Research Question, Objectives & Hypotheses

Objectives:

- Understand the main steps for conducting a high quality research
- Identify the different approaches to find out your research topic
- Recognize how to develop a good research question
- Understand how to formulate specific research objectives
- Describe the research hypothesis

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Resources:

• 436 Lecture Slides + Notes

Important – Notes

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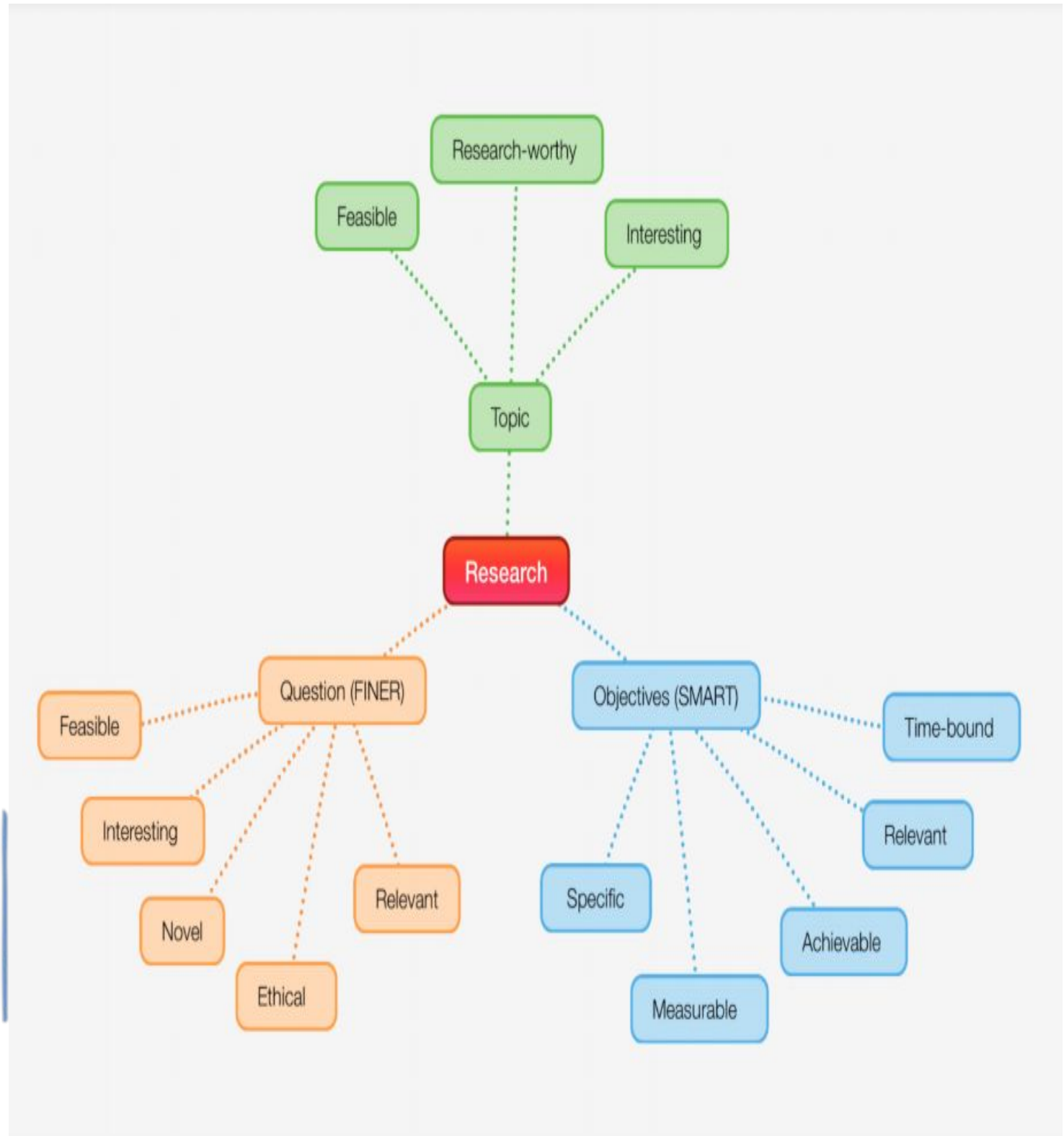
Editing file

Feedback link


Research-worthy
Feasible
Interesting
Topic
Research
Question (FINER)
Feasible
Interesting
Novel
Ethical
Relevant
Objectives (SMART)
Time-bound
Relevant
Specific
Achievable
Measurable

Steps for Conducting a Research:

1- Selecting the research topic	2- Define the research problem
3- Specify the research objectives and hypothesis	4- Develop a research design
5- Design the method of collecting information	6- Manage and implement the data collection
7- Analyze and interpret the results	8- Write a Final research report/manuscript

❖ Research Topic

Why it is Important?

- The first and the foremost difficult task in research.
- The keystone of the entire scientific project.
- It drives the entire study, and is crucial for moving the project forward.

A successful research project starts with a good topic, But how can you decide what to pick?

Tips for Selecting a Research Topic

Why? 1- For funding, people will interest in .my research and funds it 2- For publication

- Choose a topic that you are interested in.
- Consider the scope of your topic (Not too broad, not too narrow)
- Choose a topic that is feasible
- Choose a topic that is "research-worthy"

For example, if the topic needs specific test and this test is not available, so this is not feasible.

Where Do You Get Your Ideas From?

Attending conferences - Discussion with college - Reading previous articles - Area of interest – Clinical observation - Problems in clinical field - news - small group discussion.

Steps For Choosing A Good Research Topic

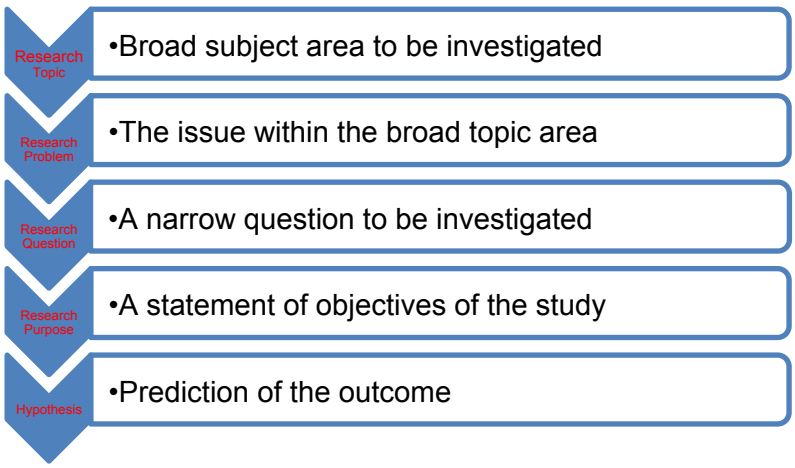
1) Select a broad topic of interest.

2) Narrow it down to an effective research topic

Ask following questions initially

- Do I have, time for this topic at this point during my course?
- Is this really the burning topic for me?
- Will this be worth it?
- Is this a major and relevant public health problem or is it too mysterious?
- Are my goals/objectives too big? Am I covering too much?
- Will available methods answer my questions?
- What are the ethical and human subject issues here?

Flowchart of The Development of a Research Idea:



WHAT IS NEXT? Explore the issue (quick google search) & Start asking questions

Questions to Ask When Exploring:

Who: Which groups have an interest in this topic? (e.g. parents, organizations, students, the government,etc.) Who specifically will you focus on ?I

What: What are the most important issues? What are the different factors involved? What is known about the topic

Where: Where is the topic relevant? Will you focus nationally or internationally? Some sort of comparison

From where you will collect data?

When: When did the situation or event start? Is it ongoing

Why: What interests you about it? Why do you want to write about

Selecting a Research Topic

After selecting "maim topic", these considered "subtopics"

Abnormality	Is the patient sick or well?
Diagnosis	How accurate are tests used to diagnose?
Frequency	How often does a disease occur?
Risk	What factors are associated with an increased risk of disease
Prognosis	What are the consequences of having a disease?
Treatment	How does the treatment change the course of disease?
Prevention	-Does an intervention on well people keep disease from arising? -Does early detection and treatment improve the course of the disease?
Causes	-What conditions lead to disease? -What are the pathogenic mechanisms lead to diseases?
Cost	How much will care for and illness cost?

❖ Research Questions:

•Umbrella questions that address your topic and would use question words.
•Include KEY WORDS that you can use to help you search your topic in a database or search engine,
Questions you DO NOT know the answer to. You are doing the research to gain new knowledge.

- It should be a single sentence in the form of a question
- It should be clear, unambiguous and specific
- It should NOT be too narrow, too broad, or too challenging.

✓ A well-defined and specific research question is the key for making decisions about study design and population and subsequently what type of data will be collected and analyzed.

Factors That Might Help to Develop A Reasonable Research Question:

1. Literature review
2. Time — Fit time period
3. Cost
4. Sufficient number and types of subjects.
5. Ability to collect and store data
6. Ethical issues.

How to Develop A Research Question:

1. Often begins with a general concern.
2. Must be narrowed to measurable and can be able to do research.

Examples:

General Concern	Narrowed Research Question
Should women take hormones to prevent bone loss?	Is taking estrogen associated with a lower risk of osteoporosis in women 60+?
Can a vegetarian diet reverse cardiovascular disease?	Does a plant-based diet reduce serum cholesterol levels in patients with cardiovascular disease?
Can diabetic patients be taught to control their blood glucose levels?	Can a structured intensive diabetes education program help patients with type 2 diabetes control their blood glucose levels?

What Goes In The Research Question?

- Disease or condition of interest
- Population
- Intervention to be tested
- Comparison group(s) -- placebo? Existing treatment?
- Outcome measures

Condition of interest could be risk factor, treatment or prevention

Sample research question:

Interest: Can a vegetarian diet reduce cardiovascular disease?

❖ Research question: Does an entirely plant- based (vegan) diet reduce blood serum cholesterol levels in men over 50 years old with lipid levels > ... compared to a meat- based diet?

Interest: Should women take hormones to prevent bone loss?

❖ Research question: Does w after menopause reduce the likelihood of bone density loss in women over 60 years of age, compared to women not taking estrogen?

Types of Research Questions

- Descriptive: describing a group, exploring
- Relational: associations between two variables in a group
- Comparable: associations between two or more variables (differences) in two or more groups (Causality / prediction / intervention

Examples:

- What is the level of knowledge of "Biostatistics" among 3rd year medical students ?
- Is drug "A" better than drug "B" in the management of hepatic failure in patients with Cirrhosis?
- Is alcoholism related to the development of Cirrhosis liver?

FINER criteria: a good research question: Very important

F	**Feasible** • Adequate number of subjects • Adequate technical expertise • Affordable in time and money • Is it possible to measure the variables?
I	**Interesting to the investigator** • Getting the answer intrigues investigator, peers & community
N	**Novel to the field** • Confirms, refutes or extends previous findings
E	**Ethical** • Amenable to a study that institutional review board (IRB) will approve
R	**Relevant** • To scientific knowledge • To clinical and health policy • To future research

❖ Research Objectives:

What are Objectives

An intent, communicated by a statement describing the plan of the research in clear, measurable term

Importance of Research Objectives

- Bring Focus to the study
- Avoids collection of unnecessary data
- Determines an appropriate study design
- Helps determine analysis plan

Goals and Objectives:

What is the different between goals and objectives? Goals general than objectives.

Goals:

It describes the aim of the work in broad terms (over a longer time period)

Objectives:

These are more specific and relate directly to research question. They may be divided into two types:

Primary objectives → (bound to be achieved)

Secondary objectives → (by the way)

e.g. Primary: to determine the effect of vegetarian diet on the cholesterol level.

Secondary: to assess whether it is different between male and female.

Research Goal & Objectives:

- The goal (aim) and objectives must be stated at the very beginning of the study, since they will guide the investigator during the process of formulating research questions and hypothesis.
- They will also help in the prioritization process.
- They will enable the reader or consumer of the work to judge whether the investigator had achieved these objectives or not.

-**The research objectives should be:**

- Closely related to the research question
- Covering all aspects of the problem
- Very specific
- Ordered in a logical sequence — From most important to least important.
- Stated in action verbs that could be evaluated e.g. **to describe, to identify, to measure, to compare, etc.**
- Achievable, taking into consideration the available resources and time.
- Mutually exclusive, with no repetitions or overlaps.

SMART Objectives: Very important

S	Specific
M	Measurable
A	Achievable
R	Relevant
T	Time-bound

Objective – examples:

To study whether SNP markers are associated with obesity and hypertension phenotypes.
To assess the general population knowledge & attitude towards Organ donation
To identify the risk factors for Type-II diabetes

Example:

Goal: To reduce risk of cardiovascular diseases in Saudi population by developing evidence based interventions
Question (1): Is dietary intake of saturated fats over the past xx weeks related to hypercholestrolemia in Saudi adult population?
Question (2): Is dietary intake of saturated fats over a period of xx months is associated with risk of coronary heart disease in Saudi adult population?
Objective1: To determine the daily intake of saturated fats in the past 4 weeks in Saudi adults
Objective 2: To determine the relationship of dietary intake of saturated fats and blood levels of low density lipoprotein (LDL) in Saudi adults
Objective3: To determine the association of dietary intake of saturated fats and intimal thickness of coronary artery in Saudi adults

❖ Research Hypothesis:

"Research hypothesis is a statement of the research question in a measurable form"

Number or percentage

- A hypothesis can be defined as a prediction or explanation of the relationship between one or more independent variables (PREDISPOSING/RISK FACTORS) and one dependent variable (OUTCOME/CONDITION/DISEASE).
- A hypothesis, in other words, translates the problem statement into a precise, clear prediction of expected outcomes.

It is good to have a hypothesis in the beginning, to ether accepted it or rejected it depending on the results.

Hypothesis formulation

This is based on **existing knowledge**, deriving it through critical reading of literature and facts.

,Example

Always the sentence of hypothesis starts with "it's hypothesized that"

It is hypothesized that average daily intake of saturated fat in Saudi adult population is more than 20% of the .recommended intake when measured by xxx test and yyy standards to define dietary saturated fat intake

:Objective

To determine the relationship of dietary intake of saturated fats and intimal thickness of coronary artery

:Hypothesis

It is hypothesized that > 20% of recommended saturated fat intake in Saudi population will be associated with 50% increased intimal thickness of coronary artery when compared to the normal intimal thickness measured by XYZ

Summary

- What is a Research?

  Systematic collection, analysis and interpretation of data to answer a question

- The main steps in conducting a research?
- A successful research project starts with selecting a good topic
- Tips for selecting research topic:
    - Interesting you
    - Feasible
    - Research worthy
    - Not too broad, not too narrow
- Your research question should be clear, unambiguous and specific
- Important information in a research question
    - Disease or condition of interest
    - Population
    - Intervention to be tested
    - Comparison group(s) -- placebo? Existing treatment?
    - Outcome measures

THE END