

IQRA National University  
Department of Electrical  
Engineering Subject: Research  
Methodologies



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**Question No: 1**

- a) List down different steps involve in research process?  
(10)
- b) Explain different steps involve in formulating a research problem?  
(10)

**Question No: 2**

- a) A traditional research design is a blue print or detailed plan for how a research study is completed, list steps involved in planning a research study? (10)
- b) Differentiate between Qualitative and Quantitative Methods of research.  
(10)

**Question No: 3**

How study design is selected based on nature of investigation?

(10)

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😊 Good Luck 😊

## **ANSWER NO: 1 Part (A)**

### **Following Eight steps are involved in research process:**

1. Formulating a research problem (Deciding)
2. Conceptualizing the research design
3. Constructing an instrument for data collection (Planning)
4. Selecting a sample
5. Writing a research proposal
6. Collecting data
7. Processing Data (Doing)
8. Writing a research report

## **ANSWER NO: 1 Part (B)**

### **The following four steps are involved in formulating a research problem:**

1. Reviewing the literature
2. Decide what you want to find out about? (Formulating a research problem)
3. Identifying variables
4. Constructing hypotheses

### **(1) Literature Review:**

The **literature review** is an integral part of the research process and makes a valuable contribution to almost every operational step.

#### **Steps for reviewing the literature:**

- a. Search for existing literature in your area of study
- b. Review the literature selected
- c. Develop a theoretical framework
- d. Develop a conceptual framework

### **(a).Searching the existing literature:**

To search effectively for the literature in your field of enquiry, it is imperative that you have at least some idea of the broad subject area and of the problem you wish to investigate, in order to set parameters for your search.

Keeping in mind a vague idea of the research problem you want to undertake, the following sources are useful for searching the existing literature:

- Books
- Journals
- Conferences' proceedings
- Other electronic documents (such as Patents, RFCs etc.)
- Web Pages
- Seminars

### **(b) Reviewing the literature selected:**

Now that you have identified several books and articles as useful, the next step is to start reading them critically to pull together themes and issues that are of relevance to your study. Unless you have a theoretical framework of themes in mind to start with, use separate sheets of paper for each theme or issue you identify as you go through selected books and articles.

Start Reading the *Material* selected (is it literature review?)

**No!** So, read critically with reference to the following aspects:

1. Note whether the knowledge relevant to your theoretical framework is confirmed.
2. Note the theories presented, the criticisms of these theories, the methodologies adopted to counter/confirm them (e.g. study design, sample size, measurement procedures etc.).
3. Examine to what extent the findings can be generalized for other situations.
4. Examine the differences of opinion among other researchers and try to formulate your opinion about the validity of these differences.

### **(c) Develop a theoretical framework:**

Examining the literature can be a never-ending task, but as you have limited time it is important to set parameters by reviewing the literature in relation to some main themes pertinent to your research topic.

- After reviewing the literature you may find that the problem you wish to investigate has its roots in a number of theories that have been developed from different perspectives.
- The information obtained from different books and journals now needs to be sorted under the main themes and theories, highlighting agreements and disagreements among authors and identifying the unanswered questions or gaps.
- Use these aspects as a basis for developing your theoretical framework.

### **(d) Developing a conceptual framework:**

The conceptual framework is the basis of your research problem. It stems from the theoretical framework and usually focuses on the section(s) which become the basis of your study.

- The conceptual framework stems from the theoretical framework which becomes the basis of your study.
- It describes the aspects you selected from the theoretical framework to become the basis of your inquiry.
- Hence, the conceptual framework is the basis of your research problem.

## **(2) Decide what you want to find out about? (Formulating a research problem):**

Steps in the formulation of a research problem:

1. Identify a broad field or subject area of interest to you
2. Dissect the broad area into subareas
3. Select what is of most interest to you?
4. Raise research questions
5. Formulate objectives
6. Assess your objectives (feasibility in terms of time, resources, data availability etc.)
7. Double check (go back and give final considerations)

Formulating the objectives:

#### **Main objectives**

Overall statement of the thrust of your study

The statement of the main associations and relationships that you seek to discover or establish

## Sub objectives

Should be listed numerically

Each sub objective contains only one aspect of the study

Sources of Research Problems:

1. People
2. Problems
3. Programs
4. Phenomena

Considerations in selecting a research Problem:

1. Interest
2. Magnitude
3. Measurement of concepts
4. Level of expertise
5. Relevance
6. Availability of data and resources
7. Ethical issues

### **(3) Identifying variables:**

The definition of a variable:

We all make value judgments constantly in our daily lives.

E.g. “this food is *excellent*”, “I could not sleep *well* last night”, “I think this is *wonderful*”

These are judgments based upon our own preferences, indicators or assessments.

Therefore, the basis on which they are made may vary from person to person.

These preferences are called **concepts**.

Now let us consider these examples:

“This program is effective”, “This is a *waste* of time”, “this product is not doing *well*”, “we are providing a *quality* of service to our clients”

These are not preferences. Rather, they are judgments that require a sound basis on which to proclaim.

This warrants the use of a measuring mechanism and it is in the process of measurement that knowledge about variables plays an important role.

An image, perception or concept that is capable of measurements– hence capable of taking on different values– is called a variable.

### **(4) Constructing Hypothesis:**

The definition of Hypothesis:

- A proposition, condition, or principle which is assumed, perhaps without belief, in order to draw out its logical consequences and by this method to test its accord with facts which are known or may be determined.
- A proposition that is stated in a testable form and that predicts a particular relationship between two or more variables. If we think that a relationship exists, we first state it as a hypothesis and then test the hypothesis in the field

A hypothesis could be either:

- Right
- Partially right
- wrong

The functions of a hypothesis:

- To conduct a research study requires a hypothesis but it is not essential ingredient.

- However, a hypothesis is important in terms of bringing clarity to the research problem. It serves the following functions:
  - Provides a study with focus
  - Tells you what data to collect
  - It enhances the objectivity in the study
  - Enables to formulate a theory since it helps in concluding what is true or what is false.

The characteristics of a hypothesis:

- A Hypothesis should be simple, specific and clear.
- A hypothesis should be capable of verification.
- A hypothesis should be related to the existing body of knowledge.
- A hypothesis should be operational sable.

## **ANSWER NO: 2 (Part A):**

A traditional research design is a blue print or a detailed plan for how a research study is to be completed. It includes:

- ❖ Operationalizing variables so that they can be measured
- ❖ Selecting a sample of interest to study
- ❖ Collecting data to be used as a basis for testing hypothesis
- ❖ Analyzing the results

### **Steps involved in planning a research study**

Following four steps are involved in planning a research study:

#### **1) Conceptualizing a research design**

An extremely important feature of research is the use of appropriate methods. Research involves systematic, controlled, valid and rigorous exploration and description of what is not known and establishment of associations and causation that permit the accurate prediction of outcomes under a given set of conditions. It also involves identifying gaps in knowledge, verification of what is already known and identification of past errors and limitations. The strength of *what* you find largely rests on *how* it was found.

The main function of a research design is to explain *how* you will find answers to your research questions. The research design sets out the specific details of your enquiry. A research design should include the following: the study design per se and the logistical arrangements that you propose to undertake, the measurement procedures, the sampling strategy, the frame of analysis and the timeframe.

#### **2) Constructing an instrument for data collection**

Anything that becomes a means of collecting information for your study is called a 'research tool' or a 'research instrument', for example observation forms, interview schedules, questionnaires and interview guides.

The construction of a research instrument is the first ‘practical’ step in carrying out a study. You will need to decide how you are going to collect data for the proposed study and then construct a research instrument for data collection.

### 3) Selecting a sample

The accuracy of your findings largely depends upon the way you select your sample. The basic objective of any sampling design is to minimize, within the limitation of cost, the gap between the values obtained from your sample and those prevalent in the study population.

The underlying premise in sampling is that a relatively small number of units, if selected in a manner that they genuinely represent the study population, can provide – with a sufficiently high degree of probability – a fairly true reflection of the sampling population that is being studied. When selecting a sample you should attempt to achieve two key aims of sampling the avoidance of bias in the selection of a sample; and the attainment of maximum precision for a given outlay of resources.

### 4) Writing a research proposal

Having done all the preparatory work, the next step is to put everything together in a way that provides adequate information about your research study, for your research supervisor and others. This overall plan, called a research proposal, tells a reader about your research problem and how you are planning to investigate. Broadly, a research proposal’s main function is to detail the operational plan for obtaining answers to your research questions. In doing so it ensures – and reassures the readers of – the validity of the methodology to obtain answers accurately and objectively.

## **ANSWER NO: 2 PART (B):**

### **Difference between Qualitative and Quantitative Methods of research:**

#### **Quantitative research**

Focuses on testing theories and hypotheses

Analyzed through math and statistical analysis

Mainly expressed in numbers, graphs and tables

Requires many respondents

Closed (multiple choice) questions

Key terms: testing, measurement, objectivity, replicability

#### **Qualitative Research**

Focuses on exploring ideas and formulating a theory or hypothesis

Analyzed by summarizing, categorizing and interpreting

Mainly expressed in words

Requires few respondents

Open-ended questions

Key terms: understanding, context, complexity, subjectivity

## **ANSWER NO: 3**

### **Study designs based on the nature of the investigation:**

On the basis of the nature of the investigation, study designs in quantitative research can be classified as:

#### **1) Experimental:**

- ❖ If a relationship is studied by starting from the cause to establish the effects, it is called experimental study.
- ❖ The independent variables can be observed, introduced, manipulated, or controlled by the researcher or someone else.

#### **2) Non-experimental:**

- ❖ If a study focuses on starting from the effects to trace the cause, it is classified as a non-experimental study.
- ❖ Variables cannot be introduced/manipulated etc. As the assumed cause has already occurred. Instead, the researcher retrospectively links the cause to the outcome.

#### **3) Quasi- or semi-experimental:**

- ❖ A mixture of traits of both experimental and non-experimental study designs