



# **Research Methodology**

## **Identifying the Problem**

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# Outline

- Importance of formulating a research problem
- Source of research problems
- Considerations in selecting a research problem
- Steps in formulating a research problem
- Formulation of research objectives

# Importance of formulating a research problem

“If one wants to solve a problem, one must generally know what the problem is. It can be said that a large part of the problem lies in knowing what one is trying to do.”

(Kerlinger 1986:17)

- Formulation of a research problem is the first and most important step of the research process
- You must have a clear idea with regard to ***what it is that you want to find out about*** and not what you think you must find

# Importance of formulating a research problem...

- A research problem could take a number of forms, from simple to the very complex
- The way you formulate a problem determines almost every step that follows
- Example: Research study regarding services available to patients with depression living in a community
  - Focus
    - To find out the types of service available to patients with depression,
      - the study will dominantly be descriptive and qualitative in nature
    - To determine the extent of use in relation to the personal attributes of the patients,
      - the study will be classified as correlational (and quantitative)
    - To find out the effectiveness of these services,
      - the study will again be classified as correlational and the study design used, methods of collecting data and its analysis will be a part of the quantitative methodology
- Initially, you may become more confused but this is normal and a sign of progression
- Note
  - Confusion is often but a first step towards clarity

# Importance of formulating a research problem...

- Irrespective of the type of research (e.g., basic or applied), research is likely to take a significant amount of your time and energy
  - The problem you study should be worth your time and energy
- Two criteria to consider while in the process of identifying a suitable research problem
  - 1) Your problem should address an **important question**, such that **the answer can actually “make a difference”** in some way
  - 2) Your problem should **advance the frontiers of knowledge**, perhaps by leading to new ways of thinking, suggesting possible applications, or paving the way for further research in the field
- Achieving these two points require
  - Collection of data
  - Interpretation of the collected data

# Importance of formulating a research problem...

- Four situations to avoid when considering a problem for research purposes
  - 1) Research projects should not be simply a ruse for achieving self-enlightenment
    - Self-enlightenment is not the primary purpose of a research
    - Example
      - The problem of this research is to learn more about the way in which the Panama Canal was built.
    - This wont led to any new knowledge

# Importance of formulating a research problem...

## 2) A problem whose sole purpose is to compare two sets of data is not a suitable research problem

### – Example

- This research project will compare the increase in the number of women employed over 100 years-from 1870 to 1970-with the employment of men over the same time span.

- A simple table completes the project (Historical Statistics, 1975).

	<i>1870</i>	<i>1970</i>
<b>Women employed</b>	13,970,000	72,744,000
<b>Men employed</b>	12,506,000	85,903,000

- The "research" project involves nothing more than a quick trip to the library to reveal what is already known

# Importance of formulating a research problem...

- 3) Simply calculating a correlation coefficient between two sets of data to show a relationship between them is not acceptable as a problem for research
- Example
    - This research project will investigate if there is a relationship between IQ score of children and those of their parents
  - Why is this not acceptable?
    - Because the **basic requirement for research is ignored**: a human mind struggling to make sense of data
    - It is just a **proposal to perform a statistical operation** that a computer can do infinitely faster and more accurately than a human being can
  - Correlation coefficient is nothing more than a statistic that expresses how closely two characteristics or other variables are associated with each other
  - Correlation coefficient tells us nothing about why the association might exist
    - Example
      - What is the cause of the relationship between children's and parents' intelligence test scores? Is it genetic? Is it environmental? Is it a combination of both genetic heritage and environment?



# Importance of formulating a research problem...

- 4) Problems that result only in a yes or no answer are not suitable problems for research
- Example
    - This research project will investigate if homework is beneficial to children
  - Why such problem is not suitable for a research?
    - The problem **simply skims the surface of the phenomenon under investigation**, without exploring the mechanisms underlying it
  - The researchable issue in the example could be wherein the benefit of homework-if there is one-lies
    - Example
      - Which components of homework are beneficial?
      - Which ones, if any, are counter productive?
    - If the answers to these questions are known, teachers could better structure homework assignments to enhance students learning and classroom achievement

# Importance of formulating a research problem...

- There are so many important questions unanswered-that we should look for significant problems and not dwell on those that will make little or no contribution

*It can be said with complete confidence that any scientist of any age who wants to make important discoveries must study important problems. Dull or piffling problems yield dull or piffling answers. It is not enough that a problem should be "interesting"-almost any problem is interesting if it is studied in sufficient depth. (p. 13)*

Peter Medawar (1979), a Nobel laureate

- Good research, then, **begins with identifying a good question to ask**-ideally a question that no one has ever thought to ask before

# Identifying a research problem: Guideline

- Look around you
  - In many disciplines, questions that need answers-phenomena that need explanation-are everywhere
  - Continually ask yourself questions about what you see and hear: Why does such-and-such happen? What makes such-and-such tick? and so on

# Identifying a research problem: Guideline...

- Read the literature
  - One essential strategy is to find out what things are already known about your topic of interest
  - Little can be gained by reinventing the wheel
  - In addition to telling you what is already known, the existing literature is likely to tell you **what is not known in the area**
  - Your research project might
    - Address the suggestions for future research that another researcher has identified
    - Replicate a research project in a different setting or with a different population
    - Consider how various subpopulations might behave differently in the same situation
    - Apply an existing perspective or theory to a new situation
    - Explore unexpected or contradictory findings in previous studies
    - Challenge research findings that seem to contradict what you know or believe to be true (Neuman, 2011)

# Identifying a research problem: Guideline...

- Read the literature...
  - Other advantages
    - It gives you a theoretical base on which to generate hypotheses and build a rationale for your study
    - It offers potential research designs and methods of measurement.
    - It can help you interpret your results and relate them to what is already known in the field
  - As you read other people's research related to your topic
    - Take time to consider **how you can improve your own work** because of it
    - **What have I learned** that I would (or would not) want to incorporate into my own research? Perhaps it is a **certain way of writing**, a **specific method of data collection**, or a particular **approach to data analysis**
  - Keep a running record of helpful journal articles and other sources

# Identifying a research problem: Guideline...

- Seek the advice of experts
  - Ask an expert:
    - What needs to be done?
    - What burning questions are still out there?
    - What previous research findings seemingly don't make sense?
  - Some beginning researchers-including many students-are reluctant to approach well known scholars for fear that these scholars do not have the time or patience to talk with novices
    - Quite the opposite is true: Most experienced researchers are happy to talk with people who are just starting out

# Identifying a research problem: Guideline...

- Attend professional conferences
  - By scanning the conference program and attending sessions of interest, they can learn "what's hot and what's not" in their field
  - Conferences are a place where novice researchers can make contacts with more experienced individuals in their field-where they can
    - ask questions
    - share ideas
    - exchange e-mail addresses that enable follow-up communication

# Identifying a research problem: Guideline...

- Choose a topic that intrigues and motivates you
  - As you read the professional literature, attend conferences, and talk with experts, you will uncover a number of potential research problems
  - Pick just one of the potential research problems
    - Selection should be based on **what you personally want to learn more** about
    - The problem you select should be **something you believe is worth your time and effort**, and even one that you are truly passionate

*“You are going to be married to it for a while, so you might as well enjoy it”*

Peter Leavenworth



# Identifying a research problem: Guideline...

- Choose a topic that others will find interesting and worthy of attention
  - Ideally, your work should not end simply with a thesis, dissertation, or other unpublished research report
  - It is good to share your findings => **publish**
  - Future employers, too, make judgment about you, at least in part, based on the topic you have chosen for a thesis or dissertation
    - Your resume or CV will be more apt to attract their attention if, in your research, you are pursuing
      - an issue of broad scientific or social concern
      - a hot topic in your field

# Describing a research problem: Guideline

- At every step in the research process, successful researchers ask themselves
  - What am I doing?
  - For what purpose am I doing it?
  - Such questions help to **focus efforts towards achieving the ultimate goal**
- Researchers get off to a strong start when they begin with an unmistakably **clear statement of the problem**

# Describing a research problem: Guideline...

- State the problem clearly and completely
  - Problem should be so clearly stated that **anyone who reads English can read and understand it**
  - You can state your problem clearly only when you also state it completely
  - Examples of meaningless half-statements-verbal fragments
    - From a student in sociology:  
*Welfare on children's attitudes.*
    - From a student in economics  
*Busing of schoolchildren.*
  - It is essential to think in terms of specific, researchable goals expressed in complete sentences

# Describing a research problem: Guideline...

- State the problem clearly and completely...
  - Examples: Restatement of the problems
    - From a student in sociology:  
*What effect does welfare assistance to parents have on the attitudes of their children toward work?*
    - From a student in economics  
*What factors must be evaluated and what are the relative weights of those several factors in constructing a formula for estimating the cost of busing children in a Midwestern metropolitan school system?*
  - **Note**
    - In the full statement of these problems, the areas studied are **carefully limited** so that the study is of manageable size

# Describing a research problem: Guideline...

- Think through the feasibility of the project that the problem implies
  - Don't rush into a problem without thinking through its implications
  - Example: research proposal

*This study proposes to study the science programs in the secondary schools in the United States for the purpose of ...*

    - US has more than 40,000 public and private secondary schools
      - How will the researcher intend to contact each of these schools?
        - » Visiting each school => could take more than 100 yrs
        - » Post mail => cost of mail preparation and follow up is high
        - » Survey by email => Time to find email addresses of all and follow up
      - Obviously, the researcher did not intend to survey every secondary school in the United States, yet that is what he wrote that he would do
  - It's great to have ideas. It's much better to have practical ideas.

# Describing a research problem: Guideline...

- Say precisely what you mean
  - When you state your research problem, you should say exactly what you mean
  - People will always take your words at their face value: **You mean what you say**
  - Basic rule in academic community
    - Absolute honesty and integrity are assumed in every statement a scholar makes
  - Example: (previous problem statement)

*This study proposes to survey the science programs in selected secondary schools throughout the United States.*

# Describing a research problem: Guideline...

- Say precisely what you mean...
  - If a researcher cannot be meticulous and precise in stating the nature of the problem,
    - others might question whether the researcher is likely to be any more meticulous and precise in gathering and interpreting data

# Describing a research problem: Guideline...

- Say precisely what you mean...

- Problem

- A researcher talks about the problem **but never actually states what the problem is.**
- Example: Problem statement of a student

*The upsurge of interest in reading and learning disabilities found among both children and adults has focused the attention of educators, psychologists, and linguists on the language syndrome. In order to understand how language is learned, it is necessary to understand what language is. Language acquisition is a normal developmental aspect of every individual, but it has not been studied in sufficient depth. To provide us with the necessary background information to understand the anomaly of language deficiency implies a knowledge of the developmental process of language as these relate to the individual from infancy to maturity. Grammar, also an aspect of language learning, is acquired through pragmatic language usage. Phonology, syntax, and semantics are all intimately involved in the study of any language disability.*



# Describing a research problem: Guideline...

- State the problem in a way that reflects an open mind about its solution

- Example

*In this study, I will prove that obese adults experience greater psychological distress than adults with a healthy body mass index.*

- Can this be considered as problem statement?

- No. It is a presumed answer to a research question.

- » Why one proposes to study what the researcher already knows?

- It is difficult to prove something definitively, beyond the shadow of doubt

- Keep your mind open to what you might find

- Hypothesis should not be part of the problem statement

- Example: Re-phrased

*In this study, I will investigate the possible relationship between body mass index and psychological stress, as well as two more specific psychological factors (depression and anxiety) that might underlie such a relationship.*

# Describing a research problem: Guideline...

- Edit your work

- Editing is sharpening a thought to gemlike point and eliminating useless verbiage
- Choose your words precisely, ideally selecting simple words, concrete nouns, and active, expressive verbs
- Many students think that any words that approximate a thought are adequate to convey it to others. This is not so!
  - *Approximation is never precision*
- Example

The diagram shows a paragraph of text with several annotations. A large bracket on the left side groups the first two sentences. An arrow points from the word 'carefully' in the second sentence to the word 'careful' in the first sentence. Another arrow points from the phrase 'sharpening a thought' to the word 'Editing' in the third sentence. A third arrow points from the phrase 'a gemlike' to the words 'straight to the point' in the third sentence. A fourth arrow points from the phrase 'and eliminating useless verbiage' to the words 'eliminating many meaningless expressions' in the fourth sentence. The final sentence is underlined. The text in the diagram is as follows:

You can avoid the difficulties  
^ We have been discussing several common difficulties  
relating to the statement of the problem. These can be  
improved or remedied through a careful editing of your  
words. Editing is a process whereby the writer attempts  
to bring what is said straight to the point. Editing also  
and eliminating useless verbiage. eliminates many meaningless expressions. We should  
therefore, choose our words carefully. By editing the words  
words, concrete nouns, and active, expressive verbs.  
we have written our expression will take on new life.

# Describing a research problem: Guideline...

- Checklist can help you formulate a research problem that is clear, precise, and accurate

## Evaluating the Research Problem

\_\_\_\_\_ 1. Write a clear statement of a problem for research.

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\_\_\_\_\_ 2. Review your written statement and ask yourself the following questions:

- Is the problem stated in a complete, grammatical sentence?
- Is it clear how the area of study will be limited or focused?
- Is it clear that you have an open mind about results that the research effort might yield?

\_\_\_\_\_ 3. On the basis of your answers to the questions in Item 2, edit your written statement.

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\_\_\_\_\_ 4. Look at your edited statement and reflect on the following questions:

- Does the answer to this problem have the potential for providing important and useful answers and information?
- Will the result be more than a simple exercise in gathering information, answering a yes/no question, or making a simple comparison?
- Is the problem focused enough to be accomplished with a reasonable expenditure of time, money, and effort?

\_\_\_\_\_ 5. Looking at the statement once more, consider this: Is the problem really what you want to investigate?

\_\_\_\_\_ 6. Show other research students your work. Ask them to consider the questions listed in Items 2 and 4 and then to give you their comments. With your compiled feedback, edit and

\_\_\_\_\_ write your problem statement once again:

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# Dividing the research problem

- Most research problems are too large or complex to be solved
- Strategy
  - Divide and conquer
- The subparts of the main problem are called subproblems
- From a research standpoint, the subproblems are easier to address and resolve
  - Gives a better idea of how to approach the entire research endeavor

# Dividing the research problem...

- The researcher must distinguish **subproblems from procedural issues** (also called pseudo-subproblems)
- Example of pseudo-subproblems
  - What is the best way to choose a sample?
  - How large should a representative sample of a population be?
  - What instruments or methods should be used to gather the data?
  - What statistical procedures should be used to analyze the data?

# Dividing the research problem...

- Characteristics of sub-problems
  - Each subproblem should be a completely researchable unit
    - A subproblem should constitute a logical subarea of the larger research undertaking
    - It is essential that each subproblem be stated clearly and succinctly
    - Often a subproblem is stated in the form of a question
      - Question tend to focus the researcher's attention more directly on the research target of the subproblem than does a declarative statement
      - Note
        - » Open-minded attitude is the mark of a true researcher

# Dividing the research problem...

- Characteristics of sub-problems...
  - Each subproblem must be clearly tied to the interpretation of the data
    - Each subproblem should involve interpretation as well as collection of data
  - The subproblems must add up to the totality of the problem
    - The subproblems should be checked for
      - Nothing in excess of the coverage of the main problem is included
      - All significant areas of the main problem are covered by the subproblems
  - Subproblems should be small in number
    - If the main problem is carefully stated and properly limited to a feasible research effort, the problem could contain two to six subproblems
    - If more subproblems are found, check
      - If some are actually procedural issues
      - if some might reasonably be combined into larger subproblems
      - if the main problem is more complex than you originally believed
        - » In this case, check if the overall research problem is realistically achievable given the time and resources available

# Dividing the research problem...

- Identifying sub-problems
  - The sum of the parts equals the whole applies here
  - Approaches
    - Paper and pencil
      - Copy the problem on a clean sheet of paper, leaving considerable space between the lines.
      - Read the problem critically to discover the areas that require in-depth treatment before the problem can be resolved.
      - Make sure every subproblem contains a word that indicates the necessity to interpret the data within that particular subproblem (e.g., analyze, discover, compare). Underline this word.
      - Arrange the entire problem, which will now have the subproblems boxed off, in a graphic that shows the research structure of the problem



# Dividing the research problem...

- Identifying sub-problems...
  - Approaches...
    - Brainstorming software
      - Example
        - » Inspiration, BrainStorm, and MindJet
      - Help to construct graphic networks of interrelated concepts, terms, and principles
      - Some software allows you to convert your diagram into an outline that lists major topics and various levels of subtopics

# Ways to avoid possibility of misunderstanding

- **Stating the hypotheses and/or research questions**
  - Describe the specific hypotheses being tested or questions being asked
- **Delimiting the research**
  - Fully disclosing what the researcher intends to do and, conversely, does not intend to do
- **Defining the terms**
  - Giving the meanings of all terms in the statements of the problem and subproblems that have any possibility of being misunderstood
- **Stating the assumption**
  - Presenting a clear statement of all assumptions on which the research will rest

# Stating the research question and hypotheses

- Hypotheses vs Research questions
  - Hypotheses
    - Intelligent, tentative guesses about how the research problem might be resolved
    - Essential to experimental research
    - Not about proof
    - Is about acceptance or rejection depending on what the data-and the data alone-ultimately reveal
  - Research question
    - Do not offer speculative answers related to the research problem
    - Common in qualitative research
  - Both
    - provide guidance for the kinds of data the researcher should collect
    - suggest how the researcher should analyze and interpret the data
    - originate in the subproblems and usually have a one-to-one correspondence

# Stating the research question and hypotheses...

- Distinguishing null hypotheses from research hypotheses
  - Example
    - A team of social workers believe that one type of after-school program for teenagers (Program A) is more effective in reducing high school dropout rates than in another program (Program B)
    - Hypothesis
      - Teenagers enrolled in Program A will graduate from high school at a higher rate than teenagers enrolled in Program B*
    - The hypothesis cannot be proved.
      - Hence, they try to **discredit an opposite hypothesis**
        - There will be no difference in the high school graduation rates of teenagers enrolled in Program A and those enrolled in Program B.*
  - If there is a substantial difference in graduation rates between the two programs (in particular if it is higher for Program A), they can reject the “no difference” hypothesis

# Stating the research question and hypotheses...

- Distinguishing null hypotheses from research hypotheses...
  - Null hypotheses hypothesize that there will be
    - no differences between groups
    - no consistent relationships between variables, or,
    - more generally, no patterns in the data

# Stating the research question and hypotheses...

- Identifying the variables under investigation
  - Variable
    - any quality or characteristic in a research investigation that has two or more possible values
  - Researches that investigate cause-and-effect relationship investigate the extent to which one variable (the hypothesized cause) influences another variable (the hypothesized effect)
    - Independent variable
      - is the hypothesized cause
      - directly manipulated by the researcher
    - Dependent variable
      - is the hypothesized effect
      - influenced by the independent variable as it, to some extent, depends on it
  - Example: Temperature vs. Ice-cream

# Stating the research question and hypotheses...

- Identifying the variables under investigation...

- Mediating variable

- Explain why a certain independent variable has the effect that it does on a dependent variable
- Independent variable influences the mediating variable, which in turn influences the dependent variable

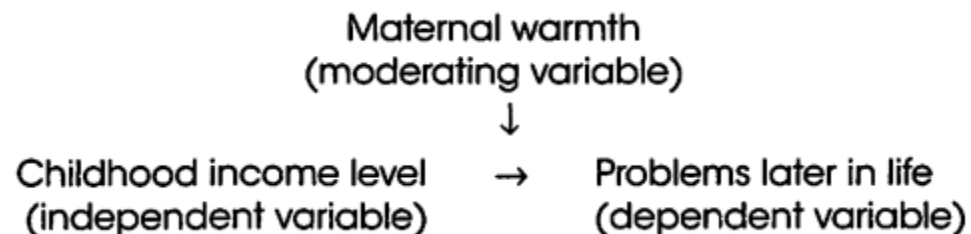
Independent variable ----> Mediating variable ----> Dependent variable

- Example

Confidence ----> Amount of effort ----> Performance quality

# Stating the research question and hypotheses...

- Identifying the variables under investigation...
  - Moderating variable
    - while not intervening between the independent and dependent variables, influences the nature and strength of their relationship
    - Discussed as risk factors or protective factors
    - Example
      - Impact of maternal warmth on the nature of the relationship between family income level and adulthood problems





# Stating the research question and hypotheses...

- Identifying the variables under investigation...
  - Mediating vs moderating variable
    - Independent variable may potentially influence a mediating variable but does not, in and of itself influence a moderating variable
  - Mostly such variables are identified in quantitative research, especially in experimental studies and certain kinds of descriptive studies
  - Identifying dependent and independent variables help in choosing
    - a) an appropriate research design
    - b) an appropriate statistical analysis

# Stating the research question and hypotheses...

- **Delimiting the research problem**
  - Research problem
    - Describe precisely what the researcher intends to do
  - It is also important to know precisely what the researcher does not intend to do
- **Defining terms**
  - What precisely do the terms in the problem and the sub-problems mean?
  - Helps to evaluate the research or determine whether the researcher has carried out what was proposed in the problem statement
  - Example
    - The purpose of the research is to analyze the impact of method X on the performance of system Y.
  - Dictionary definitions are rarely either adequate or helpful
  - Each term should be defined as it will be used in the researcher's project

# Stating the research question and hypotheses...

- Defining terms...

- A formal definition contains

- a) The term to be defined
- b) The genera, or the general class to which the concept being defined belongs
- c) The differentia, the specific characteristics or traits that distinguish the concept being defined from all other members of the general classification

- Note

The researcher must be very careful to avoid circular definitions, in which the terms to be defined are used in the definitions themselves

# Stating the research question and hypotheses...

- Defining terms...

- Operational definition

- Used when it is difficult to define a phenomena clearly
    - Defines a characteristic or variable in terms of how it will be measured in the research study
    - Example
      - Define intelligence as a score on a certain intelligence test
      - Define popularity as the number of peers who specifically identify an individual as being a desirable social partner

# Stating the research question and hypotheses...

- Stating the assumption

- Most researches are difficult to interpret without assumptions
- In research, one should leave nothing to chance in order to prevent any misunderstandings
  - All assumptions that have a material bearing on the problem should be openly and unreservedly set forth
- To discover your own assumptions, ask yourself
  - What am I taking for granted with respect to the problem?

# Formulation of research objective

- Objectives

- Are the goals you set out to attain in your study
- Inform the reader of what you want to achieve through the study
- Two types of objectives
  - Main objectives
  - Sub-objectives
- Main objectives
  - is an overall statement of the thrust of your study
  - is the statement of the main associations and relationships that you seek to discover or establish

# Formulation of research objective...

- Objective...

- Sub-objectives

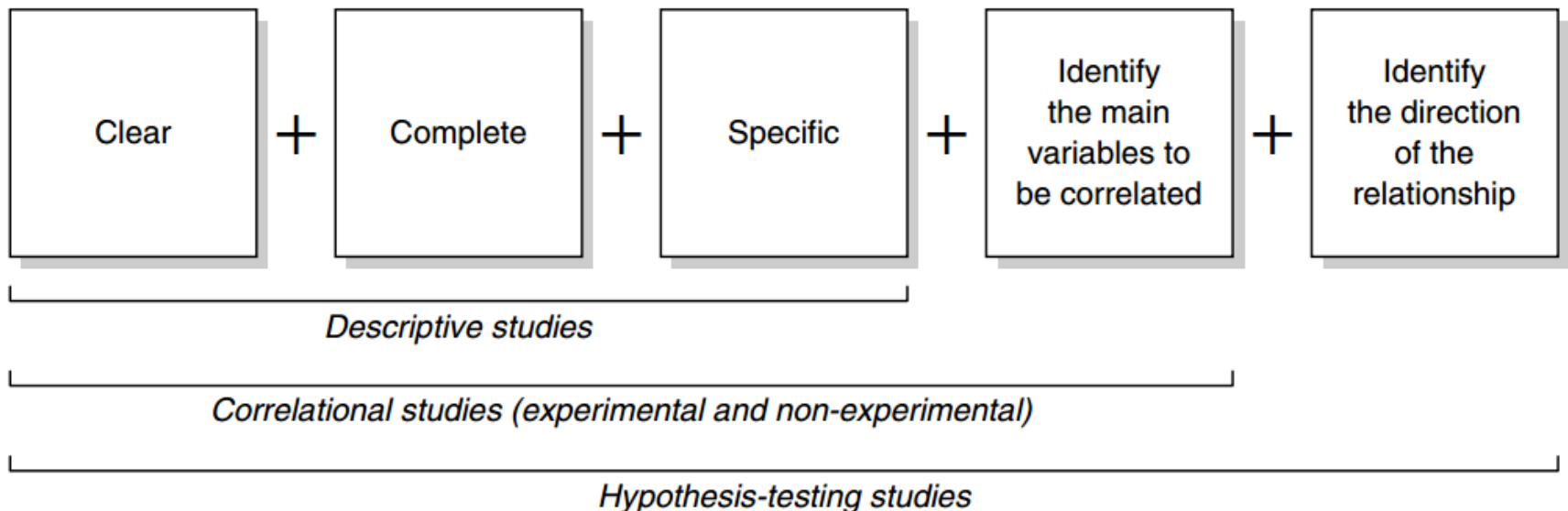
- Are specific aspects of the topic that you want to investigate within the main framework of your study
    - Grow out of your research questions
      - The main difference with research questions is the way in which they are written
      - Objectives transform research questions into behavioral aims by using action-oriented words
    - Use action-oriented words or verbs when writing your objectives
      - Start with phrases such as “To determine”, “to find out”, “to ascertain”, “to measure”, “to examine”, and “to explore”
    - Should be numerically listed
    - Should be worded clearly and unambiguously
    - Should contain only one aspect of the study

# Formulation of research objective...

- Objective...

- Sub-objectives...

- The wording determines how your research is classified (e.g., descriptive, correlational, or experimental) and designed
    - Characteristics of objectives





# Formulation of research objective...

- Objective...

- Sub-objectives...

- Examples of main objective

- Descriptive study

- to ascertain if an increase in youth unemployment will increase the incidence of street crime*

- Correlation study

- to ascertain the impact of migration on family roles or to compare the effectiveness of different teaching methods on the comprehension of students*

- Hypothesis testing

- to ascertain if an increase in youth unemployment will increase the incidence of street crime*

# General steps in formulating a research problem

- 1) Identifying a broad field or subject area of interest to you
  - Ask yourself
    - “What is that really interests me as a professional?”
    - The field in which you want to work (even after graduation)
- 2) Dissect the broad area into subareas
  - Develop an (exhaustive) list of the subareas from various sources
- 3) Select what is of most interest to you
  - From the listed subareas, select issues or subareas about which you are passionate
  - Take other discussed points in to consideration as well in selecting a research problem
  - You can use elimination technique to narrow down the list

# General steps in formulating a research problem...

## 4) Raise research questions

- Ask yourself, 'What is it that I want to find out about in this subarea?'

## 5) Formulate objectives

- Transform research questions into behavioural aims by using action-oriented words
- Some researchers first define objectives and formulate research questions from the objectives

## 6) Assess your objectives

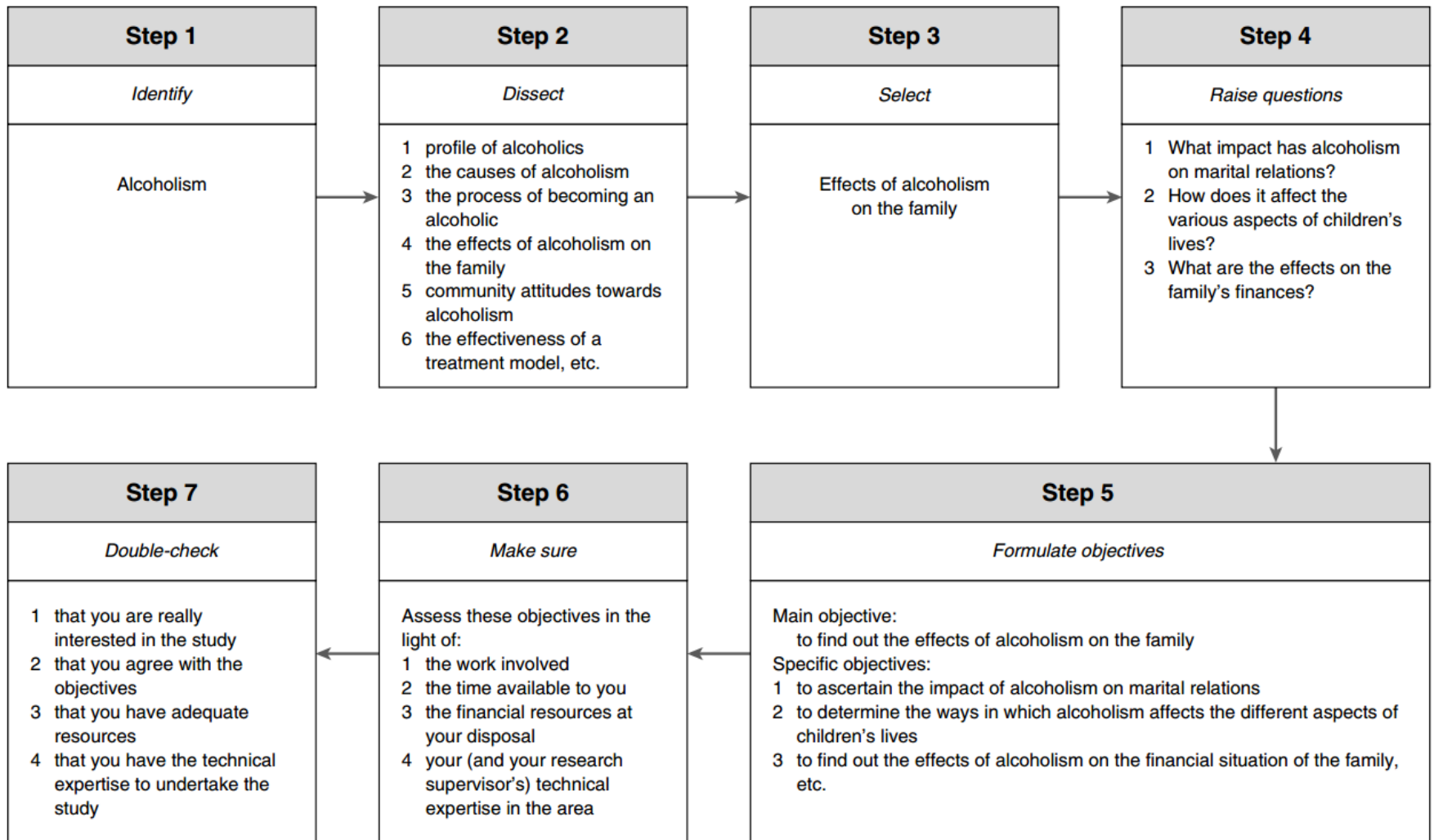
- Examine the objectives to ascertain the feasibility of achieving them through your research endeavor
- Consider them in the light of the time, resources and technical expertise at your disposal

## 7) Double check

- Go back and give final consideration to whether or not you are sufficiently interested in the study and have adequate resources to undertake it
- Ask yourself
  - 'am i really enthusiastic about this study?' and
  - 'do i really have enough resources to undertake it?'

# General steps in formulating a research problem...

- Example



# General steps in formulating a research problem...

- Example...

