Research Problem

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Today's Topics

- Research Process
- Technique involves in defining research problem
- Meaning, source, and criteria of research problem
- Error in selecting a research problem
- Scope and objectives of research problem
- Approaches of investigation of solutions for research problem

Research Process

The following provides procedural guideline for 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. execution of the project;
7. collecting the data;
8. analysis of data;
9. hypothesis testing;
10. generalizations and interpretation, and
11. preparation of the report or presentation of the results.

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Meaning of Research Problem

Professor W.A. Neiswanger correctly states that the statement of the objective is of basic importance because it determines the data which are to be collected, the characteristics of the data which are relevant, relations which are to be explored, the choice of techniques to be used in these explorations and the form of the final report.

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Meaning of Research Problem

Before starting a project, ask "**What is a research problem?"**

Knowledge gap or **a fundamental challenge** in a field, and outcome of research investigations or systematic research study contributes to the solution of the problem.

Refers to some difficulty which a researcher experiences in the context of either a theoretical or practical situation.

Technique Involved in Defining Problem

The technique for the purpose involves the undertaking of the following steps generally one after the other:

1. statement of the problem in a general way;
2. understanding the nature of the problem;
3. surveying the available literature;
4. developing the ideas through discussions; and
5. rephrasing the research problem into a working proposition.

Purpose of a problem statement

1. **Introduce the reader to the importance of the topic being studied**.
2. **Places the problem into a particular context** that defines the parameters of what is to be investigated.
3. **Provides the framework for reporting the results** and indicates what is probably necessary to conduct the study and explain how the findings will present this information.

So what?

- So, What!
- The "So What?" question refers to a research problem surviving the relevancy test [the quality of a measurement procedure that provides repeatability and accuracy]. Note that answering the "So What" question requires a commitment on your part to not only show that you have researched the material, but that you have thought about its significance.

So what?

- So, What!
- To survive the "So What" question, problem statements should possess the following attributes:

1. Clarity and precision [a well-written statement does not make sweeping generalizations and irresponsible statements],
2. Identification of what would be studied, while avoiding the use of value-laden words and terms

So what?

- So, What!

3. Identification of an overarching question and key factors or variables,
4. Identification of key concepts and terms,
5. Articulation of the study's boundaries or parameters,
6. Common cause: regarding applicability and bringing results into general use.

So what?

- So, What!

7. Delivery of the study's importance, benefits, and justification [regardless of the type of research, it is important to address the “so what” question by demonstrating that the research is not trivial],
8. Does not have unnecessary jargon; and,
9. Conveyance of more than the mere gathering of descriptive data providing only a snapshot of the issue or phenomenon under investigation.

https://library.sacredheart.edu/c.php?g=29803&p=185918

Sources of Research Problem

Interviews: Sessions with individuals can provide significant research problems.

Personal experiences: Everyday experiences can be a good source of research problems.

Deductions from theory: Inferences made from generalizations of life in a society.

Interdisciplinary perspective: Helps in understanding complex issues during research.

Relevant literature: Existing research and studies can inspire new research problems.

Source: https://www.helpforassessment.com/blog/sources-of-a-research-problem/

Criteria Characteristics of a Good Research Problem

Criteria for selecting a good research problem:

- Importance to the research area,
- Original,
- Feasible,
- Funding requirement,
- team and management support,
- availability of topics,
- ethics,
- solvable or not,
- interesting,
- clear, verifiable, relevant,
- systematic and logical.

Overview of Research Design and Methods, By: Sue L. T. McGregor In: Understanding and Evaluating Research: A Critical Guide Chapter
DOI: https://doi.org/10.4135/9781071802656.n8

Common Errors in Selecting a Research Problem

Its key crucial step in the research process. A well-defined problem can guide your research and make it more meaningful.

1. More than usually Rated Problem:

   Too wide-ranging: A problem that's too vast can be difficult to manage.

   Too small: A problem that's too specific might limit the impact of results.

Common Errors in Selecting a Research Problem

2. Lack of motivation:

   Lack of interest: If you're not genuinely interested in your topic, it can be challenging to stay motivated throughout the research process.

   Lack of passion: A lack of passion can lead to a less engaging and impactful research project.

3. Too little Research Background:

   Lack of knowledge: If you don't have a solid understanding of the existing literature, you may struggle to identify a significant research gap.

Common Errors in Selecting a Research Problem

4. Ethical Concerns:

   Potential harm: Some research topics may involve ethical concerns, such as causing harm to participants or violating law of land.

5. Practical Limits:

   Limited resources: Lack of funding, time, or equipment can hinder your ability to conduct research.

   Institutional restrictions: Your institution may have policies or regulations that limit the types of research you can undertake.

Common Errors in Selecting a Research Problem

6. Lack of Originality:

   Repetitive research: Conducting research that has already been extensively studied (waste of time funds etc.)

7. Over dependence on 2nd and 3rd Sources:

   Relying solely on secondary sources (must reach to the primary sources)

Scope and Objectives of a Research Problem

Objectives

Brief and to the point: that describe what the research aims to achieve, and how it will answer the primary goal

Defining the scope and objectives of a research problem:

Define the scope:

Consider research methodology, population, sample size, data collecting instruments, timeline, budget, and any criteria.

Scope and Objectives of a Research Problem

Defining the scope and objectives of a research problem:

Define the objectives

- You must ensure that objectives are selective, specific, measurable, achievable, important, time bound and must be logical.

Get feedback

- Have a research expert or guide or mentor or advisor review the scope and objectives before starting the research

Scope and Objectives of a Research Problem

- Scope

1. They are the boundaries and goals of a research project
2. Defines what work will be carried out and what won't be covered while addressing the research problem
3. It helps to make sure that the research stays focused and on track to accomplish its targets

Approaches of investigation of solutions for research problem

There are two basic approaches to research, viz., **quantitative approach** and the **qualitative approach**.

Quantitative approach involves the generation of data in quantitative form which can be subjected to rigorous quantitative analysis in a formal and rigid fashion.

Qualitative approach to research is concerned with **subjective assessment of attitudes, opinions and behavior**. Research in such a situation is a function of researcher's insights and impressions.

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Criteria of Good Research

One expects scientific research to satisfy the following criteria:

1. The purpose of the research should be clearly defined, and common concepts be used.

2. The research procedure used should be described in sufficient detail to permit another researcher to repeat the research for further advancement, keeping the continuity of what has already been attained.

3. The procedural design of the research should be carefully planned to yield results that are as objective as possible.

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Criteria of Good Research

4. The researcher should report with complete frankness, flaws in procedural design and estimate their effects upon the findings.

5. The analysis of data should be sufficiently adequate to reveal its significance, and the methods of analysis used should be appropriate. The validity and reliability of the data should be checked carefully.

6. Conclusions should be confined to those justified by the data of the research and limited to those for which the data provide an adequate basis.

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Criteria of Good Research

7. Greater confidence in research is warranted if the researcher is experienced, has a good reputation in research and is a person of integrity

In other words, we can state the qualities of a good research as under:

1. Good research is systematic
2. Good research is logical
3. Good research is empirical
4. Good research is replicable

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Ethics in Engineering Research

- Extremely important as engineered products deal with humans
- Failure in engineering research outcome may lead to
  - Casualties, health hazards, pollution
  - Property loss, hit on economy
- Professional societies regulate the activities of practicing engineers and industry

Ethics in Engineering Research

- Practicing engineer should
  - Exchange of information freely with other practitioners
  - Adhering to code of ethics
  - Holistic view of the project
  - Maximize benefit of all stakeholders

Summary

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2. Technique involves in defining research problem
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