


**Steps in Planning and Conducting a Research**



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**What is Research?**

- ◆ Systematic search for pertinent information on a specific topic.
- ◆ Careful, organized and well-planned investigation of a problem.



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**Main attribute of the research process**

- ◆ Follows a scientific method of inquiry
- ◆ Conclusions made are based on empirical evidence or on observed facts and not just hearsay, gut feeling or on intuition
- ◆ Objective, critical analysis and logical reasoning
- ◆ Establish findings and principles that may be applied confidently in the future, under similar circumstances



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### Salient features of research process

- ◆ Systematic
- ◆ Objective
- ◆ Reproducible



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### Steps in Conducting Research

- Scientific research follows sequence of problem-solving



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### Basic Steps

- ◆ Identify and Define research problem
- ◆ Selecting topic for research
- ◆ Formulating research objectives
- ◆ Review the literature relating to problem identified
- ◆ Define actual problem for investigation in clear specific terms



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### Basic Steps

- ◆ Formulate testable hypothesis and define basic concepts and variables
- ◆ Construct research design
- ◆ Design tools for data collection
- ◆ Design plan for data analysis
- ◆ Collect data
- ◆ Process collected data



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### Basic Steps

- ◆ Analyze data
- ◆ Write research report
- ◆ Disseminate results



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### Identify and Define the Research Problem

- ◆ 2 sub-steps are involved:
  - Selection of a research topic
  - Formulation of research objectives



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## Selecting a Topic for Research

- ◆ Factors to consider:
  - Personal interest and inclination
  - Scientific or intellectual interest
  - Practical value in the application or implementation of results
  - Training & personal qualification
  - Availability of subjects
  - Special equipment & working conditions



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## Selecting a Topic for Research

- ◆ Factors to consider:
  - Sponsorship and administrative cooperation
  - Availability of research funds
  - Hazards, handicaps
  - Time
  - Prestige



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## Formulating the research objectives

- ◆ Reflect the questions whose answers the investigator wants the study to yield.
- ◆ Expressed either in the form of a statement or a question.
- ◆ Important. They serve as the "steering wheel" in the conduct of the research.
- ◆ Guides in specifying the variables of the study, the choice of the research design to be used, the data to be collected, the interpretation of results.



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## Research Problems and Objectives

- ◆ Ways in formulating research problems and objectives:
  - Discuss with people who have had experience in the area of interest.
  - Use of first hand observation or of reflection upon one's experiences.
  - Review of theory and research already done on the topic.



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## Research Problems and Objectives

- ◆ Suggestions :
  - Repeat earlier studies to see if consistent findings will be established.
  - Repeat earlier research under different conditions or different types of population
  - Challenge findings or interpretation of prior research
  - Apply methods conventionally used in one area into other related areas
  - Develop new & creative approaches



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## Characteristics of Research Objectives

- ◆ Phrased clearly, unambiguously and specifically.
  - Focus on a clear goal to give direction to the research process
- ◆ Stated in measurable terms and should not involve value judgement.



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## Review the Literature relating to the problem identified

- ◆ Two important uses:
  - To get acquainted with the existing studies related to the research to be conducted relative to:
    - ◆ Who has done the work on the problem area
    - ◆ What has been found
    - ◆ Research design utilized
    - ◆ Statistical analysis applied
  - To establish a rationale or a theoretical/conceptual framework based on previous research studies done.



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## Using reference management software

- ◆ Makes it easy to track references obtained through electronic searches.
- ◆ Conducts and then stores references for you, including an abstract.
- ◆ Citation information readily available electronically when the review is written.
- ◆ ProCite:  
<http://www.isresearchsoft.com/pc/PChrome.asp>
- ◆ EndNote: <http://www.endnote.com>



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## Define the actual problem for investigation in clear specific terms

- ◆ Researcher must be shrewd in narrowing the scope of his study without becoming concerned with a trivial problem.
- ◆ Assumptions, restrictions and limitation must be explicit with respect to the coverage of the study.
- ◆ Helps focus attention on valid objectives, & helps minimize the dangers of over generalization.



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## Factors considered in delimiting the problem

- ◆ Scope of the problem
- ◆ Time allotted for the conduct of the study
- ◆ Cost and funding
- ◆ Cooperation/coordination needed from other institutions or researchers
- ◆ Availability of research subjects
- ◆ Availability of equipment needed
- ◆ Ethical considerations



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## Formulate testable hypothesis

- ◆ Hypothesis must be expressed in a concrete and clear manner, and stated in terms of observable and measurable behavior, allowing objective evaluation of results.
- ◆ Provides guidance in the search for evidence by way of:
  - Limiting area of investigation
  - Sensitizing the researcher to pertinent data and relationships
  - Providing a unifying concept



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## Hypothesis

- ◆ Null hypothesis
- ◆ Alternate hypothesis



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### Define basic concepts and variables

- ◆ 3 categories of variables:
  - Independent – presumed to cause, effect, influence or stimulate the outcome.
  - Dependent – refers to the output, the outcome or the response variable.
  - Control – may produce changes which may be mistaken to be the effect of the independent variables being considered
    - ◆ Controlled, held constant or randomized – so the effects are neutralized, cancelled out or equated for all conditions.




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### Construct the research design

- ◆ Represents the “plan of attack” of the researcher in answering the research objectives.
- ◆ Must be well thought out in order to ensure the researcher that he obtained all the data relevant to objectives and hypothesis he formulated.




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### Areas of concern in choice of research design

- ◆ Selection and number of subjects
- ◆ Control and manipulation of relevant variables
- ◆ Establishment of criteria to evaluate outcomes
- ◆ Instrumentation




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### Factors to consider

- ◆ Research objectives
- ◆ Feasibility
- ◆ Ethical considerations
- ◆ Economy and efficiency
- ◆ Internal and external validity.



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### Internal vs. External Validity

- ◆ Internal Validity
  - Refers to extent to which investigator is able to control the different biases affecting the study and in the end, measures what he really intends to measure.
- ◆ External Validity
  - Refers to the extent to which the investigator is able to generalize the results of his study.



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### Design the Tools for Data Collection

- ◆ Questionnaire
- ◆ Interview schedule and forms



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## Design the Plan for Data Analysis

- ◆ A number of researchers think about data analysis only after all data has been collected.
- ◆ Consequences:
  - Some very important variables in study are either not measured at all or collected using a measurement scale which is inconsistent with desired mode of data analysis.
  - Objectives are too ambitious or non-measurable, given the nature of the data that were collected.




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## Design the Plan for Data Analysis

- ◆ A good practice is to construct dummy tables.
- ◆ Dummy tables – skeleton tables drawn to help investigator conceptualize how data is going to be organized and presented after it has been collected.




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## Collect the Data

- ◆ Essential phase of the research process.
- ◆ Researcher employs specialized tools, instruments and procedures depending upon the method designed for such activity.




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### Process the collected data

- ◆ Process the information gathered to prepare for and facilitate analysis and interpretation of data.
- ◆ Editing of data collection forms and coding of responses are procedures usually done in this stage



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### Analyze the Data

- ◆ Quantification, description and classification of data.
- ◆ Statistics play a vital role in the process.
- ◆ Researcher must be familiar with basic statistical concepts and procedures and must know their limitations as well as the areas where they may be appropriately applied.



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### Write the research report

- ◆ Prepare report of different activities he has undertaken together with his findings.
- ◆ Must be well organized and presented in proper form and style
- ◆ Basic principles of technical report writing are followed.



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## Disseminate the results

- ◆ Publish findings in scientific journals and news releases
- ◆ Presentation of results in scientific meetings.



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## Exercise 1

- ◆ Consider the following objectives:
  - To analyze the grades of students
  - To study the anti-microbial activity of extract A.
- ◆ Do they have the characteristics of "good" research objectives?



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## Exercise 2

- ◆ For each following research objectives, identify the dependent, independent and control variables.
  - To determine the total lead concentrations in the groundwater sources of Barangay X.

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