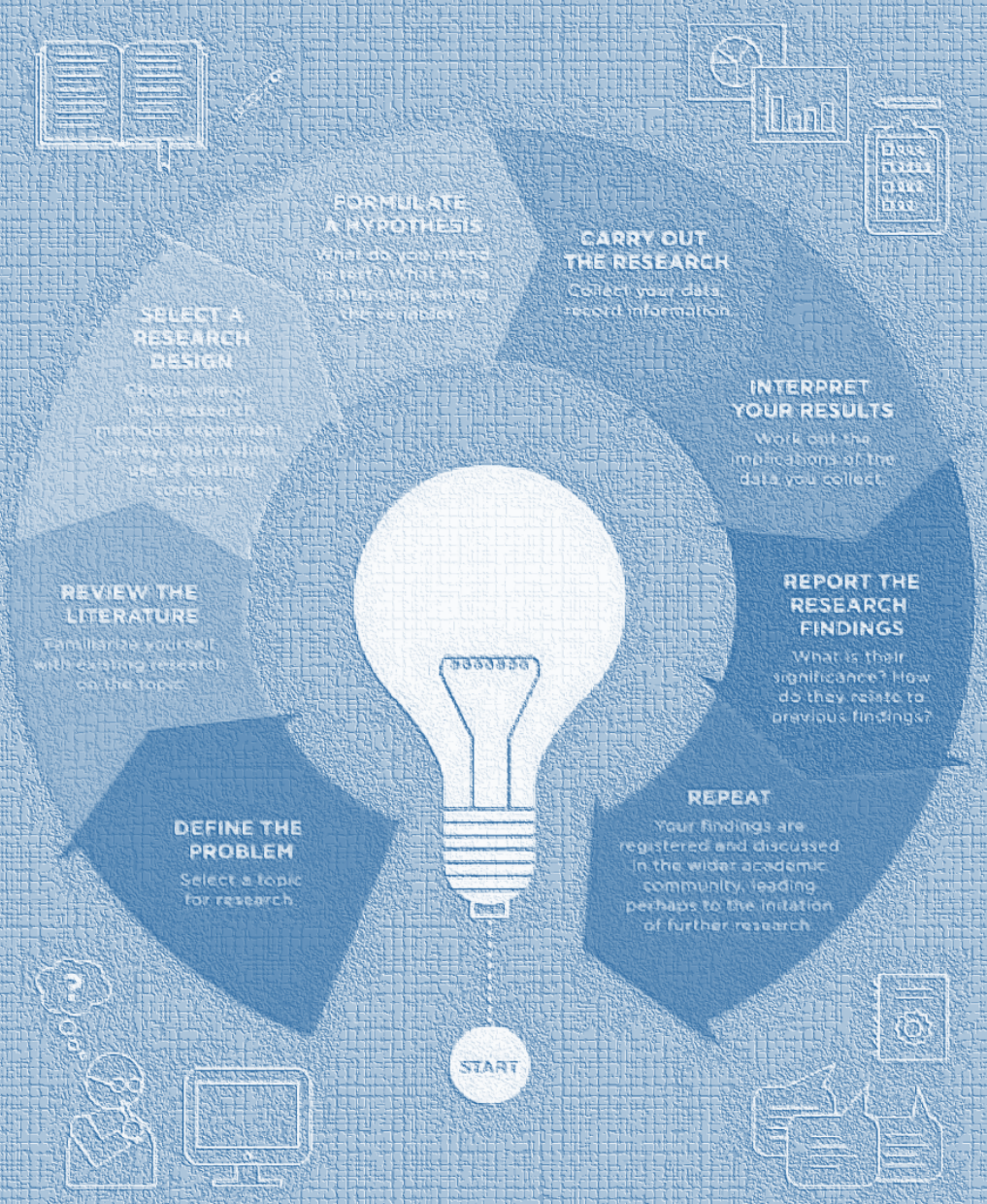
College of Defence Management

Victory through Excellence



A Guide to Research

A GUIDE TO RESEARCH

CONTENTS

CHAPTER I

RESEARCH AND SCIENTIFIC METHOD

1. Quest of knowledge has played an important role in the progress of human civilisation. Research is a basic human instinct and has played an unparalleled role in the development of human civilisation. Records bear testimony to all the concerted and continuous efforts for exploring and experimenting with unknown mysteries and known facts of nature. This activity to seek truth is referred to as RESEARCH.

2. **Meaning of Research**. The English word 'research' is derived from the French word *'recherche '* which means to seek again, explore or investigate. Research is an activity directed at the "systematic search for pertinent information on a topic. Research is an intellectual activity undertaken with the object of advancing the frontiers of human knowledge and abilities. ***Research is the formal and systematic work undertaken to build new knowledge and test existing knowledge.***

3. **Relevance of Research in Military**. **Problem-solving and decision-making** in the military as in any other organization depends upon the knowledge of the individual. Knowledge is 'actionable information' that comprises facts, values, insight and framed experiences. At present, most of us resort to base our study of a problem on previous data and apply our intuition/hunch (may be based on our service experience) and offer our recommendations. **Research, on the other hand, is a systematic way of identifying/ understanding a problem and arriving at solutions**. We, as strategic leaders, need to change our mindset and promote original research work rather than merely using or consuming existing knowledge.

Research and Knowledge

4. Research, as has been defined, is any formal work undertaken systematically to increase the stock of knowledge. What is Knowledge? Plato had said that **Knowledge is justified true belief**. It comprises **values, framed experiences, beliefs, insights and facts** taken from various sources which drive our action. We imbibe values and insights from our parents and teachers, facts from our education and make sense of the experiences based on education and values. The values and experiences could be completely subjective as these are based on an individual's interpretation of facts. So, while these could be used for taking individual or personal decisions, these cannot be used for making organisational decisions. For example, while one may buy a car for personal use based on one's liking of the shape or colour of the car, the same yardstick is not appropriate for buying a vehicle from public money.

5. There are four methods of acquiring knowledge – **Tenacity, Authority**, **Apriori and Scientific**.

(a) When knowledge is acquired based on **an individual's values and beliefs, it is referred to as tenacity and is the least sophisticated method of acquiring knowledge.** What we believe is determined by what we have believed all along and it may be completely idiosyncratic. The stereotyping that we do of people based on their race, nativity etc. fall in this category**.**

(b) **Authoritative method** of acquiring knowledge is when someone who is highly **respected, states a fact** and the fact is accepted without proof. What we believe is determined by our evaluation of the credibility of the source of the knowledge e.g. Doctors prescription.

(c) **Apriori method** which is also called a method of a **reasonable man**. This method rests on the idea that the propositions submitted are self-evident, that is, they agree with reason & passes the scrutiny of social process. Truth is determined by whatever criteria we wish to establish for reasonableness e.g. a child does not need to be given proof of his/ her mother; it is evident.

(d) The final method of justifying your beliefs is the **method of science**. Unlike any of the other methods of knowing, science demands that we support **our internal beliefs with external evidence,** which is observable and not based on an **individual's belief**. Further, as it is evidence-based the knowledge acquired through the method of science is amenable to being proved false.

(e) To link all four methods of knowing, we may take a **tenaciously held belief, elevate it by finding an authority that will vouch for it, and further justify it to reasonable men by showing its logic and prove it scientifically**. Earth is round, links all four methods of knowing.

(f) Science is, therefore, an activity that contributes systematised information to the world. Scientist's job is to discover new facts and add them to the existing pool of information. Therefore, when we talk about the methods of doing research or establishing knowledge, **the scientific method** is accepted as the **most credible** and is considered as the **'gold standard'** to undertake research.

Scientific Research Method: What does it Mean

6. **Science** refers to a systematic and organized body of knowledge in any area of inquiry that is acquired using "**the scientific method**". **Natural science** is the science of naturally occurring objects or phenomena, such as light, objects, matter, earth, celestial bodies, or the human body. Natural sciences can be further classified

into physical sciences, earth sciences, life sciences, and others. In contrast, **social science** is the science of people or collections of people, such as groups, firms, societies, or economies, and their individual or collective behaviors. It involves the study of human behavior, perceptions, feeling emotions etc. In the Armed Forces, research is mainly concerned with the understanding and predicting the behavior of individuals, groups, organisations, societies and nations as a whole. Thus, research done by us, falls in the category of **social science** research.

7. The purpose of science is to create **Scientific Knowledge** which refers to a generalised body of laws and theories to explain a phenomenon or behaviour of interest that are acquired using the scientific method. The goal of scientific research is to build scientific knowledge i.e. **discover laws** and postulate **theories** that can explain **natural or social** phenomena. Scientific laws or theories arrived through a process of logic and evidence. **Logic (theory)** and **evidence (observations)** are the two, and only two, pillars upon which scientific knowledge is based. Thus, in scientific research, **theories** and **observations** are interrelated and cannot exist without each other. **Theories provide meaning and significance to what we observe, and observations help validate or refine existing theory or construct new theory**.

8. In a nutshell, Scientific method is a systematic step by step procedure following the logical process of reasoning. It is an **objective, logical and systematic approach**, which is free from **personal bias or prejudice**, the results of which are **capable of being verified**. The scientific method must satisfy four key characteristics:-

(a) **Logical**. Inferences must be based on logical principles of reasoning.

(b) **Confirmable**. Inferences derived must match with observed evidence.

(c) **Repeatable**. Other researchers should be able to independently replicate or repeat a scientific study and obtain similar, if not identical, results.

(d) **Scrutinisable**. The procedures used and the inferences derived must withstand critical scrutiny (peer review) by other researchers.

9. **Scientific Method in Social Science Research**. We have already seen and understood that the scientific method is the most credible and the knowledge built through this method is most suited for organisational decisions. The scientific method of inquiry is based on **empirical and measurable evidence** subject to specific principles of reasoning. Since social science research deals with human beings and their inner feelings/ perceptions/ beliefs, it is very difficult to develop objective criteria to understand their behavior. This dichotomy is resolved by ensuring that social science research methods comply as closely as possible to the tenets of **scientific methods**. Thus, the **scientific method does not refer to a field of science or**

specific subject of matter, but rather to procedure or mode of investigation. The scientific method employed in the **social sciences is not the method of natural sciences; it is only inspired by the scientific method**.

10. **<u>Forms of Scientific Enquiry/Logical Reasoning</u>**.

(a) As we know **theory and observations** are the pillars of scientific research and the two are interrelated. The scientific inquiry may take one of the two possible forms – **Deductive and Inductive**. These are also referred to as broad methods of **logical reasoning**. The type of logic used indicates the **role of research in relation to theory.**

(b) In case the researcher uses deductive logic/ reasoning, the goal is to test concepts and patterns known from theory using new empirical data i.e. the ***process of verifying predictions made by the theory.*** Thus, research using deductive inquiry is **theory-testing** research and this process uses theory to make a prediction/ hypothesis which is subjected to a carefully designed experiment/ research for testing.

(c) Inductive reasoning works the other way, moving from specific observations to broader generalizations and theories. In case **inductive logic/ reasoning** is **followed**, the goal of a researcher is to infer theoretical concepts and patterns from observed data i.e. **the process of experimenting with reality to create or modify the theory**. Inductive research is called **theory-building** research. The induction process involves the generation of data from the carefully designed experiments/ research whose result is observed to **either create or modify the existing theory**. Thus, induction is the process of drawing conclusions based on facts or observed evidence.

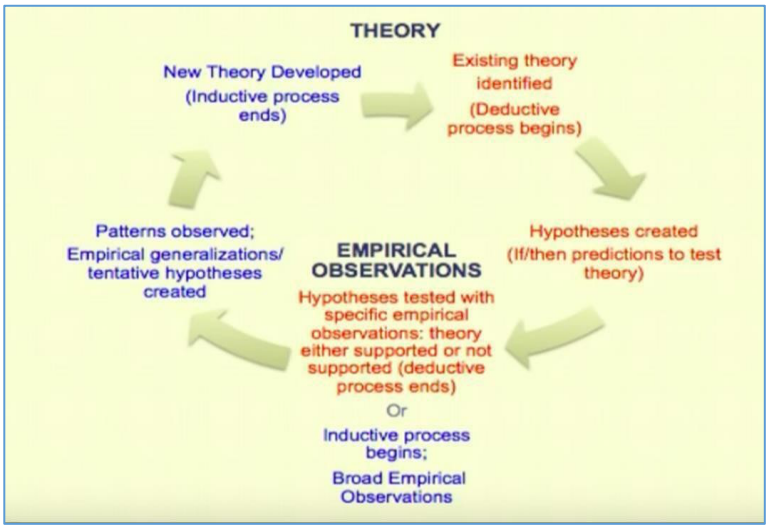


Fig 1.1– Inductive/ Deductive Logical Reasoning

Types of Research

11. Research types can be looked at from three different perspectives:-

(a) Applications of the findings of the research study.

(b) Objectives of the study.

(c) Mode of enquiry used in conducting the study.

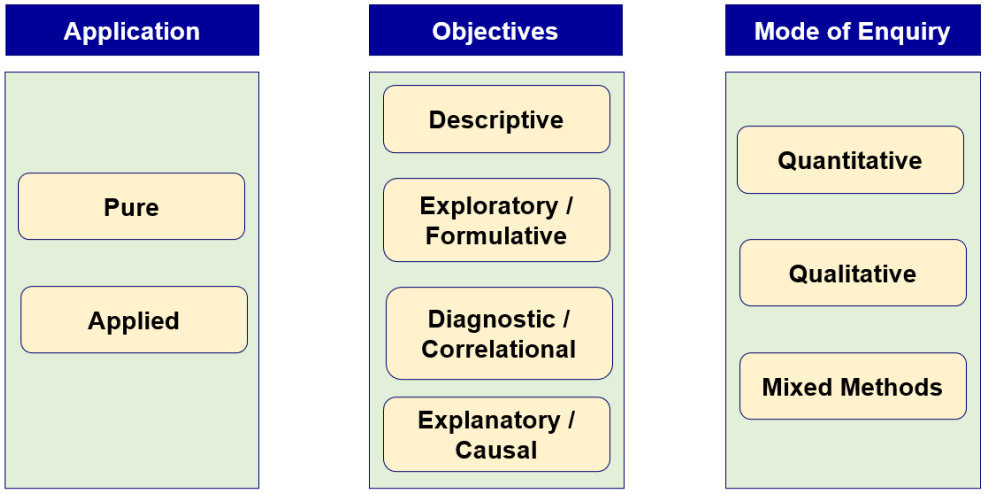


Fig 1.2-Types of Research

12. The classification of the types of a study based on these perspectives is not mutually exclusive: that is, a research study classified from the viewpoint of '**Application**' can also be classified from the perspectives of '**Objectives**' and '**Enquiry Mode**' employed.

13. **Pure and Applied Research**. Scientists, mathematicians, R&D laboratories engage mostly in Pure research. They add to the already existing knowledge base and contribute to building/ redefining theories/ concepts. Applied research aims at finding solutions for the immediate problem being faced by an organization, the central aim is to discover a solution for some pressing practical problem. In Armed Forces, research undertaken falls in the domain of Applied research.

14. **Objectives**. From the perspective of **objectives of research** which can be to gain familiarity, describe/ determine the impact of phenomena, explain relationships between various aspects etc., research undertaken in the Armed Forces can generally fall under the following categories: -

(a) **Descriptive**. Descriptive research attempts to **describe systematically a situation, problem, phenomenon, service or program**.

(b) **Exploratory/ Formulative**. This research is undertaken to **explore an unfamiliar subject area about which either little or no information is available** with an aim to gain familiarity or achieve new insights.

(c) **Diagnostic/ Correlational**. The main emphasis is to **discover or establish the existence of a relationship / association / interdependence between two or more variables**. These studies determine the frequency with which something occurs or its association with something else. E.g. Causes of frequent accidents of MIG aircraft.

(d) **Explanatory/ Causal**. This research explains the causes of social phenomenon. It attempts to establish a relationship between variables ie to identify the extent and nature of **cause-and-effect** of one variable on the other. E.g. Stressful living and heart attacks.

(e) Although theoretically a research study can be classified in one of the above categories from the perspective of objectives, in practice, most studies are a combination of either of them.

15. **Research Approaches**. From the point of the **mode of enquiry**, there are two approaches to research: **quantitative (structured approach)** and **qualitative (unstructured approach**). The former involves the generation of data in a quantitative form which can be subjected to rigorous quantitative analysis and this type of research helps you to quantify the variation and diversity. Since, the quantitative approach needs a theoretical base to quantify reality, it uses deductive logic. **A qualitative approach** to research is concerned with subjective assessment of attitude, opinions and behaviour. The main objective of a qualitative study is to **describe the variation and diversity** in a phenomenon, situation or attitude with a very flexible approach, it generates data in a non-quantitative form which are not subjected to rigorous quantitative analysis. Since, the qualitative approach needs to identify patterns to generalize and describe reality, it uses inductive logic to build theory. For example, if the teaching methodology at CDM were to be assessed, a quantitative approach would categorise it as Excellent, Good, Fair or Bad (or on a scale of 1 to 10) based on quantified parameters, while a Qualitative approach may describe the teaching methodology in terms of pedagogy, infrastructure, perceptions of environment etc. Quantitative and Qualitative are the two Paradigms that form the basis of social science research. Though these may provide values, terminology, methods and techniques for you to apply to your research, it is the **purpose** of research rather than the paradigm that should determine the mode of enquiry. However, most real-life problems are neither completely quantitative nor completely qualitative, it lies on a continuum of the two. Mixed Research Strategy employs both strategies to solve a problem or explain a phenomenon.

Criteria of Good Research

16. Whatever may be the type of research work/ studies, the important aspect is that they all should meet the following criteria to be characterised as good research.

(a) **Formal**. Means that it follows a structured research style that allows students and researchers to present their findings in a detailed, almost scientific manner.

(b) **Public**. It means that any research is meant for public consumption and would not be considered proper if not open to public scrutiny. In case of classified research the scope of "Public" may be limited to authorised people.

(c) **Systematic**. Research work is structured with specified steps to be taken in a specified sequence in accordance with the well-defined set of rules. It does not rule out creative thinking, but it certainly does reject the use of guessing and intuition in arriving at conclusions.

(d) **Replicable**. The methods, techniques and procedures that are used for operationalising various steps of the research process should be explained in sufficient detail so that these can be replicated by any other researcher.

(e) **Empirical**. Research provides concrete data and evidence that forms the basis for external validity to research results.

(f) **Critical**. The process adopted and the procedures used must be able to withstand critical scrutiny.

(g) **Valid and Verifiable**. The conclusions reached by the researcher based on findings are correct and can be verified by others.

CHAPTER II

RESEARCH STRATEGY & PROCESS

Research Strategies

1. Research Strategy is the **overall orientation of the research-work or a broad approach towards research**. In Social Sciences, **Quantitative and Qualitative** are the two broad approaches/ strategies towards research. There is also a mixed approach which optimally employs both Quantitative and Qualitative strategies.

2. **Quantitative Research Strategy**. Quantitative research can be construed as a research strategy that emphasizes quantification in the collection and analysis of data. Quantitative research works with statistics or numbers that allow researchers to quantify the world/ reality. It seeks to quantify the social phenomenon and explains the same based on existing theories. It entails a **deductive approach** to the relationship between theory and research in which the emphasis is on testing the theories. It deals with objective criteria and positive evidence.

3. **Qualitative Research Strategy**. By contrast, qualitative research can be construed as a research strategy that usually emphasizes words rather than quantification in the collection and analysis of the data. The qualitative researcher wants to interpret the observed data. It predominantly emphasizes on **inductive approach** to the relationship between theory and research, in which the emphasis is placed on generation or building of theories. In this strategy, social reality is built based on perceptions constructed by individuals based on their interactions ie how individuals interpret the social world and seek to find the inner reality of the social actors. This approach seeks to develop **concepts and theories** to explain an existing phenomenon or solve an existing problem.

4. **Mixed Research Strategy**. No problem is completely quantitative or qualitative in nature. Mixed Research Strategy employs a mix of quantitative and qualitative strategies to solve a problem or explain a phenomenon. In this strategy, a single research project integrates both quantitative and qualitative strategies. Depending on the timing for collection and analysis of data, the Mixed Research Strategies may be Sequential or Concurrent, besides the considerations of Mixing, Weighting and Theorising or Transforming Perspectives.

5. **Selection of the Research Strategy**. The selection of research strategy is based on the **Researcher's Knowledge of Existing Theories** (If an existing problem or social phenomenon can be explained based on existing theory, the researcher is likely to follow a deductive approach. If not, the researcher would endeavor to develop a theory to explain the phenomenon or problem), the **World View of the Researcher** (If the researcher believes that the problem can be solved based on objective criteria

and positive evidence, the researcher will build his research on the positions of objectivism and positivism. However, in case he believes that the social reality or phenomenon is affected by the social actors, and research needs to be based on the inner reality as perceived by the social actors in the natural settings, the researcher would choose constructionism and Interpretivism) and the **Nature of Problem**.

Research Process

6. Research is an organised intellectual process involving multiple stages/ steps. Like any logical and systematic task, research also needs proper planning. Broadly, a research process is like undertaking a journey, ie before you start, you must decide where you want to go and then which route to take. During the research journey also, there are two important decisions to make, the first is to decide **what you want to find out about,** then need to **decide how to go about finding their answers by undertaking the research.**

Phase	Phase 1	Phase 2	Phase 3
Main Task	**Deciding** ↓ What to Research	**Planning** ↓ How to research	**Undertaking** ↓ Execution
Involves	Problem statement, Research Questions & objectives	Designing research-planning data collection & analysis	Collection & Analysis of Data

Fig 2.1-Research Process

7. Quantitative and qualitative research methodologies differ both in their **underpinning philosophy and to some extent, in the methods, models and procedures** used. Though the **research process is broadly the same** in both, quantitative and qualitative research are differentiated in terms of the methods of data collection, the procedures adopted for data processing & analysis and the style of communication of the findings. The research process consists of a **series of actions or steps** necessary to effectively carry out research and the desired sequencing of these steps. The major steps in conducting research are: -

(a) Formulating Research problem.

(b) Review of Literature (deciding the strategy).

(c) Developing Research Hypothesis/ Hypotheses (in Quantitative research).

(d) Conceptualising a Research Design.

(e) Data collection.

(f) Analyzing and interpreting the data.

(g) Reporting and evaluating research.

8. The seven steps generally represent the overall process; however, they should be viewed as an ever-changing process rather than a fixed set of steps. These steps are closely related activities which **overlap** continuously rather than following a strictly prescribed sequence. At times, the first step determines the nature of the last step to be undertaken. One should remember that the various steps involved in the research process are **not mutually exclusive** nor are they separate and distinct. They **do not necessarily follow each other** in any specific order and the researcher must be constantly anticipating at each step in the research process the requirements of the subsequent steps.

9. The research commences with a **general statement of the problem**, or rather, the purpose for engaging in the study. The **review of literature** identifies suitable theories, themes, concepts and brings out gaps in previous research which provides justification for the study & research strategy adopted. The identified gap in the literature by the researcher stimulates a **hypothesis** which is the premise/ supposition to be tested in a quantitative research. The broad framework of how the study is to be carried out ie the **design of research** is conceptualized. The data is then collected from the relevant sample, to **test the hypothesis or build a theory,** which is **analysed and interpreted** using a variety of tools, engaging in what is known as empirical research. The results of the data analysis in accepting or failing to accept the hypothesis or theoretical model built are then **reported and evaluated**.

CHAPTER III

RESEARCH PROBLEM

1. The first and foremost step in the research process happens to be that of **selecting and properly defining a research problem**. A **research problem**, in general, **refers to some difficulty which a researcher experiences in the context of either a theoretical or practical situation and wants to obtain a solution for the same**.

2. **Importance**. Formulation of a research problem is the first and most important step of the research process. It is like the ***identification of a destination before undertaking a journey***. In the absence of a destination, it is impossible to identify the most appropriate route. Similarly, ***in the absence of a clear research problem, a clear and economical plan is impossible***. The ***research problem serves as the foundation of a research study***. The way you formulate a research problem determines almost every step that follows i.e. ***the type of study design that can be used, the type of sampling strategy that can be employed, the research instrument that can be used or developed and the type of analysis that can be undertaken.*** It may not always be possible to formulate problem simply, clearly and completely. It requires detailed treatment and iterations to come about the exact nature of the problem so to be able to be defined accurately. It enables the researcher to systematically point out why the proposed research or the problem should be undertaken and what is hoped to be achieved with the study results.

3. **Components of Research Problem**. Most research in the social science domain revolves around ***four Ps - People, Problem, Program and Phenomena***. The emphasis on a particular 'P' may vary from study to study but generally, in practice, most research studies are based upon at least a combination of two Ps. You may select a group of individuals (***a group of individuals – or a community as such – 'people'***), to examine the existence of certain issues or problems relating to their lives, to ascertain their attitude towards an issue (***'problem'***), to establish the existence of a regularity (***'phenomenon'***) or to evaluate the effectiveness of an intervention (***'program'***). Every research study has two aspects: ***the people provide you with the 'study population' whereas the other three Ps furnish the 'subject areas'***. Your study population i.e. individuals, groups and communities, is the people from whom the information is collected and are thus central to research study. Your subject area is a problem, program or phenomenon about which the information is collected.

4. **Choosing the Field of Research**. When selecting a research problem/ topic, there are several considerations to keep in mind which will help to ensure that your study will be manageable and that you remain motivated. These considerations are: -

(a) **Interest**. A research endeavor is usually time consuming and involves hard work and possibly unforeseen problems. One should select a topic of great interest to sustain the required motivation.

(b) **Magnitude**. It is extremely important to select a topic that you can manage within the time and resources at your disposal. Narrow the topic down to something manageable, specific and clear.

(c) **Measurement of Concepts**. Make sure that you are clear about the indicators and measurement of concepts (if used) in your study.

(d) **Level of Expertise**. Make sure that you have an adequate level of expertise for the task you are proposing since you need to do the work yourself.

(e) **Relevance**. Ensure that your study adds to the existing body of knowledge, bridges current gaps and is useful in policy formulation. This will also help you to sustain interest in the study.

(f) **Availability of Data**. Before finalising the topic, make sure that data is available.

(g) **Ethical Issues**. How ethical issues can affect the study population and how ethical problems can be overcome should be thoroughly examined at the problem formulation stage.

5. **Steps in Formulation of Research Problem/ Problem Statement**. The process of formulating research problem consists of several steps.

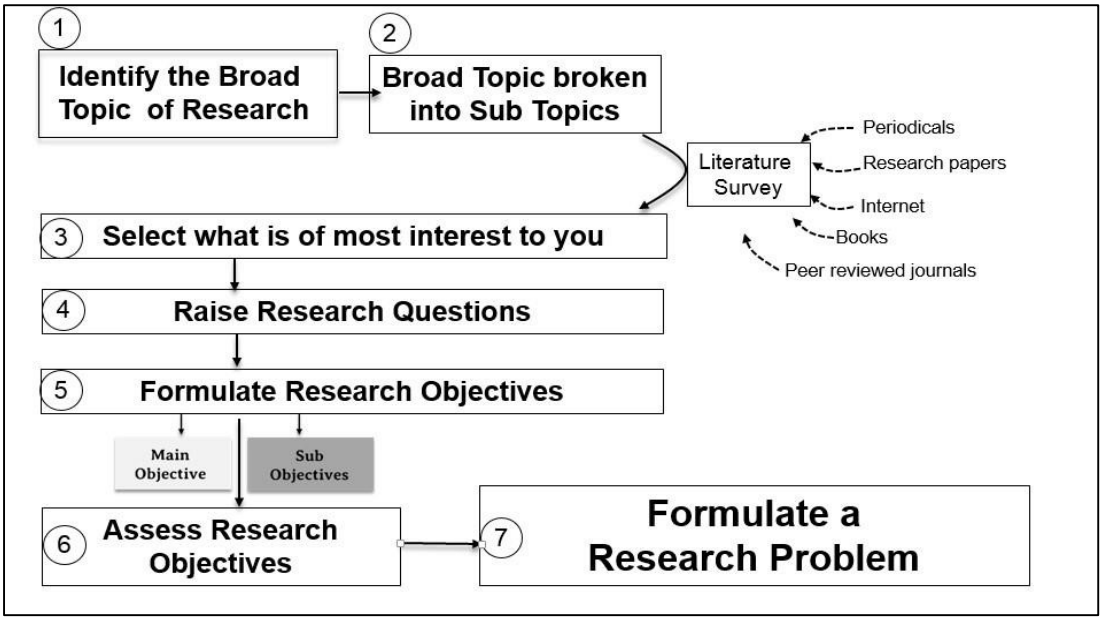
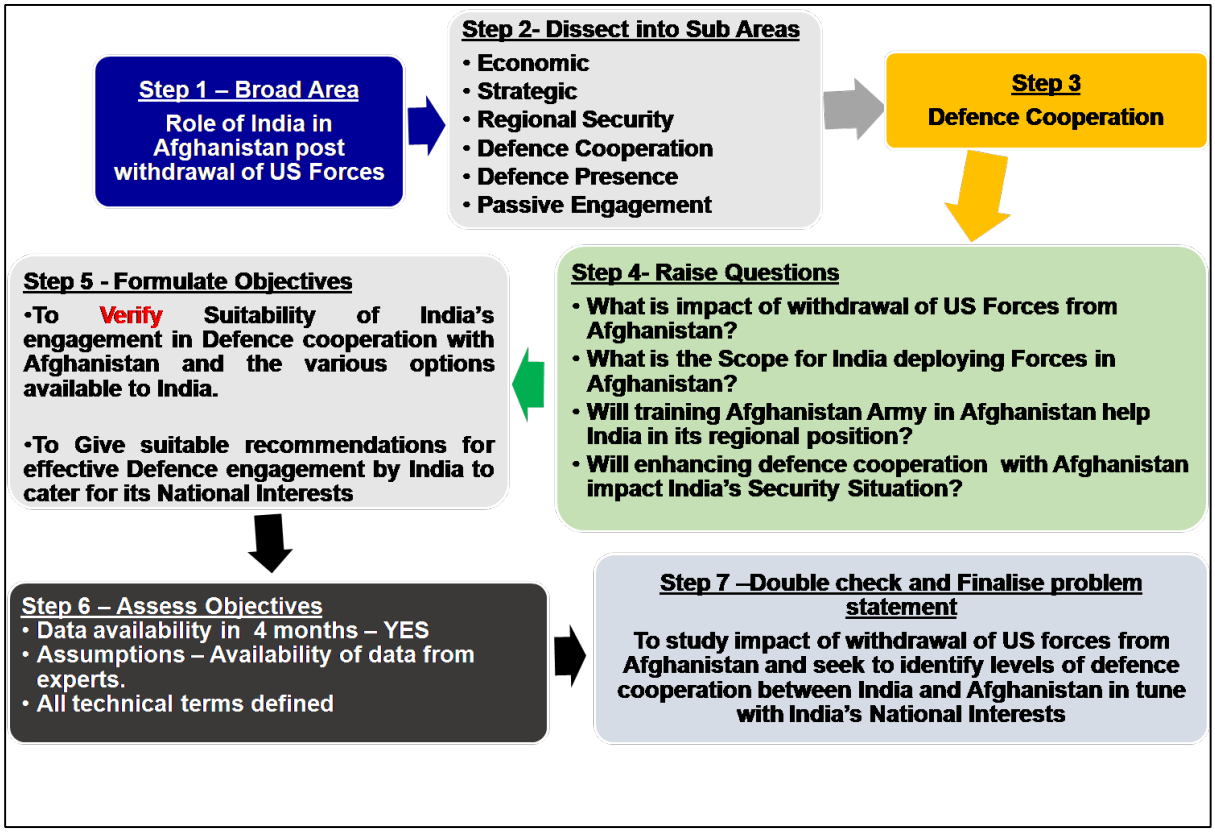


Fig _ 3.1 _ Formulation of Research Problem

6. **<u>Research Questions, Objectives and Problem Statement</u>**. The researcher needs to understand that research questions, research objectives and problem statement are interlinked and the steps (4-7) as mentioned in Para 5 are interchangeable ie first research objectives may be identified and then research questions formulated, the answers to which would enable meeting the objectives of the research. Some researchers are satisfied only with research questions and do not formulate objectives at all. If you prefer to have only research questions or only objectives, this is fine, but keep in mind the requirements of your academic institution for research proposals as each institution has specific requirements with respect to format/ structure of a thesis. The main difference between objectives and research questions is the way in which they are written. Objectives transform these questions into behavioral aims by using action-oriented words such as '**to find out**', '**to determine**', '**to ascertain**' and '**to examine**'. Research questions once framed can be used to formulate objectives or vice versa. Each question can become one objective or a combination of two or more questions can also become a single objective. **The research problem is formulated by** combining your objectives and sub-objectives.

7. An illustrative example of steps to be followed in the formulation of Research Problem is given as under:-



CHAPTER IV

REVIEW OF LITERATURE

1. 'Review of Literature' is ***going through the existing literature to acquaint yourself with the available body of knowledge in your area of interest*** and is carried out post-selection of an area of research from a broad topic. It is one of the essential *tasks* when you undertake a research study. Reviewing the literature can be time consuming, daunting and frustrating but it is also rewarding. The *review of literature* is an ***integral part of the research process and makes a valuable contribution to almost every operational step***. In the initial stages of research, it helps you to establish the ***theoretical roots*** of your study, clarify your ideas and develop your research methodology. Later in the process, the review of literature ***serves to enhance and consolidate your own knowledge base and helps you to integrate your findings with the existing body of knowledge.***

2. It is an attempt to identify, locate, and organize the already reported literature related to the chosen problem. It must be noted that care should be taken to peruse recent and original material/ sources and frame one's judgement and opinions based on the existing literature. **Relevance, reliability and validity** are very important factors in reviewing the published literature so as not to reinvent the wheel in the study/ research.

3. **Purpose**. The basic purpose is to completely understand the problem chosen for investigation. In relation to your study, the review of literature can help in the following ways:-

(a) Identify seminal work in the area of your research.

(b) Bringing clarity and focus to your research problem.

(c) Gain insights into the subject in depth i.e. current state of knowledge in the area of inquiry and increase your domain knowledge.

(d) Establish the link between what you are proposing to examine and what has already been studied i.e. identify gaps in knowledge in the research area.

(e) Provide a theoretical and conceptual context of the research i.e. to identify key theories and findings in the area of research.

(f) Lead to the justification of the current work to be undertaken.

(g) Identify methods most appropriate for your study.

How to Review the Literature

4. The procedure for the literature review can be broadly divided into the following:-

(a) Searching for the existing literature in your area of study.

(b) Reviewing the selected literature.

(c) Developing a Theoretical framework.

(d) Developing a Conceptual framework.

5. **Searching the Existing Literature**. Sources include books, journals, online resources and government documentation on the subject.

6. **Review the Selected Literature**. After identifying the literature, the next step is to start reading them critically to pull together themes and issues that are associated. Read critically with particular reference to the following aspects: -

(a) Note whether the knowledge relevant to your study is confirmed beyond doubt. Ascertain the areas in which little or nothing is known, the gaps that exist in the body of knowledge- Theoretical, contextual, empirical etc.

(b) Note the theories put forward, the criticisms of these and their basis. Identify theory most suitable one for your study.

(c) Identify relevant concepts, constructs and variables of the selected theory relevant for your study.

(d) Examine the methodologies adopted and the criticisms of them. Identify methods & techniques found to be most suitable for the study.

7. **Developing a Theoretical Framework**. As you start reading the literature, you will realize that it deals with several aspects that have a direct and indirect bearing on your research topic. Use these aspects as a basis for developing your ***theoretical framework***. The theoretical framework consists of all the **concepts/ constructs/ themes of the relevant theory along with their inter-relationship in which the study is embedded.** Until you go through the literature thoroughly, you cannot develop a theoretical framework. Let us understand this with an example. Suppose you want to understand the motivation level of NE officers in an organisation. You should review the literature about motivation theory. If you select Herzberg's 'Two Factor Theory' for the study, the theoretical model will constitute constructs of Hygiene and motivation factors as given in Theoretical framework in figure 4.1 below.

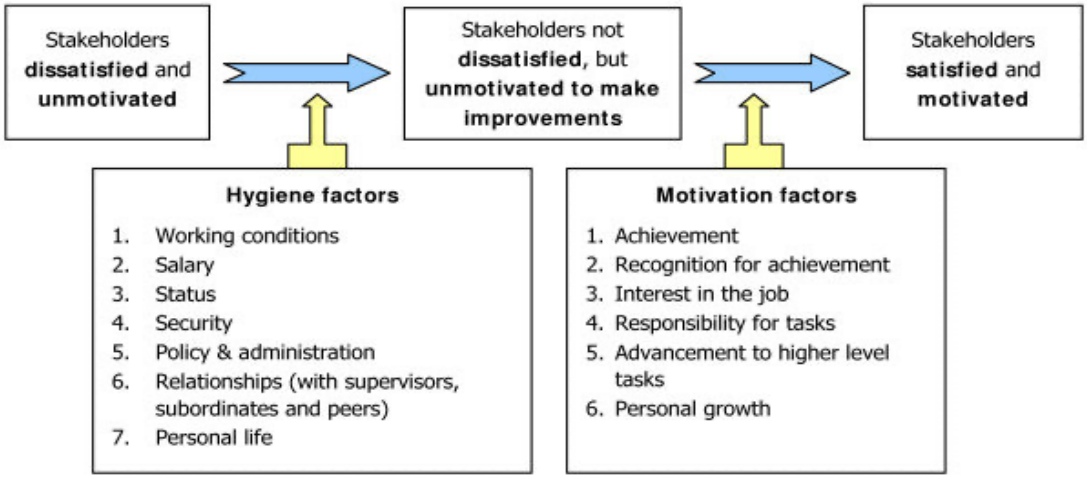


Fig 4.1-Theoretical Framework

8. **Developing a Conceptual Framework**. The conceptual framework forms **the conceptual basis of your research work**. It **stems from the theoretical framework** and usually focuses on the section(s) which become the basis of your study. Whereas the **theoretical framework consists of the themes or issues in which your study is embedded, the conceptual framework describes as to how these aspects you selected from the theoretical framework will be measured for your enquiry to answer research questions**. For instance, in the example cited in the theoretical framework, the researcher may measure perception of various stake holders about these constructs to quantify the motivation levels of NE officers.

9. **Structure**. There are several ways to organize and structure a literature review. The three common ways are ***chronological, thematical and debate*** which are described below: -

(a) **Chronological**. In a chronological review, you will ***group and discuss your sources in order of their appearance*** (usually publication), ***highlighting the changes in research in the field and your specific topic over time***. For e.g. a literature review on theories of mental illness might present how the understanding of mental illness has changed throughout the centuries, by giving a series of examples of key developments and ending with current theories and the direction your research will take.

(b) **Thematic**. In a thematic review, you will ***group and discuss your sources in terms of themes or topics they cover***. By grouping topics of research together, you will be able to demonstrate the types of topics that are important to your research. For e.g. if the topic of a literature review is “Changes in popular music”, then there might be separate sections on research involving the production of music, dissemination of music, interpretation of music and historical studies of popular music.

(c) **Debate**. In a debate-style review, you note **scholars take clear and oppositional stands on the same topic**. For e.g. groups of scholars disagree about the best way to measure a physiological event, and as a result, use different instruments and methodologies.

10. **Points to Remember**. Certain points to be kept in mind while reviewing literature are:-

(a) Take good notes, including the details of the material you read.

(b) In reviewing the literature, you should do more than simply summarize what you have read but carry out a critical analysis of the same. The literature review must assist you in building an argument.

(c) Your search for literature should be guided by your research questions/ objectives/ problem statement.

(d) Bear in mind that reading the literature is not something that you should stop doing once you begin designing your research. You should continue your search for and reading of relevant literature throughout your research.

.

CHAPTER V

CONCEPTS, CONSTRUCTS, VARIABLES AND RESEARCH HYPOTHESIS

Conceptualisation

1. Social science research is cumulative i.e. we build current knowledge on prior knowledge. Normally, we summarize our prior knowledge of theories, which are simplified explanations of how the world works. A theory summarizes established knowledge in a specific field of study. Because the world around us is dynamic, a theory in the social sciences is never a deterministic statement and rather it is open to revisions and amendments. Theory development is an iterative and lengthy process. The more it is confirmed across time and space, the more it is robust. Theories are abstractions of objects, objects' properties, or behavioral phenomena. Any theory normally consists of at least two concepts, which define a theory's content and attributes. Theoretical propositions consist of relationships between abstract concepts. Testing theories (i.e., theoretical propositions) require **measuring these concepts** accurately, correctly, and in a scientific manner, before the strength of their relationships can be tested.

2. **Concepts**. Concepts are the **building blocks of theory** and represent the points around which social research is conducted. They are defined as the **mental abstraction** of a particular instance organised around a main idea or theme. Concepts are based on our experience, on real phenomena and are a generalised idea of something of meaning. All words in the dictionary may be construed as concepts at some level. Concepts may also have progressive levels of abstraction. Some concepts such as a person's weight are precise and objective, while other concepts such as a person's personality may be more abstract and difficult to visualize.

3. **Constructs**. Construct is an **abstract concept that is specifically chosen (or "created" or adopted) as per context to explain a given phenomenon**. Construct is a Concept with consciously added contextual meaning for a scientific purpose. It can be measured directly or indirectly. A construct may be a simple concept, such as a person's weight (single underlying dimension/ **Unidimensional construct**), or a combination of a set of related aspects (**multi-dimensional construct**) such as person's communication skill, which may consist of several underlying dimensions/ variables such as the person's vocabulary, syntax, and spelling. The distinction between constructs and concepts are clearer in multi-dimensional constructs, where the **higher-order abstraction is called a concept** and the lower **order abstractions with added context are called constructs**.

Operationalisation

4. Operationalisation refers to the process of **developing measures/ indicators or variables/ items for measuring these constructs/ concepts**.

5. **Variables**. In scientific research, a variable **is a measurable representation of a construct or an abstract concept. *Measurability is the main difference between a concept and a variable*.** Concepts are mental images or perceptions and therefore their meanings vary markedly from individual to individual, whereas variables or constructs are measurable, though, of course, with varying degrees of accuracy**.** A concept cannot be measured whereas a variable can be subjected to measurement by crude/ refined or subjective/ objective units of measurement. Linkages between ***Concepts, Constructs, Measures, Indicators and Variable*** is as shown in the figure.

6. **Types of Variables**. A variable can be classified in several ways. The classification developed here results from looking at variables in three different ways as shown in the figure below: -

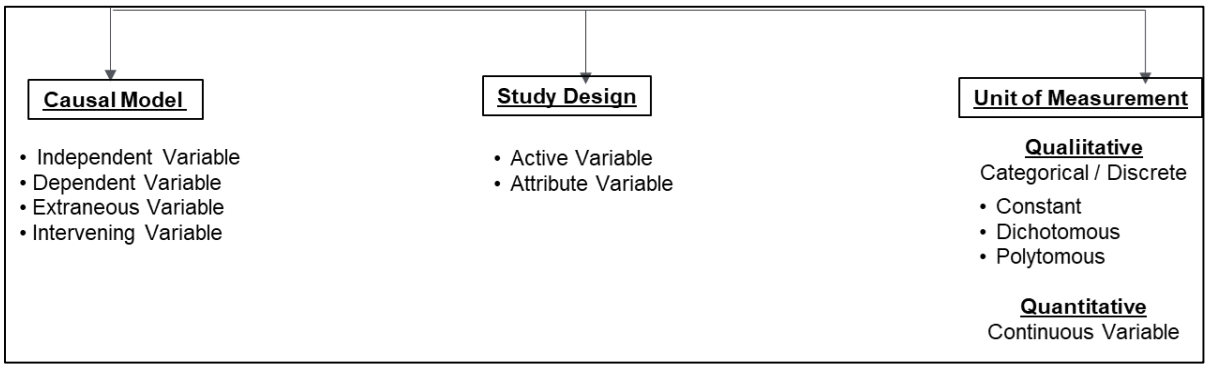


Fig 5.2 _ Types of Variables

(a) In studies that attempt to investigate a causal relationship or in empirical research, **Dependent Variable (DV)** is of primary interest to any researcher. The goal is to explain or predict the variability in the DV and is the main variable that poses the problem of a study. The **Independent Variable (IV)** is the one that influences the DV and accounts for or explains the variance in DV. Thus, IV can be considered as a cause for an effect. The ***unmeasured variables affecting the changes in DV*** are called ***extraneous variables*** and the ***variables that link IV and DV*** are called ***intervening variables***.

(b) From the Study design point of view, variables that can be manipulated, changed or controlled by the researcher are called **Active Variables** e.g. during Studies on Intervention in teaching models, experiments, program etc. Those variables that cannot be manipulated, changed or controlled by the researcher and reflect the characteristics of the study population, for example, age, gender, education, levels of motivation are called **Attribute variable**.

(c) The variables can be categorised into categorical/ discrete when the unit of measurement is nominal or ordinal and continuous when the unit of measurement is interval or ratio. A **Discrete variable** when measured can take only an integer value, a **Continuous Variable** have continuity in their measurement and they can assume any **real values** e.g. age, income, weight etc. A **Categorical variable which is also a Discrete variable** has only one category or value is called constant variable, if it has two categories like yes/ no, good/ bad called a dichotomous variable and if it has more than two categories or values like religion (Hindu, Muslim, Sikh), political parties (labour, liberal and democrat) and attitudes (strongly agree, agree, neutral, disagree, strongly disagree) referred as a polytomous variable.

Developing Hypothesis

9. **Definition**. Technically speaking, "**hypothesis**" is a Greek word that means "**an assumption/ subject to verification**". According to Kerlinger, '***A hypothesis is a*** *conjectural statement of the relationship between two or more variables, constructs or concepts'.* A hypothesis is a ***hunch, assumption, suspicion, assertion or an idea about a phenomenon, relationship or situation, the reality or truth of which you do not know and they become the basis of an enquiry.*** Thus, the hypothesis is a predictive statement capable of being tested by scientific methods and can made directly from the theoretical framework. It is the bridge between theory and reality.

10. **Functions**. A hypothesis serves the following functions: -

(a) Formulation of a hypothesis provides a study with focus. It tells you what specific aspects of a research problem to investigate.

(b) A hypothesis tells you what data to collect and what not to collect, thereby providing focus to the study.

(c) The construction of a hypothesis enhances objectivity in a study.

(d) A hypothesis may enable you to add to the formulation of the theory. Successfully tested hypothesis must answer the research question, thus contributing/ adding to the existing knowledge.

11. **Characteristics**. The wording of a hypothesis must have certain attributes that make it easier for you to ascertain its validity. These attributes are:-

(a) Simple, specific and conceptually clear. No place for ambiguity in construction of hypothesis and should be limited in scope i.e. must be specific.

(b) Capable of being measured and tested.

(c) Should state presence/ absence of a variable (univariate) or state relationship between variables, if it happens to be a relational hypothesis.

(d) Should have roots in the existing body of knowledge and adds to the body of knowledge.

(e) Must explain the facts that gave rise to the need for explanation *i.e.* hypothesis must explain what it claims to explain; it should have an empirical reference.

12. **Null and Alternate Hypothesis**. Theoretically, there should be only one hypothesis, that is the ***research hypothesis,*** which is the basis of your investigation. However, for statistical purpose, a thesis/ dissertation has a Null hypothesis and an Alternate/ Research Hypothesis. The **Null Hypothesis (H_0)** is a hypothesis which will be tested and **Nullification of it will be taken as evidence in support of alternate Hypothesis**. For instance, Earth is flat was a commonly held belief during the old times and can be considered as a Null Hypothesis. In statistical testing, Null hypothesis states that there is no relationship between two measured phenomena or no difference among groups. The **Alternate Hypothesis (H_a/ H_1)** is the one which is formulated first and is the statistical version of the Research Hypothesis. **Burden of proof rests on the Alternate Hypothesis**. **It is the hunch/ proposition/ conjecture of the researcher**. It is a statement of what a hypothesis test is set up to establish. It is opposite of the Null Hypothesis and is only reached if Null is rejected. An alternate hypothesis is one which sets the parameters expected to be found i.e. desired conclusion of the researcher. In statistical testing, Alternate hypothesis defines that there is a statistically important/ significant relationship between two variables. Alternate is the one which is formulated first and is the statistical version of the Research Hypothesis. **Burden of proof rests on the Alternate Hypothesis**

13. **Types of Hypotheses**.

(a) **Attributive or Descriptive**. Propositions that state the existence, point prevalence or distribution of some variable. They can be broadly sub-divided as follows:-

(i) **Hypothesis of Existence**. Eg WFC is high amongst persons of armed forces. This hypothesis only state the existence of an attribute.

(ii) **Hypothesis of Point Prevalence**. Researcher needs to have enough knowledge about a program and its outcomes to speculate about the exact prevalence of the situation or the treatment program in

quantitative units. Eg More than 70% of IAF Officers are satisfied with the present Appraisal System.

(b) **Hypothesis of Difference**. Stipulates that there will be a difference/ no difference between two or more groups of variables, outcomes or the prevalence of a condition or phenomenon. Eg The perceptions of IA and IAF Officers on Theaterisation are significantly different. Few other examples may be quotes as follows:-

(i) There is a significant difference in perception amongst Army and Navy personnel that a single Integrated Organisation leads to enhanced efficiency in Acquisition of Capital Equipment by the Armed Forces.

(ii) There is no significant difference in perception amongst Lt Col & below and Col & above about adequacy of accommodation in station XYZ.

(c) **Associative**. Eg WFC impacts job satisfaction negatively amongst personnel of the Armed Forces**.** This hypothesis predicts the relationship between the constructs/variables and can be of following types:-

(i) **Non-Directional Hypotheses** Predicts relationship (but not the direction) between Predictor Variable (PV) and Outcome Variable (OV). Eg- Reg exercise impacts body weight (one could lose excess weight or gain muscle mass.

(ii) **Directional/ Correlational Hypotheses**. They specify the expected direction of the relationship between Predictor Variable (PV) and Outcome Variable (OV) i.e. the researcher predicts not only the existence of a relationship but also its nature/ direction (positive or negative). Eg Longer tenures lead to increased job satisfaction in PBOR.

(d) **Causal Hypotheses**. Causal hypotheses propose/ predicts Cause-Effect relation between Independent Variable and Dependent Variable. It suggests a strong linkage. Eg: Mid-Day Meal in schools in rural Jharkhand has caused significantly improved enrolment.

(e) **Conditions for Causality**. Causality very difficult to establish in social science research because following conditions need to be met:-

(i) **Temporal Precedence**. Phenomenon A must occur before Phenomenon B.

(ii) **Covariance**. Both A and B must have significant covariance (Eg increase/decrease in A leads to increase/decrease in B).

(iii) **Control over Confounding Variables**. Control over the event must be exercised to eliminate presence of confounding variables Since, Social Experiments cannot be carried out, it's **almost impossible to establish Cause-effect relation in Social-Science domain**.

14. **Errors in Hypothesis Testing**. A hypothesis is an assumption that may prove to be either correct or incorrect. It is possible to arrive at an incorrect conclusion about a hypothesis for a variety of reasons. In drawing conclusions about a hypothesis, the following two types of errors can occur:-

(a) **Rejection** of a **null hypothesis** when it is **true**. This is known as a **Type I error**.

(b) **Acceptance** of a **null hypothesis** when it is **false**. This is known as a **Type II error**.

		When Null Hypothesis is actually TRUE	
		TRUE	**FALSE**
When decision	**ACCEPT**	***Correct Decision***	***Type II Error***
	REJECT	***Type I Error***	***Correct Decision***

15. **Hypothesis in Qualitative Research**. One of the differences in qualitative and quantitative research is around the importance attached to and the extent of use of hypotheses when undertaking a study. As qualitative studies are characterised by an emphasis on describing, understanding and exploring phenomena using categorical and subjective measurement procedures, construction of hypotheses is neither advocated nor practiced. Also, as the degree of specificity needed to test a hypothesis is deliberately not adhered to in qualitative research, the testing of a hypothesis

becomes difficult and meaningless. This does not mean that you cannot construct hypotheses in qualitative research, the non-specificity of the problem as well as methods and procedures make the convention of hypotheses formulation far less practicable and advisable. In the social sciences, formulation of hypotheses is mostly dependent on the researcher and the academic discipline whereas within an academic discipline it varies markedly between the quantitative and qualitative research paradigms.

CHAPTER VI

RESEARCH DESIGN

1. **Meaning**. A researcher needs to organise his ideas in a logical sequence, outline the proposed work. In essence, Research Design is a framework, a procedural plan or a 'blueprint' that is adopted by the researcher for conducting the research project. In the Armed Forces, it may also be termed as the 'Synopsis'. It details the procedures necessary for obtaining the information needed to solve problems. It helps the researcher in:-

(a) Identification and/ or development of procedures and logistical arrangements required to undertake a study.

(b) Emphasising the importance of quality in these procedures to ensure their validity, objectivity and accuracy.

2. **Purpose**. A research design should provide answers to the following:-

(a) What is the study about?

(b) Why is the study being undertaken?

(c) What type of data is required?

(d) What are the required sources of data?

(e) Where can the required data be found?

(f) What are the methods of data collection?

(g) How data needs to be analysed?

(h) How will you ensure validity, objectivity and accuracy in research?

3. **Components**. A research design essentially has the following components to meet the purpose and functions:-

(a) **Sampling Plan.** The sampling plan deals with the ***method of selecting items/ subjects to be observed*** for the given study. Sample design must ***include the size of the sample and the different strata of the population chosen for the study***.

(b) **Data Collection Method**. The data collection method includes the methodology adopted by the researcher to observe, record, or quantify behaviour or perception. How the researcher wants to observe the samples?

viz questionnaire, interview, focus group, etc. The observational design also *relates* to the conditions under which the observations are to be made.

(c) **Analytical Plan**. Statistical or qualitative methods involved in the analysis of collected data, drawing meaningful interpretation and reporting of the research findings forms part of the analytical plan.

(d) **Operational Plan**. The operational plan deals with the techniques by which the procedures specified in the sampling, Analytical and observational designs can be carried out.

4. **Popular Research Design**. Following are some of the popular Research Designs:-

(a) Experimental & Quasi Experimental

(b) Correlational Research Design

(c) Survey Research Design (including Cross-sectional and Longitudinal).

(d) Case Study Research Design

(e) Action Research.

(f) Secondary Data research.

5. **Mixed-Method Research Designs**. Mixed methods design which involve use of both qualitative and quantitative approaches may be **fixed and/ or emergent**, and researchers need to be cognizant of the approach that they are using and open to considering the best alternative for their circumstances. **Fixed mixed methods designs are mixed methods studies** where the use of quantitative and qualitative methods **is predetermined and planned at the start of the research process, and the procedures are implemented as planned**. Emergent mixed methods designs are found in mixed methods studies where the **use of mixed methods arises due to issues that develop during the process of conducting the research**. The emergent mixed methods design generally occurs when a second approach is added after the study is underway because one method is found to be inadequate. The three core mixed methods designs are the **convergent (parallel) design**, the **explanatory sequential design** and the **exploratory sequential design** as given in figure 6.1 below. In addition, our list of major designs includes two examples of designs that bring multiple design elements together: the **transformative design** and the **multiphase design**.

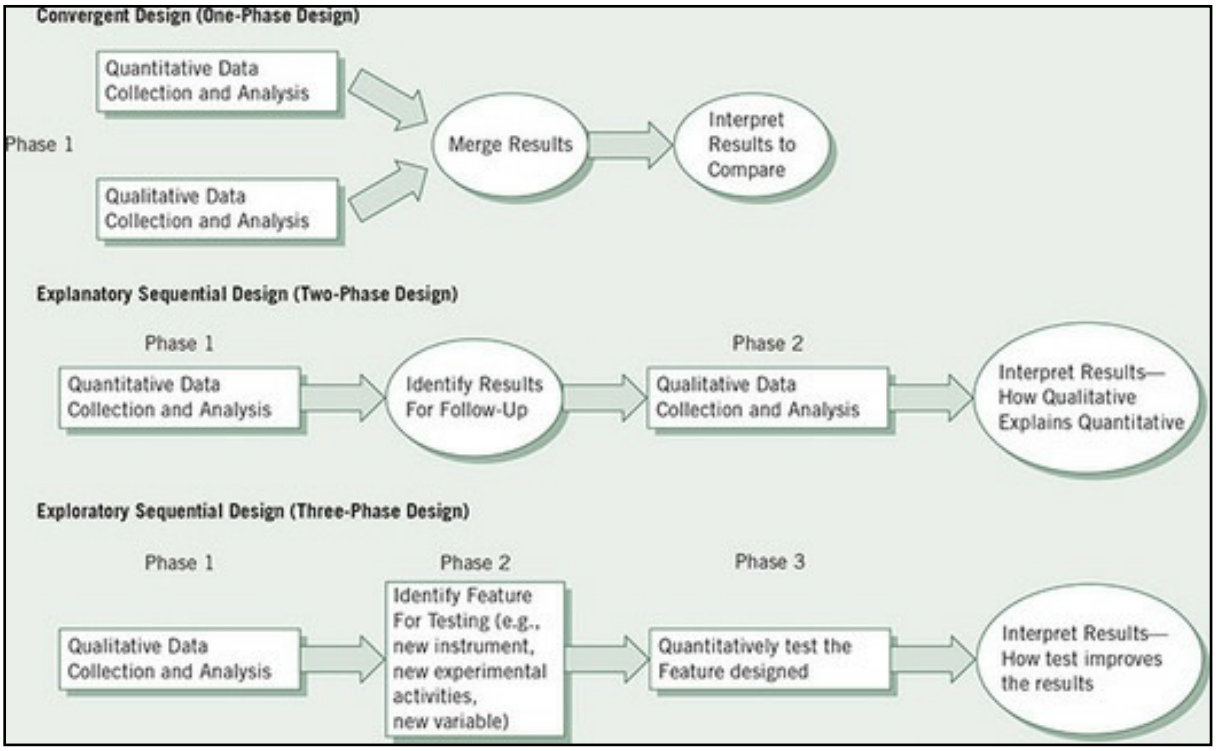


Fig 6.1_Core Mixed Method Designs

CHAPTER VII

DATA COLLECTION

1. Data Collection is an important aspect of any type of research. Inaccurate data collection can impact the results of a study and ultimately lead to invalid results. The choice of appropriate data collection methods should be based on the research questions, design, sample and possible data sources.

2. **Types of Data**. The task of data collection begins after a research problem has been defined and research design/ plan chalked out. While deciding about the method of data collection to be used for the study, the researcher should keep in mind two types of data viz., **primary and secondary**.

(a) **Primary data** are those which are collected afresh and for the first time, and thus happen to be original in character.

(b) **Secondary data**, on the other hand, are those which have already been collected by someone else for other purpose, useful for present study and which have already been passed through the statistical process.

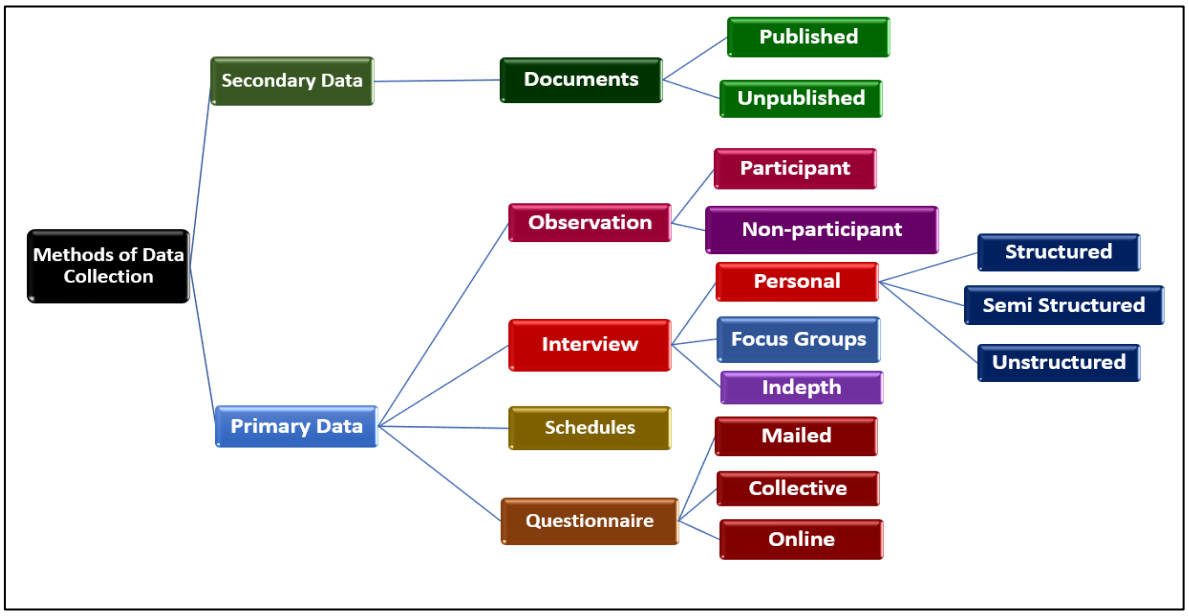


Fig 7.1_Methods of Data Collection

3. **Observation**. Observation is a **purposeful**, **systematic and selective** way of watching and listening to an interaction or phenomenon as it takes place. There are many situations in which observation is the most appropriate method of data collection e.g. when you want to learn about the interaction in a group, study the dietary patterns of a population, ascertain the functions performed by a worker, or study the behaviour or personality traits of an individual. There are many ways of recording observations.

Narrative and descriptive recording are mainly used in qualitative research but if you are doing a quantitative study you would record an observation in categorical form or on a numerical scale. There are two types of observations i.e. participant observation and non-participant observation. **Participant observation** is **when the researcher participates in the activities of the group being observed in the same manner as its members**, with or without they knowing that they are being observed. **Nonparticipant observation**, on the other hand, is **when the researcher does not get involved in the activities of the group but remain a passive observer**, watching and listening to its activities and drawing conclusions from this.

4. **Interview**. Interviewing is a commonly used method of collecting information from people. An interview is any **person-to-person interaction, either face to face or otherwise, between two or more individuals with a specific purpose in mind**. Interviews are classified into different categories according to this degree of flexibility. **Unstructured interviews** are characterized by almost **complete freedom and flexibility** in terms of **content and structure**. The interviewer has complete freedom in terms of the content. sequence, wording to use and the way he asks questions to the respondents. In a **structured interview,** the researcher asks a **predetermined set of questions**, the **content and structure** of the interview are **rigid**. **Focus group interviews,** is a technique used to gain initial knowledge about a phenomenon. It allows a group of respondents the time and scope to talk about their opinions on a particular subject, moderated by the interviewer and arrive at common or divergent understanding of the situation. **In-depth interviews** generally have **no set format**. This allows the interviewer to ask questions which come to their mind next as a follow-up and **interrogate points** of interest as they go on further. It may involve multiple interactions and tend to **be more open-ended, informal, free-flowing and flexible**.

5. **Questionnaire**. A questionnaire is a **written list of question**s, the answers to which are recorded by respondents quantitatively. In a questionnaire, respondents read the questions, **interpret and choose the answer** out of given set of choices. There may be one or two open ended questions to enable respondents to clarify their responses. It is, therefore, important that the **questions are clear and easy to understand**, the look, feel and layout of a questionnaire should be such that it is pleasant to the eye and the framing, sequence of questions should be logical and easy to follow. A questionnaire can be administered as a mailed Questionnaire, collective administration to a captive audience, at a public place or as an online survey. The advantages of a questionnaire are less cost and greater anonymity while the disadvantages are its limited applicability (to a literate population), low response rate, a self-selecting bias of respondents and lack of opportunity to clarify issues.

6. **Schedules**. This method of data collection is very much like the collection of data through questionnaire. The minor difference lies in the fact that schedules (proforma containing a set of questions) are being filled in by the enumerators who are specially appointed for the purpose. Enumerators explain the aims and objects of the

investigation and also remove the difficulties which any respondent may feel in understanding the question. This method requires enumerators to be specially trained and skilled in filling up schedules.

(Note : Other data collections techniques like Life Cycle Interview, Critical Incident technique, Oral History, Narrative etc. are also there and will be covered during the course)

7. **Data Collection in Quantitative and Qualitative Research**. Most methods of data collection can be used in both qualitative and quantitative research. Differences between data collection in Quantitative and Qualitative research is tabulated below: -

Quantitative	Qualitative
Observation recorded in categorical scale.	Observation recorded in narrative/ descriptive form.
Structured interview recorded in response categories or if the categories are developed and quantified.	Unstructured or semi-structured interview recorded in descriptive or narrative form.
Descriptive responses collected in numerical form	Descriptive responses obtained as a reply to open-ended questions.

Sampling – Meaning, Purpose and Types

8. Sampling or selection of the sample is the process of selecting units (e.g., people, organizations) from a population of interest so that by studying the sample we may fairly generalize our results for the population from which they were chosen.

9. **Types of Sampling**.

(a) **Random/ Probability Sampling**. It is a method of sampling which utilizes some form of **random** selection. To have a random selection method, you must set up some processes or procedures which assure that each element of the population has an equal and independent chance of selection, i.e. all elements have an equal probability of being chosen and selection of one element is not dependent on the other. The types of random sampling are:-

(i) **Simple Random Sampling**. This is the simplest form of random sampling. A computer random number generator, table of random numbers or a mechanical device be used to select a sample.

(ii) **Systematic Sampling**. In systematic sampling, the sampling frame is first divided into several segments called intervals. Then, from the first interval, using the Simple Random technique, one element is

selected. The selection of subsequent elements from other intervals is **dependent** upon the order of the element selected in the first interval. E.g. If the fifth element is chosen in the first interval, the fifth element of each subsequent interval will be chosen.

(iii) **Stratified Random Sampling**. Stratified Random Sampling involves dividing your population into homogenous subgroups and then taking a simple random sample in each sub-group.

(iv) **Cluster Random Sampling**. Cluster sampling is based on the ability of the researcher to divide the sampling population into groups (based upon visible or easily identifiable characteristics) called clusters and then to select elements within each cluster, using the simple random technique. Clusters may be heterogeneous within themselves but there is homogeneity between clusters.

(v) **Multistage Sampling**. Multistage sampling, also called multistage cluster sampling, is exactly what it sounds like – *sampling in stages.* Due to this multi-step nature, the sampling method is sometimes referred to as phase sampling. For example, motivation surveys conducted by the Ministry of Defence begin by dividing Indian Army into 'Corps' as cluster and selecting some of these Corps randomly (first stage). The selected Corps are then divided into strata, and participants are randomly selected as in stratified sampling (second stage).

(b) **Non-Random/ Non-Probability Sampling**. This method of **sampling** does **not follow the theory of probability in the choice of elements and is** used **when the number of elements in a population is either unknown or cannot be individually identified**. In such situations, the selection of elements is dependent upon other considerations and are generally used in qualitative study where the objective is not to generalize your findings. The commonly used non-random methods are given below:-

(i) **Quota Sampling**. It is a method in which participants are chosen non randomly according to some fixed quota to ensure desired representation. There are two types of quota sampling – proportional and non-proportional.

(ii) **Snowball Sampling**. In this method, you begin by identifying someone who meets the criteria for inclusion in your study. You then ask them to recommend others, possessing the desired info, to take part in the study thereby increasing sample size. This approach is most applicable to small populations that are difficult to access. E.g. Population of Nuclear experts.

(iii) **Convenience Sampling**. It is a method in which participants are selected because they are often readily and easily available as the desired info for the study are possessed by these participants.

(iv) **Purposive Sampling**. In this, we sample with a purpose in mind or they may have been identified during the quantitative data analysis of phase-1 MMR. We usually would have one or more specific predefined groups we are seeking.

(v) **Judgmental Sampling**. It involves the selection of a sample of persons with knowledge of the phenomenon or demonstrable expertise in the area of research.

CHAPTER VIII

DATA ANALYSIS AND INTERPRETATION

1. **General**. Quantitative and qualitative data need different methods of analysis as given in figure 8.1 below. In quantitative data analysis, the emphasis is on statistical analysis to generalize the results of sample to the population from where the sample is drawn. Whereas, in qualitative data analysis, the focus is on understanding the phenomenon through patterns and interpretation of textual data.

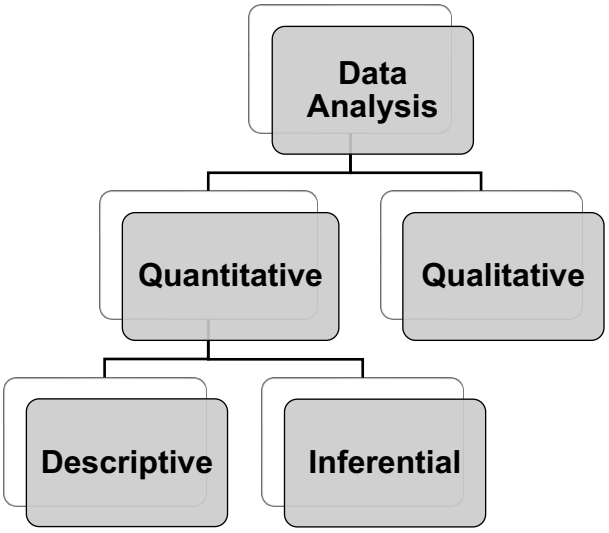


Fig 8.1_Data Analysis methods

Quantitative Data Analysis

2. Data Analysis Procedures (DAP) in quantitative data analysis is a prerequisite and help you put your research project in perspective and assist you in testing the hypotheses with which you have started your research. An analysis is the ordering or the breaking down of data into constituent parts to obtain an answer to research questions. Inferences made of the analysis results in interpretations enabling to draw conclusions. DAP has two sub-processes as follows:-

3. **Data Preparation**. In this, the researcher needs to first clean and organize the data for analysis. The following steps are required to be undertaken for the same:-

(a) **Editing**. Editing consists of scrutinising the completed research instruments to identify and minimize errors, incompleteness, misclassification and gaps in information obtained from the respondents. E.g. Partially filled questionnaire.

(b) **Coding**. Coding refers to the process of assigning numerals or other symbols to answers so that responses can be put into a limited number of categories or classes. E.g. Conversion of data collected in opinions to numeric data. (Strongly Disagree -1, Disagree – 2, Neutral – 3, Agree – 4, Strongly Agree – 5).

(c) **Classification**. Classification is a process of condensation. It is the process of arranging data in groups or classes based on common characteristics.

(d) **Tabulation**. It is a process of an orderly arrangement of data into a series of rows and columns where they can be read in two dimensions. The data needs to be arranged in some kind of concise and logical order. Tabulation is a process of representation of data.

(e) **Scaling**. Another significant stage of data preparation and distribution before choosing a suitable technique for analysis is scaling. Scales are devised to measure variables in social science research. It refers to procedures by which numbers assigned to various opinions, attitudes like we did in coding. Also, knowing the level of measurement helps you decide what statistical analysis is appropriate on the assigned values. There are typically four levels of measurement – **Nominal, Ordinal, Interval and Ratio**.

4. **Techniques of Data Analysis**. The next significant stage is to critically analyse the prepared data in a purposeful way that meaningful inferences can be drawn to conclude the research work. The most useful, logical, scientific and acceptable method of analysis of data is to use appropriate statistical techniques.

5. **Descriptive Statistics/ Analysis**. Descriptive statistics are used to describe the basic features of the data in the study. They provide simple summaries about the sample and measures. Together with simple graphics analysis, they form the basis of virtually every quantitative analysis of data. These analyses are largely the study of **distributions of one variable**.

6. **Inferential Statistics/ Analysis**. Inferential statistics are techniques used to make predictions, to test hypothesis and to infer the characteristics of a population from the characteristics of a sample. It proceeds beyond the description of data by its interpretation.

7. **Data Analysis Process**. The data analysis process involves three steps: -

(a) **Step I**. **Select** the correct statistical methods/ tests to run on your data – Descriptive and Inferential statistics.

(b) **Step II**. Conduct statistical tests and **analyse** the results.

(c) **Step III**. **Interpret** the findings properly so that you can write up your results.

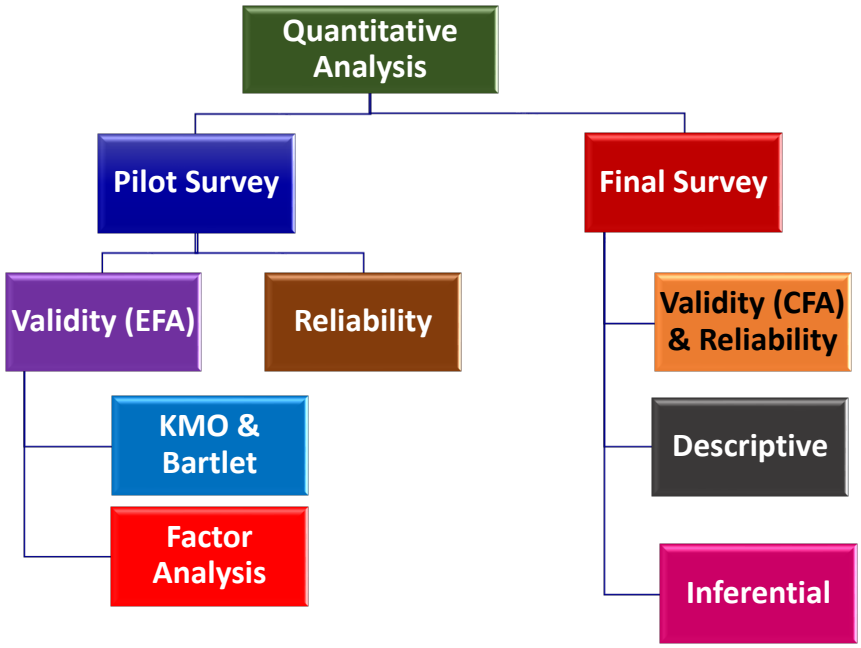


Fig 8.2_Quantitative Data Analysis

8. **Statistical Tests**.

(a) **Pilot Survey**. The pilot survey responses are subjected to tests of validity and reliability i.e. KMO & Bartlett test and Cronbach Alpha test respectively. Then it is subjected to factor analysis to check construct validity to authenticate a main/ final survey questionnaire.

(b) **Final Survey**. Apart from descriptive, test of validity & reliability, final survey data or responses are subjected to parametric & non-parametric tests for drawing inferences for the population. Certain parametric tests can only be carried out if the data is normal.

(i) **Parametric Tests**. You should choose a parametric test if your data is sampled from a population that follows a normal distribution (or Gaussian distribution). These include t-test (hypothesis testing), analysis of variance (ANOVA), measures of association/ relations (Pearson correlation, regression).

(ii) **Non-parametric Tests**. You should choose a non-parametric test if the population clearly does not follow a normal distribution. Non-

parametric tests are also to be used when dealing with categorical data. These include measures of association/ relation (Spearman correlation, Mann-Whitney test, Friedman test or Chi-square test or Discriminant Analysis).

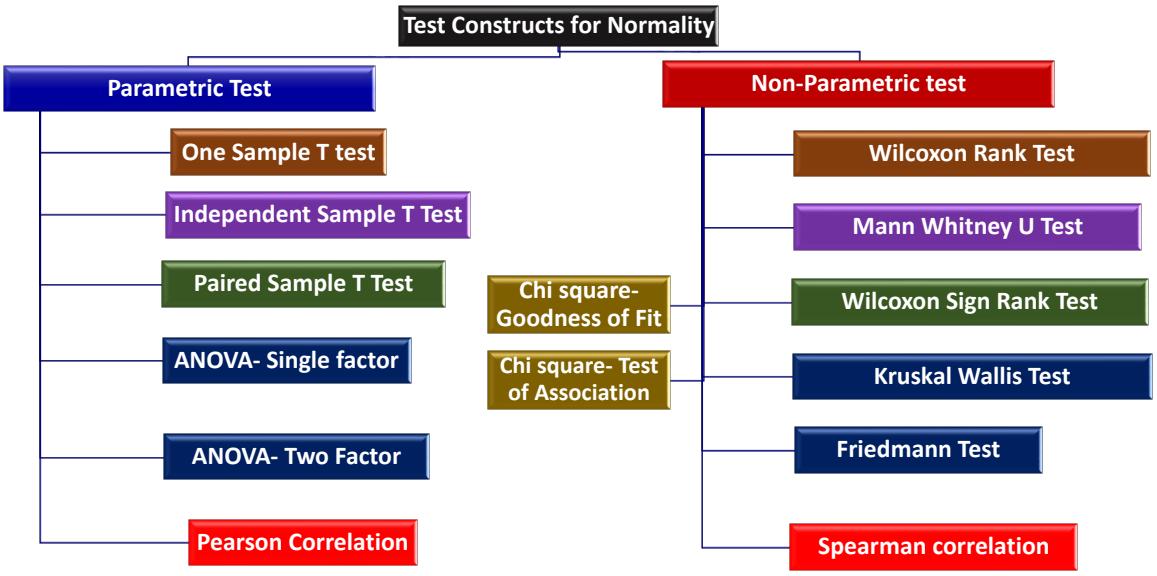


Fig 8.3_Quantitative Data Analysis

9. **Tools Used for the Statistical Analysis**.

(a) **Microsoft Excel**. Microsoft Excel includes a collection of statistical functions, within the add-on Data Analysis Tool Pack. MS Excel can analyse descriptive statistics at a simple level and when used effectively can be very useful in the exploratory analysis of data, cross-tabulations (pivot charts), viewing data in graphs and summarising data with means and standard deviations.

(b) **Formal Statistical Packages**. Inferential statistics are more often analysed in specialist statistical packages such as Jamovi, SPSS, SAS, PSPP & R which provide greater functionality compared to Excel. These formal statistical packages can summarise data, determine whether there are significant differences between groups and examine relationships among variables and various other statistical tests. Further, these packages can produce charts, graphs and tables from the results of the analysis. The college is presently using Jamovi 2.3.28 for quantitative data analysis, being widely accepted, open-source software and user friendly with many online YouTube learning videos available.

10. **Displaying Quantitative Data**. The main purpose of using quantitative data display techniques is to make the findings easy and clear to understand and to provide

extensive and comprehensive information succinctly and effectively. Broadly, there are three ways of communicating and displaying the analysed data: -

(a) **Text**. Text by far is the most common method of communication in both quantitative and qualitative studies, and perhaps the main method in the latter. It is therefore essential to know how to communicate effectively, writing should be thematic, should follow a logical progression of thought and the layout should be attractive and pleasing to the eye.

(b) **Tables**. Other than the text, tables are the most common method of presenting analysed data in quantitative studies. They can dramatically clarify the text, provide visual relief, and serve as a quick point of reference. Crosstabs of key variables should be presented as tables for clarity and emphasis.

(c) **Graphs**. Graphic data visualisation can make analysed data easier to understand and effectively communicate what it is supposed to show. The main objective of a graph is to present data in a way that is easy to understand and interpret, and interesting to look at.

Qualitative Data Analysis

11. **Data Analysis in Qualitative Studies**. Qualitative data when collected, exists in textual form. The term "text" is broader than it seems. A text can be a piece of writing, such as a book, an email, or a transcribed conversation. But in this context, a text can also be any object whose meaning and significance you want to interpret in depth: a film, an image, an artifact, even a place. **Textual analysis** is a broad term for various research methods used **to describe, interpret and understand texts**. All kinds of information can be gleaned from a text – from its literal meaning to the subtext, symbolism, assumptions, and values it reveals.

12. **Methods of Qualitative Data Analysis**. The type of data collected by the researcher lends itself to the type of textual analysis to be carried out.

S No	Type of Data		Method of Analysis
(a)	Primary Data	Analyse the text	Thematic Analysis
		Analyse the text with reference to the Context	Discourse Analysis
(b)	Secondary Data	Analyse the text	Content Analysis

13. **Thematic analysis** is a method of analysing qualitative data. It is usually applied to a set of texts, such as interview transcripts. The researcher closely examines the data to identify common themes – topics, ideas and patterns of meaning that come

up repeatedly. There are various approaches to conducting thematic analysis, but the most common form follows a six-step process:

(a) **Step 1**. Familiarization with Data.

(b) **Step 2**. Coding.

(c) **Step 3**. Generating Themes.

(d) **Step 4**. Reviewing Themes.

(e) **Step 5**. Defining and Naming Themes.

(f) **Step 6**. Writing Up.

14. **Interpretation**. Interpretation is a key step in the research process. This step brings meaning to the various statistical inferences in quantitative data and the underlying themes in qualitative data. Interpretation refers to the task of drawing inferences from the collected facts after an analysis of the data. Its an act of explaining & showing your own understanding of something - guided by logic and reason, established theories and previous findings. It involves analysing results in light of the most appropriate amongst competing/ contradictory theories, validate existing theory/ modify existing theory or develop new explanatory concepts to guide future research. The overall aim being further intellectual stimulation & knowledge development. A good interpretation is the one which address the Research Questions, suggest solutions in light of existing theory/ body of knowledge through system's view and Intellectual Synthesis. Therefore, don't directly state statistical results, be Imaginative, Novel & Creative using Convergent & Divergent Thinking and understand context especially cultural aspects-Linguistic/ Religious/ Ethnic/ Economic context. Don't jump to broad generalisation, keep time, area, conditions in mind.

CHAPTER IX

WRITING RESEARCH PROPOSAL AND REPORT

Research Proposal

1. All research endeavor, in both qualitative and quantitative research, in every academic and professional field is preceded by a research proposal. It informs your guide or academic supervisor or potential research contract provider about your conceptualisation of the total research process that you propose to undertake so that they can examine its validity and appropriateness. Depending on the level at which the research is being undertaken (Masters/ Doctorate), the research proposal will be approved by the guide/ supervisor/ academic committee. The requirements for a research proposal may vary from institute to institute and from discipline to discipline within a university, however, the basic concept and idea remains the same.

2. **Concept**. A research proposal is an overall plan, scheme, structure and strategy designed to obtain answers to the research questions or problems that constitute your research project. A research proposal should outline the various tasks you plan to undertake to fulfil your research objectives, test hypotheses (if any) or obtain answers to your research questions. It should also state your reasons for undertaking the study. Broadly, a research proposal's main function is to give out the operational plan for obtaining answers to your research questions.

3. **Contents**. The research proposal should contain the following information about the study:-

(a) An **introduction**, including a brief literature survey.

(b) **Research Questions and Objectives** of study leading to the articulation of the research problem.

(c) **Extensive Review of literature** to include an identified gap in the body of knowledge, that justifies your study, a theoretical framework that underpins your study, a conceptual framework which guides your study to address the identified gap.

(d) **Hypothesis/ Hypotheses** to be tested, if applicable.

(e) Study **design** that you are proposing to adopt which includes – sampling design, Research **instrument**(s) you are planning to use, methods of data collection, analysis techniques etc.

(f) Data Processing procedures.

(g) Ethical issues involved and how you propose to deal with them.

(h) Proposed chapters of the report.

(j) Problems and limitations of the study and likely areas for future study.

(k) Proposed timeframe for the project.

4. Your proposal should follow the suggested guidelines and be written in an academic style. It must contain appropriate citations in the body of the text and a bibliography of references at the end.

Report Writing

5. Report writing is the final activity in the research process wherein the study is presented in a readable, logical and well-presented manner. In addition to your understanding of research methodology, the **quality of the report depends upon your written communication skills and clarity of thought, your ability to express thoughts in a logical and sequential manner, and your knowledge base of the subject area**. In a way, this last step is the most crucial as it is through the report that the findings of the study and their implications are communicated to your supervisor and readers.

6. The **main difference between research and other writing is in the degree of control, rigorousness and caution required. Research writing must be accurate, clear, free of ambiguity, logical and concise.** Your writing should not be based upon assumptions about the knowledge of your readers about the study. Bear in mind that you must be able to defend whatever you write should anyone challenge it. Do not use ornamental and superficial language. Even the best researchers make several drafts before writing up their final one, so be prepared to undertake this task.

7. The following **factors** must be considered while preparing the report: -

(a) **Length**. It should be long enough to cover the subject but short enough to maintain interest. The report should not be dull and be able to sustain readers interest.

(b) **Objective Style and Simple**. Abstract terminology and technical **jargon should be avoided in a research report**. The report **should be able to convey the matter as simply as possible**.

(c) **Do not Assume Prior Knowledge**. Do not assume that reader know what is in the researcher's mind. Do not think that things are self-evident.

(d) **Free from Mistakes**. The reports should be free from grammatical mistakes and must be prepared strictly in accordance with the techniques of composition of report-writing such as the use of quotations, footnotes, documentation, proper punctuation and use of abbreviations in footnotes and the like.

(e) **Originality**. A research report should be original and must contribute to the solution of a problem and must add to the store of knowledge.

(f) **Clear Objective**. The objective of the study, the nature of the problem, the methods employed and the analysis techniques adopted must all be clearly stated.

(g) **Policy Implications**. Towards the end, the report must also state the policy implications relating to the problem under consideration. It is usually considered desirable if the report makes a forecast of the probable future of the subject concerned and indicates the kinds of research still needs to be done in that field.

(h) **Appendices & Bibliography**. Appendices should be enlisted in respect of all the technical data in the report. Bibliography of sources consulted is a must for a good report and must necessarily be given.

Organisation of Report

8. It is strongly recommended that you follow the guidelines for the preparation of the report/ dissertation as given by your academic institution. The layout should preferably conform to the following:-

(a) **Preliminaries**.

(i) Cover.

(ii) DS Comments Page.

(iii) Declaration Page – Participant declaration, Mentor certificate, originality certificate.

(iv) Abstract.

(v) Acknowledgements.

(vi) Table of contents.

(vii) List of Appendices, Tables, Figures.

(viii) List of Abbreviations.

(b) **Main Body (Flexible)**.

(i) Chapter 1 – Introduction

(ii) Chapter 2 – Historic Background

(iii) Chapter 3 – Review of Literature

(iv) Chapter 4 – Research design

(v) Chapter 5 – Data Analysis and Interpretation

(vi) Chapter 6 – Findings Recommendation and Conclusion

(vii) Bibliography

9. **Plagiarism**. Any attempt to copy from another (present or previous) participant or to copy large chunks from academic or other sources without appropriately referencing those sources will trigger the full weight of plagiarism procedure. Prefer paraphrasing to quotes with appropriate intext citation and referencing in bibliography. **If there is any doubt concerning the authenticity of your work, the university reserves the right to demand an individual presentation before a panel**. **All the material that relates to your report, including completed questionnaires or tapes from interviews, should be shown to your mentor and be kept until the examination board has confirmed your results**. Do not throw this material away once your report is submitted, as you might be asked to present it as part of the viva voce. College is using Turnitin Software to check plagiarism level which shall not be beyond 10% and the software has features to check AI content as well.

Ethical Issues

10. There are various stakeholders in research, whether it is quantitative or qualitative and it is important to look at ethical issues concerning each of them. –

(a) **Research Participants or Subjects**. Ethical issues related to research participant/ respondents of study as under:-

(i) Collecting irrelevant information.

(ii) It is considered unethical to collect information without the knowledge of participants and their expressed willingness and informed consent.

(iii) Providing Incentives to respondents to participate in the study.

(iv) Sharing information about a respondent with others for purposes other than research is unethical.

(b) **Researcher**. Ethical issues related to the researcher :-

(i) Bias on the part of the researcher is unethical.

(ii) Using Inappropriate Research Methodology.

(iii) Incorrect reporting.

(iv) Inappropriate use of information collected from respondents.

(c) **Sponsoring Organisation**. Ethical issues regarding organizations which support and fund research activity are as under:-

(i) Restrictions imposed by sponsoring Organisation like the selection of a particular research methodology, not reporting the facts etc. are unethical.

(ii) Misuse of information by sponsoring body is unethical.

REFERENCES

1. Research Methodology – A Step by Step Guide for Beginners by Ranjit Kumar.

2. Research Methodology – Methods and Techniques by C R Kothari.

3. Introduction to Research Methods – A practical guide for everyone undertaking a research project by Dr Catherine Dawson.

4. Social Science Research – Principles, Methods, and Practices by Anol Bhattacherjee.

5. Marketing Research – An Applied Orientation by Naresh K Malhotra.

6. Fundamentals of Education Research by Anderson G.

7. Business Research Methods by Bryman & Bell.

8. Experimental and Quasi- Experimental Designs for Research, by Campbell, D. T.& Stanley, J.C.

9. Research Design: Qualitative , Quantitative, and Mixed Methods Approaches by Creswell John W.

10. Become a Researcher – A Reacher Companion for Social Sciences by John Pryor and Paul Yates.

11. Foundations of Behavioural Research by Kerlinger, F.N..

12. A Companion to Qualitative Research by Uwe Flick, Ernst Von Kardoff and Ines Steinke.

13. Research Methods – The Basics by Nicholas Walliman.

14. Business Research Methods by Donald R Cooper & Pamela S Schindler.

15. Statistical Methods & Scientific Inference by Fisher, R. A. (1990).

16. Designing and Conducting Mixed Methods Research by John W Creswell and Vicki L Plano Clark