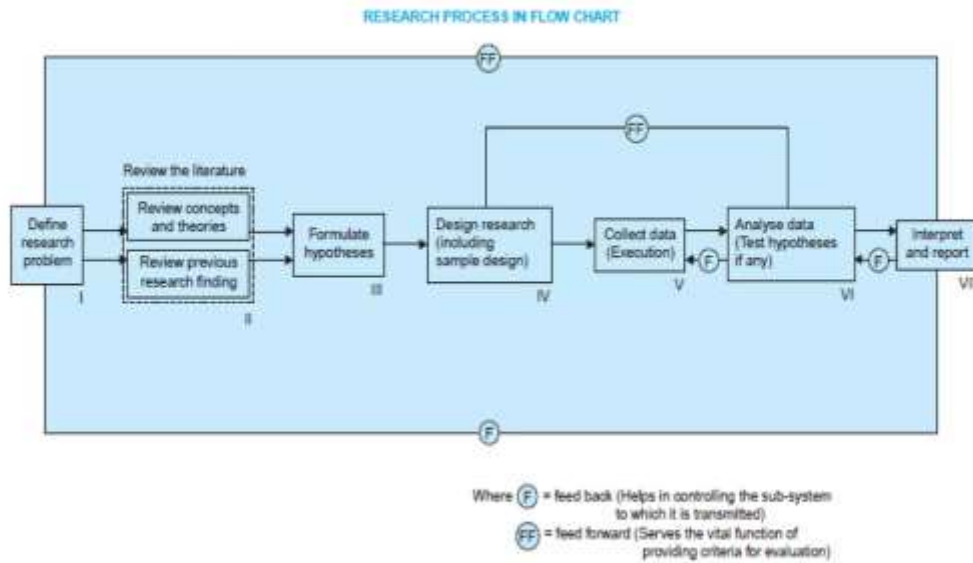
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Annotation. This article provides a systematic overview of the scientific research process, its nature, and all the essential stages involved. The study discusses the essence of scientific research, problem formulation, defining objectives and tasks, selecting research methods, data collection, and perspective. Furthermore, the research emphasizes how correct execution of each stage contributes to reliable and valid results.[1]

Keywords. Scientific research process, research stages, objectives, problem formulation, methodology, data collection, hypothesis, report preparation, research execution, educational research.

Research process consists of series of actions or steps necessary to effectively carry out research. The process consists of a number of closely related activities. These activities overlap continuously rather than following a strictly prescribed sequence. [2]At times, the first step determines the nature of the last step to be undertaken. The various steps involved in a research process are not mutually exclusive. They are interdependent.

Research Process Flow Chart



Stages in Scientific Research Process:

Formulating the Research Problem. Researcher must decide the general area of interest. Ambiguities relating to the problem should be resolved. Feasibility of a particular solution has to be considered before a working formulation of the problem can be set up. The formulation of a general topic into a specific research problem, thus, constitutes the first step in a scientific enquiry. Way of understanding the problem- 1) discuss it with colleagues or experts. 2) Examine all available literature concerning the concepts and theories, and similar such studies.

After this the researcher rephrases the problem into analytical or operational terms i.e., to put the problem in as specific terms as possible. This task of formulating, or defining, a research problem is a step of greatest importance in the entire research process. The problem to be investigated must be defined unambiguously for that will help discriminating relevant data from irrelevant ones. [3]

Extensive Literature Survey . Once the problem is formulated, a brief summary of it should be written down. 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. One source leads 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.[1] By using Google, Google Scholar and Google Books; articles and reference books can be searched.

Development of Working Hypothesis. After extensive literature survey, researcher should state in clear terms the working hypothesis. Working hypothesis is tentative assumption made in order to draw out and test its logical or empirical consequences. Hypothesis provides the focal point for research. It also affects the manner in which tests must be conducted in the analysis of data and indirectly the quality of data which is required for the analysis. Hypothesis should be very specific and limited to the piece of research in hand because it has to be tested. The role of the hypothesis is to guide the researcher by delimiting the area of research and to keep him on the right track. It sharpens his thinking and focuses attention on the more important facets of the problem. It also indicates the type of data required and the type of methods of data analysis to be used.

How to develop working hypothesis? a) Discussions with colleagues and experts about the problem, its origin and the objectives in seeking a solution; b) Examination of data and records, if available, concerning the problem for possible trends, peculiarities and other clues; c) Review of similar studies in the area or of the studies on similar problems; and d) Exploratory personal investigation which involves original field interviews on a limited scale with interested parties and individuals with a view to secure greater insight into the practical aspects of the problem.[1] Thus, working hypothesis arise as a result of a-priori thinking about the subject, examination of the available data and material including related studies and the counsel of experts and interested parties.

Preparing the Research Design. Research design depends on research purpose. Research purposes may be grouped into four categories: (i) Exploration (ii) Description (iii) Diagnosis and (iv) Experimentation There are several research designs, such as, experimental and non-experimental hypothesis testing. The preparation of the research design, appropriate for a particular research problem, involves usually the consideration of

the following: (i) the means of obtaining the information (ii) the availability and skills of the researcher and his staff (if any) (iii) explanation of the way in which selected means of obtaining information will be organised and the reasoning leading to the selection; (iv) the time available for research; and (v) the cost factor relating to research, i.e., the finance available for the purpose.

Determining Sample Design. Quota sampling: In stratified sampling the cost of taking random samples from individual strata is often so expensive that interviewers are simply given quota to be filled from different strata, the actual selection of items for sample being left to the interviewer's judgement. This is called quota sampling. The size of the quota for each stratum is generally proportionate to the size of that stratum in the population. Quota sampling is thus an important form of non-probability sampling. Quota samples generally happen to be judgement samples rather than random samples.[4]

Collecting the Data. To solve any real life problem it is necessary to collect data that are appropriate. Primary data can be collected either through experiment or through survey. If the researcher conducts an experiment, he observes some quantitative measurements, or the data, with the help of which he examines the truth contained in his hypothesis. In the case of a survey, data can be collected by any one or more of the following ways: i) By observation ii) Through personal interview iii) Through telephone interviews iv) By mailing of questionnaires v) Through schedules vi) Google forms

Execution of the Project . Execution of the project is a very important step in the research process. If the execution of the project proceeds on correct lines, the data to be collected would be adequate and dependable. The researcher should see that the project is executed in a systematic manner and in time. If the survey is to be conducted by means of structured questionnaires, data can be readily machine-processed. If the data are to be collected through interviewers, arrangements should be made for proper selection and training of the interviewers. This means that steps should be taken to ensure that the survey is under statistical control so that the collected information is in accordance with the pre-defined standard of accuracy.

Analysis of Data . After the data have been collected, the researcher turns to the task of analysing them. The analysis of data requires a number of closely related operations

such as establishment of categories, the application of these categories to raw data through coding, tabulation and then drawing statistical inferences. The unwieldy data should necessarily be condensed into a few manageable groups and tables for further analysis. Coding operation is usually done at this stage through which the categories of data are transformed into symbols that may be tabulated and counted.[5] Computers not only save time but also make it possible to study large number of variables affecting a problem simultaneously.

Hypothesis Testing .After analysing the data as stated above, the researcher is in a position to test the hypothesis, if any, he had formulated earlier. Do the facts support the hypothesis or they happen to be contrary? Various tests, such as Chi square test, t-test, F-test, have been developed by statisticians for the purpose. The hypothesis 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.

Generalizations and Interpretation. If a hypothesis is tested and upheld several times, it may be possible for the researcher to arrive at generalisation, to build a theory. As a matter of fact, the real value of research lies in its ability to arrive at certain generalisations. 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. [4]

Preparation of the Report. 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: The layout of the report should be as follows: (i) [1]the preliminary pages; (ii) the main text, and (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 (b) Summary of findings (c) Main report (d) Conclusion. At the end of the report, appendices should be enlisted in respect of all technical data. Bibliography, i.e., list of books, journals, reports,

etc., consulted, should also be given in the end. Index should also be given specially in a published research report. Report should be written in a concise and objective style in simple language avoiding vague expressions such as ‘it seems,’ ‘there may be’, and the like. Charts and illustrations in the main report should be used only if they present the information more clearly and forcibly.

To conclude, this study clearly shows that the scientific research process is a well-organized and methodical activity designed to produce credible, accurate, and meaningful knowledge. Every phase beginning with the identification of a research problem and concluding with the preparation of the final report plays an essential role in ensuring that the outcomes are trustworthy and scientifically valuable. A correct application of research methodology, precise data collection procedures, and thoughtful data analysis are crucial elements that maintain the quality and integrity of any scientific investigation. Through learning about the research process, I have come to appreciate the significance of systematic planning, logical structuring, and critical assessment when carrying out research work.

Overall, scientific research not only enriches the existing body of knowledge but also strengthens vital skills such as analytical thinking, logical reasoning, and effective problem-solving. These abilities make the research process highly important in both educational settings and real-world professional environments.

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