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READING MATERIAL

ON

RESEARCH METHODOLOGY

(Pre-read recommended for project preparation)

RESEARCH METHODOLOGY

What is Research?

Paul Leedy describes research as "the systematic process of collecting and analyzing information (data) in order to increase our understanding of the phenomenon with which we are concerned or interested." Leedy suggests that the word research has so many meanings attached to it in that "few people have any idea of the real meaning."

Research is an ORGANIZED and SYSTEMATIC way of FINDING ANSWERS to QUESTIONS.

SYSTEMATIC because there is a definite set of procedures and steps which you will follow. There are certain things in the research process which are always done in order to get the most accurate results.

ORGANIZED because in that there is a structure or method in going about doing research. It is a planned procedure, not a spontaneous one. It is focused and limited to a specific scope.

FINDING ANSWERS is the end of all research. Whether it is the answer to a hypothesis or even a simple question, research is successful when we find answers. Sometimes the answer is no, but it is still an answer.

QUESTIONS are central to research. If there is no question, then the answer is of no use. Research is focused on relevant, useful, and important questions. Without a question, research has no focus, drive, or purpose.

It is also defined as Scholarly or scientific investigation or inquiry. 'Research' is to be understood as original investigation undertaken in order to gain knowledge and

understanding It's a detailed study of a subject, especially in order to discover (new) information or reach a (new) understanding.

Research refers to study and research on pure science that is meant to increase our scientific knowledge base. This type of research is often purely theoretical with the intent of increasing our understanding of certain phenomena or behavior but does not seek to solve or treat these problems.

The word *research* derives from the French **recherché**, from **recherché**, to search closely where "chercher" means "to search" in French language. Its literal meaning is 'to investigate thoroughly'.

Research is a human activity based on intellectual investigation and aimed at discovering, interpreting, and revising human knowledge on different aspects of the world. It can be scientific or not scientific.

Scientific research relies on the application of scientific methods based on scientific paradigm. This research provides scientific information and theories for the explanation of the nature and properties of humans and the whole Universe. It makes practical applications possible.

Significance of Research:

1. Provides basis for economic, business, educational policies.
2. Solves various operational and planning problems of business (Market R, Operations R, Motivational R) Helps decision making in business
3. Increases funds of knowledge

Where do research topics come from?

So how do researchers come up with the idea for a research project? Probably one of the most common sources of research ideas is the experience of **practical problems in the field**.

Many researchers are directly engaged in social, health or human service program implementation and come up with their ideas based on what they see happening around them. Others aren't directly involved in service contexts, but work with (or survey) people who are in order to learn what needs to be better understood. Many of the ideas would strike the outsider as silly or worse. For instance, in health services areas, there is great interest in the problem of back injuries among nursing staff. It's not necessarily the thing that comes first to mind when we think about the health care field. But if you reflect on it for a minute longer, it should be obvious that nurses and nursing staff do an awful lot of lifting in performing their jobs. They lift and push heavy equipment, and they lift and push oftentimes heavy patients! If 5 or 10 out of every hundred nursing staff were to strain their backs on average over the period of one year, the costs would be enormous -- and that's pretty much what's happening. Even minor injuries can result in increased absenteeism. Major ones can result in lost jobs and expensive medical bills. The nursing industry figures that this is a problem that costs tens of millions of dollars annually in increased health care. And, the health care industry has developed a number of approaches, many of them educational, to try to reduce the scope and cost of the problem. So, even though it might seem silly at first, many of these practical problems that arise in practice can lead to extensive research efforts.

Another source for research ideas is the **literature in your specific field**. Certainly, many researchers get ideas for research by reading the literature and thinking of ways to extend or refine previous research. Another type of literature that acts as a source of good research ideas is the **Requests For Proposals** (**RFP**s) that are published by government agencies and some companies. These RFPs describe some problem that the agency would like researchers to address -- they are virtually handing the researcher an idea! Typically, the RFP describes the problem that needs addressing, the contexts in which it operates, the approach they would like you to take to investigate to address the problem, and the amount they would be willing to pay for such research. Clearly, there's nothing like potential research funding to get researchers to focus on a particular research topic.

And let's not forget the fact that many researchers simply **think up their research** topic on their own. Of course, no one lives in a vacuum, so we would expect that the ideas you come up with on your own are influenced by your background, culture, education and experiences.

Is the study feasible?

Very soon after you get an idea for a study reality begins to kick in and you begin to think about whether the study is feasible at all. There are several major considerations that come into play. Many of these involve making **tradeoffs between rigor and practicality**. To do a study well from a scientific point of view may force you to do things you wouldn't do normally. You may have to control the implementation of your program more carefully than you otherwise might. Or, you may have to ask program participants lots of questions that you usually wouldn't if you weren't doing research. If you had unlimited resources and unbridled control over the circumstances, you would always be able to do the best quality research. But those ideal circumstances seldom exist, and researchers are almost always forced to look for the best tradeoffs they can find in order to get the rigor they desire.

There are several practical considerations that almost always need to be considered when deciding on the ***feasibility*** of a research project. First, you have to think about **how long the research will take** to accomplish. Second, you have to question whether there are important **ethical constraints** that need consideration. Third, can you achieve the **needed cooperation** to take the project to its successful conclusion. And fourth, how significant are the **costs** of conducting the research. Failure to consider any of these factors can mean disaster later.

The word "research" is used to describe a number of similar and often overlapping activities involving a search for information.

Often people think of research in terms of science and technology, but research takes place in every area of academic study. Research into our culture, our business practices or our economy can be as important as medical and scientific research.

The simple answer to this question is that research is what we do when we have a question or a problem we want to resolve. We may already think we know the answer to our question; we may think the answer is obvious, common sense even; but until we have subjected our problem to rigorous scientific scrutiny, our 'knowledge' remains little more than guesswork or at best, intuition. But what do we mean by 'scientific scrutiny' and how do we go about it?

Research encompasses activities that increase the sum of human knowledge.

Research and experimental development comprises:

1) Creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of humanity, culture and society, and the use of this stock of knowledge to devise new applications.

2) Any activity classified as research and experimental development is characterised by originality; it should have investigation as a primary objective and should have the potential to produce results that are sufficiently general for humanity's stock of knowledge (theoretical and/or practical) to be recognisably increased. Most higher education research work would qualify as research and experimental development.

3) Research carries with it a professional and ethical responsibility to disseminate and apply the results of research activity and to conduct research in a manner consistent with the Statement and Guidelines on Research Practice. An essential characteristic is that it leads to publicly verifiable outcomes which are open to peer appraisal.

The complementary activity of scholarship refers to possession of an extensive and profound knowledge of an academic discipline and the analysis and interpretation of existing knowledge aimed at improving, through teaching or by other means of communication, the depth of human understanding.

Types of Research Activity

Research is the creation of new knowledge. It can be categorized into four distinct types: Basic, Strategic, Applied & Experimental Development.

Pure basic research is experimental and theoretical work undertaken to acquire new knowledge without looking for long-term benefits other than the advancement of knowledge. Basic, or blue-sky research, is the pursuit of new knowledge without any assumptions about what it might lead to – essentially knowledge for its own sake.

Strategic basic research is experimental and theoretical work undertaken to acquire new knowledge directed into specified broad areas in the expectation of useful discoveries. It provides the broad base of knowledge necessary for the solution of recognized practical problems. Strategic research is the pursuit of new knowledge which might, in principle, have a practical application but without a precise view of the timescale or nature of the application. Applied research is knowledge which is developed with a specific objective in mind, particularly the conversion of existing knowledge into products, processes and technologies.

Applied research is original work undertaken primarily to acquire new knowledge with a specific application in view. It is undertaken either to determine possible uses for the findings of basic research or to determine new ways of achieving some specific and predetermined objectives. Applied research may be the stage in which collaboration with industry is most likely, but basic and strategic research creates pools of expertise and knowledge which benefit in many ways. Not only do breakthroughs with commercial potential first emerge from these types of research, but also the critical mass of knowledge needed to develop these breakthroughs into a marketable product is created here.

Experimental development is systematic work, using existing knowledge gained from research or practical experience, that is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed.

Types of Research based upon different criteria of classification:

1. Process	**Descriptive** Surveys (fact finding) ex post facto	Vs	**Analytical** Analysis of facts to evaluate the situation
2. Purpose	**Applied** Find solution to a problem	Vs	**Fundamental** Basic or pure. Formulates theory and generalisation
3. Type of data	**Quantitative** Phenomena can be expressed in Quantitative data, rigorous statistics applied.	Vs	**Qualitative** Phenomena can be expressed as Qualitative descriptions, motives behind an action, attitude opinion
4. Content	**Conceptual** Theoretical (abstract)	Vs	**Empirical** Relies on experiences and observations
5. Period	**Longitudinal** Longer period	Vs	**One time study** Shorter duration
6. Setting	**Field** Area of data collection is large field	Vs	**Laboratory** Strict and rigorous control of exp. Conditions

The timescales over which research takes place vary greatly. Sometimes a specific piece of research might only last a few months or even less, while at other times research may take decades to develop knowledge in a specific area. There may be an early breakthrough in a piece of research but a further, lengthy period before this is refined.

Alternatively, it may take years of exploration before a breakthrough is made. Sometimes the result is entirely different from (but potentially as valuable as) the one being sought. It is important to realize that there is no simple 'model' of how research should work, and every piece of research will follow its own path.

The most important characteristics of formal research, as Leedy defines it, is that it involves the interpretation of data to draw conclusions. Research is not, then, the mere restating of previously known facts (as previously done for undergraduate term papers) or the process of obtaining new knowledge by searching for information (information gathering for buying a car).

- Research originates with a question or problem.
- Research requires a clear articulation of a goal.
- Research follows a specific plan of procedure.
- Research usually divides the principal problem into more manageable sub-problems.
- Research is guided by the specific research problem, question, or hypothesis.
- Research accepts certain critical assumptions.
- Research requires the collection and interpretation of data in attempting to resolves problem that initiated the research.
- Research builds on previous research.

Why is research undertaken?

1). There is an absence of perfect knowledge. We live in a world of uncertainty. There is a constant need for knowledge.

2) There is a need to explore and produce answers to questions that have hitherto been unexplored and unanswered.

3) There is a need to contest and/or refute existing answers to questions for which there have been answers provided on the basis of previous research that have been pursued

4) There is a need to modify and/or refine existing answers to questions for which there have been answers provided on the basis of previous research.

There is a need to find out what is really happening.

What is reality? - agreement reality v/s experiential reality

Answers to research questions are at best contingent statements for which the truth or falsity can be challenged.

Scientific v/s Non-Scientific Methodology.

• Science as a systematic process of producing knowledge and the knowledge itself that is produced.

• Methodology as the study of method, the science of finding out.

What is the Science?

Science is best defined as a careful, disciplined, logical search for knowledge about any and all aspects of the universe, obtained by examination of the best available evidence and always subject to correction and improvement upon discovery of better evidence. What's left is magic. And it doesn't work. -- James Randi

A better approach is to do experiments and perform careful observations. The results of this approach are universal in the sense that they can be reproduced by any skeptic. It is from these ideas that the scientific method was developed.

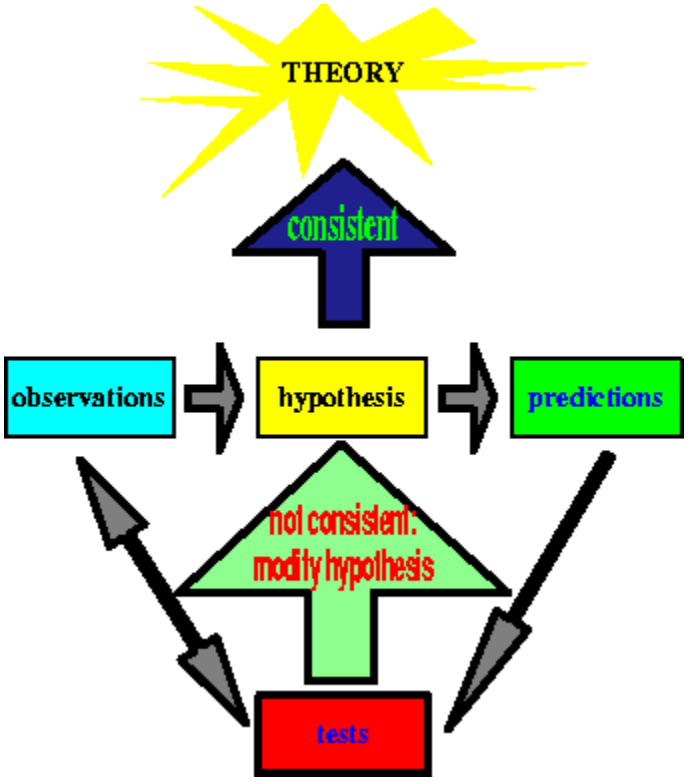
Most of science is based on this procedure for studying Nature.

What is the ``scientific method''?

The scientific method is the best way yet discovered for winnowing the truth from lies and delusion. The simple version looks something like this:

- 1. Observe some aspect of the universe.
- 2. Invent a tentative description, called a hypothesis, that is consistent with what you have observed.
- 3. Use the hypothesis to make predictions.
- 4. Test those predictions by experiments or further observations and modify the hypothesis in the light of your results.
- 5. Repeat steps 3 and 4 until there are no discrepancies between theory and experiment and/or observation.

When consistency is obtained the hypothesis becomes a theory and provides a coherent set of propositions which explain a class of phenomena. A theory is then a framework within which observations are explained and predictions are made.



Flow diagram describing the scientific method

Methodology

Methodology is the study of method. It

– provides a description and an analysis of method
– highlights strengths and limitations of method
– provides a basis for clarifying pre-suppositions about method
– permits a critical assessment of techniques
– generally facilitates an understanding of science as a process

Method

Method is common techniques used in all sciences or significant parts of them.

It includes procedures such as:

– conceptualization and hypothesis formulation
– making observations and measurements
– performing experiments
– building models and theories
– providing explanations
– drawing conclusions and making predictions

Technique

Technique is common to specific sciences/scientific disciplines and sub disciplines:

– there is a right way and a wrong way of doing things
– there is a better and a worse way of doing things
– the ways of doing things that is for one compelling reason or another considered to be acceptable
– the mastery of techniques is normally linked to scientific training

Steps in the Conduct of Research

1) Select a Topic
2) Develop Research Problems / Questions
3) Identify Variables
4) Hypothesize
5) Make Decisions about Research Design
6) Collect Data
7) Evaluate Data Quality
8) Analyze Data
9) Interpret Results/Findings
10) Test Hypothesis
11) Disseminate Results / Inform Stakeholders

The Purpose of Research

Exploration:

– Satisfies curiosity

– Tests feasibility for a more detailed study

– Develops and refines methods for a more detailed study

– Permits the researcher to break new ground

Description:

– Censuses, surveys and opinion polls

– Hinges upon issues of data quality, reliability/validity

Explanation:

– How and why?

– Cause and effect answers.

The Research Cycle

Theory

Deduction of Hypotheses -- Operationalization

Observation – Generalization

Laws – Induction

Theory

Theory:

A **theory** is a set of interrelated constructs (concepts), definitions, and propositions, that present a systematic view of phenomena by specifying relationships among variables, with the purpose of explaining and predicting the phenomena**.**

– The starting point is a set of assumptions

– It provides an explanation as to how and why change occurs

– It involves a system of concepts and ideas

– It provides a basis for modeling relationships including causal relationships between these concepts

– It provides a basis for connecting a series of idea

Hypothesis

A **hypothesis** is a proposition about a relationship between two or more variables. The proposition assumes the form of a statement that has its roots in a number of different sources including theory, direct observation, guesses and intuition**.**

A **hypothesis** is conjectural and subject to testing since it consists of two or more variables that are measurable or potentially measurable**.**

Observations

Qualitative and quantitative information that result from data collection and measurement processes to facilitate confirmation or disconfirmation of hypotheses. Observations also facilitate the generation of descriptive statistics.

Laws

Summary statements that are repeated and supported through a process of replication. Withstand variation across time and across settings.

Scientific Research

Scientific Research is systematic, controlled, empirical, and critical investigation of natural phenomena guided by theory and hypotheses about the presumed relationships about such phenomena.

Some universal virtues of scientific research:

– Empiricism

– Check subjective threats

– Reinforce the importance of control

Research Design

Research Design focuses upon the planning of scientific research. It is the development of a strategy for finding out something.

This involves the following:

i) Specifying what you want to find out

ii) Determining the best way to proceed with finding out

iii) Purpose of Research - Exploratory, Descriptive, Explanatory

iv) Units of Analysis - Individuals, Groups and Social Artifacts

v) Topics for Research - Characteristics, Orientations, Experiences, Actions

vi) Nature of Relationships

vii) Time Dimension - Cross-sectional versus Longitudinal Studies

viii) Measurement - Conceptualization, Operationalization,

ix) Enumeration - Population, Sample

x) Choice of Method - Qualitative versus Quantitative

THE RESEARCH PROCESS

To begin with, one is expected to decide the general area or aspect of a subject-matter he would like to inquire into. This decision at best, points to a general area of the scholar's interest & concern. It would be like saying that one desires to visit the northern part of the country during the vacations. Such a decision affords only a crude indication. It does not help much in planning & organization because the specific details are lacking. The range of potential areas of general interest in any particular discipline is very extensive indeed.

The operations involved in a research process are so independent that the earlier steps or operations determine to an appreciable extent the nature of the later ones. Serious difficulties may arise, often preventing a successful completion of the study, if the researcher has not taken into active account the subsequent procedures during the initial stages of the inquiry. Thus the researcher has to be constantly anticipating at each step in the research process, the requirements of the subsequent steps.

As a research progresses from the formulation of the problem through collection data to presenting the conclusions, the focus necessarily shifts from one kind of activity to the other. Such shifts, it should be remembered, reflect differing emphases at different points on specific operations involved in research process, rather than a singular concentration at any time on any particular step.

The organization of the subject-matter requires that steps should be discussed separately & consecutively, hence adopting the sequence of steps proposed above, not for getting, of course, that the research process never corresponds from the published research reports.

It should also be borne in mind that designating certain steps as major only implies that each of such steps subsumes under it a set of inter-related operations, each of which is important in its own way in affecting the value of the research results & their worth thus major steps should advisedly be considered as groupings or classes of operations or activities hundreds of which involved in research, each corresponding to some requirement of research. For example, "Data Collection" summarizes decisions about the kinds of data needed, the most efficient way of collecting them, the activities to be carried out in the development & pre-testing of the data collection instruments etc. in addition, such decisions as constitute responses to the practical requirements of research are also covered, i.e. planning of budget, procurement & administration of funds, allocation of personnel, training of personnel (e.g. interviewers), strategies of eliciting co-

operation from the people who are to be respondents & so on. It is obvious that each one of these operations will have some effects on the quality of research. A small omission anywhere will affect adversely the quality of study, just as a small lapse, even in the manner it is served, will affect the satisfaction people get from a recipe.

Topics prompted by intellectual concerns differ from those mooted by practical ones in that the former are less likely to involve the study of specific situations primarily as objects of interest in them. The specific situations have only an illustrative relevance, i.e. they are studied as specimens of some larger class of structures or process in which the researcher evinces theoretic interest. Many a time, investigators may be tempted to jump immediately from the selection of a general topic to the collection of data. But this only means that they would have to face the task off formulating a problem at some later stage when only the lucky ones may be able to produce a worthwhile scientific inquiry. Obviously, without a problem the heaps of data would hardly mean anything. The meaningfulness of data collected can be assessed only after their scrutiny & organization with a view to finding out how these data would answer a specific problem. The problem is, indeed the organizing principle for the processing & organization of data.

FORMULATION OF PROBLEM:

In most scientific work, the difficulty lies in framing problems or questions rather than in finding their solutions. A great deal of thought has to be put into the formulation of problems to expect to get anything worthwhile from the efforts to solve them. In point of fact, research really begins when a difficulty or a challenge which is the basic component of a research problem. The formulation of a specific research problem, the first material step in a scientific inquiry must be influenced basically by the requirements of scientific procedure. There is no surefooted & infallible principle which can guide an investigator to pose significant problems for research. It is possible, however, to identify some

conditions which have proved very helpful in formulating significant problems for research. A careful study of literature, systematic immersion into the subject-matter, analysis of " insight stimulating cases, etc, are some of these conditions. Formulation of problem for research, sensibly, involves, concern for reducing the research task to a manageable size.

Formulation of a problem:

R. L. Ackoff visualizes five components of a problem:

a) Research-consumer:-

There must be an individual or a group which experiences some difficulty. The individual may be the researcher himself & the group could be a group of researchers of scientists. For most problems there are other participants. The researcher, if he is different from other research-consumer is a participant in the problem.

b) Research-consumer Objectives:-

The research-consumer must have something he wants to get or some ends he seeks to achieve.

c) Alternative Means to Meet the Objectives:-

The researcher must have available alternatives means for achieving the objectives he desires. Means are courses of action open to the research-consumer. A course of action may involve use of various objects. It needs to be remembered that there must be at least two means available to the research-consumer. If he has no choice of means, he can have no problem.

d) Doubt in Regard to Selection of Alternatives:-

The existence of alternative courses of action is not enough, in order to experience a problem, the research consumer must have some doubt as to which alternative to select. All problems get reduced ultimately to the evaluation of efficiency of the alternative means for a given set of objectives.

e) One or More Environments to which the Difficulty of Problem Pertains:-

A change in environment may produce or remove a problem. A research-consumer may have doubts as to which will be the most efficient means in one environment but would have no such doubt in another. For e.g. a person may have a problem involving a decision as to what kind of coat to wear on a clear day. But should it rain, he would have no doubt about the propriety of wearing his raincoat.

Merton distinguishes three principal components in the progressive formulation of a problem for social research.

a) Originating Questions:-

The originating questions constitute the initial phase in the process of problem formulation. Originating questions are of various types. One class of originating questions calls for discovering a particular body of social facts. Such questions, sometimes called 'fact-finding' questions, hold a particular significance for social sciences. Another type of originating questions directs attention to the search for uniformities of relations between classes of social variables. It is quite evident that the originating questions differ in their scope as well as their degree of specificity. For e.g. in the discipline of sociology a large number of originating questions are addressed to sociological variables within one or another institutional sphere of society. Originating questions of another kind are put in such a form that they can be addressed to a variety of institutional spheres, e.g. the question. 'Do the diverse social roles that members of different social classes are called upon to play have consequences more important for their personalities than have their class positions. Originating questions claim an exclusive value, each has its own value in augmenting knowledge of particular kinds.

b) Rationale of Questions:-

Rationale is a statement of reasons why a particular question is worth putting across i.e. how the answer to the question will contribute to theory & practice. The requirement of a rationale arrests the flux of scientifically trivial questions & enlarges the volume of

important ones. The practical rationale makes out a case for the question by pointing out that its answers will help people achieve practical values, i.e. health, comfort, productivity, etc. Theoretical rationale of a question may be considered as one worth asking because its answer would enlarge the scope of an existing theory or conceptual scheme. Theoretical rationale of a question may direct the scientist's attention to observed inconsistencies in currently-accepted ideas or findings & may prompt him to ask whether these inconsistencies are apparent rather than real. A question may be considered well worth asking because its answer will be expected by bridging the gaps in the existing ideas that do not account for aspects of phenomena to which they should in principle apply. Eg. Many social regularities need not be culturally prescribed; men tend to have higher suicide rates than women, even though cultural norms do not invite males to put an end to themselves.

c) Specifying Questions:-

The originating questions, as we have seen, differ in their degree of specificity. The objective of transforming the originating question into specifying question with an eye on a series of observations in particular concrete situations warrants a search for empirical materials in reference to which the problem can be investigated fruitfully.

Conditions to formulate significant research problems:

a) Systematic Immersion in the Subject through First-hand Observation:-

The researcher must immerse himself thoroughly in the subject-area within which he wishes to pose a specific problem. For e.g. if the researcher was interested in the broad problem of juvenile delinquency, he should try to know at first-hand the various aspects of the life of delinquents by interviewing them, their family members & supervisors, etc, by observation. No experience is more rewarding in terms of getting a deep feel of the situation.

b) Study of Relevant Literature on the Subject:-

The researcher must be well-equipped to experience some difficulty or challenge. This in turn would depend upon the researcher being well conversant with the relevant theories in the field, reports & records etc. This would help to know if there are certain gaps in the theories or whether the prevailing theories applicable to the problem are inconsistent with each other and so on.

c) Discussions with Persons with Practical Experience in the Field of Study:-

It is known as experience survey. Administrators, Social workers, Community leaders, etc. are persons who have a store of rich practical experience in different fields of social life. Hence their advice, comments, information & judgements are usually invaluable.

Definition & Statement of the Problem:

1. Whitney, " To define a problem means to put a fence around it, to separate it by careful distinctions from like questions found in related situation of need".

2. Monroe and Engel hart, "To define a problem means to specify it is detail and with precision. Each question and subordinate question to be answered is to be specified. The limits of the investigation must be determined. Frequently it is necessary to review previous literature / studies in order to determine just what is to be done."

3. Hillway has given us some rules for definition of a problem –

a) Be sure that the topic chosen is neither too vague nor too broad in scope.
b) To make the problem clearer and more understandable state it as question which requires definite answer.
c) Carefully state the limits of the problem (scope), eliminating all aspects and factors, which will not be considered in the study.
d) Define any special terms that must be used in the statement of the problem. (Operational definition)

Evaluation of the Problem:

1. Is the problem researchable? (Reasonable problem is concerned with the relationship between two or more variables that can be defined and measured).
2. Is the Problem new? (Avoid unnecessary duplication).
3. Is the problem significant? (Try to fill in the gaps in the knowledge, resolve inconsistencies, reinterpret facts) The findings should become a basis for theory, generalisations or principles.
4. Is the problem feasible for a particular researcher?
   a) Research competencies,
   b) Interest and enthusiasm,
   c) Financial considerations,
   d) Time requirement,
   e) Administrative considerations (equipment, personnel)

Most people associate research with doing something: observing people, using equipment, or analyzing data. However, the most critical parts of the research process are those parts that are associated with **thinking** not doing. Researcher must understand how to develop research questions, define variables, and formulate hypotheses. Unless these three areas are carefully done the researcher will waste his/her time in running around observing people, using equipment, and analyzing data.

After one has become interested in an area of inquiry, and has studied the available literature, it is time to formulate a research question and develop hypotheses. This stage is the most crucial part of research. If one is not exactly clear about what one is studying, then the result is a very muddy research study. Contrary to myth many research studies are muddy and ill conceived, because of careless thinking at this stage of the process.

A research question is a formal statement of the **goal of a study**. The research question states clearly what the study will investigate or attempt to prove. The research question is a logical statement that progresses from what is known or believed to be true (as determined by the literature review) to that is unknown and requires validation.

The research question is a statement of what the researcher wants to discover. The research question is based on previous discoveries (as located in the literature review) and can be either a general statement or a specific hypothesis. The research question is the purpose of a study summed up in one or two sentences. Often the title of a research study will be the research question.

Often to begin the literature search process that precedes the development of a research study, the researcher formulates a research question. One way to do this is to write a *Topic Sentence*. This is the research question summarized in one sentence of this form: "What is the effect of something on something else?" Let's define the terms in the example.

1. "Something" - This is a variable. It is the variable that affects another variable.
2. "Something Else" - This is another variable. It is the variable that is changed due to the effects of the first variable.
3. "Effect" - This is the process that happens when one variable relates with another.

Here is a sample Topic Sentence: "As a person gets older the amount of their body that is muscle mass decreases."

Let's define the components:

1. "Something" - "a person gets older." The variable of "aging."
2. "Something Else" - "amount of their body that is muscle mass." The variable is the amount of muscle.
3. "Effect" - "decreases." - The effect of aging on muscle mass is predicted.

A Topic Sentence can be a statement or a question.

It is important to be able to identify the research question. The other components of a study grow from the research question in a logical manner. Once we have a clear research question, the question leads to specific variables. The variables are the observable phenomena that can be studied. A variable varies, that is it can be observed to change, or can take on different attributes. Gender is a variable and it can take on two different attributes, male and female. Knowledge of the variables allows us to understand the hypotheses of the study. The hypotheses describe the predicted relationships between the variables.

REVIEW OF RELATED LITERATURE:

Once you have selected a potential research topic, the next step is to review the body of literature related to that topic. (In instances where the topic was generated by examining the professional literature, you have already begun this process). A critical review of the literature acquaints you with the current state of knowledge regarding your topic, and helps refine your research problem. Reading about previous research makes it less likely that you will repeat work that has already been done, and also enables you to learn from the mistakes of other researchers.

Knowledge is cumulative: Every piece of research will contribute another piece to it. That is why it is important to commence all research with a review of the related literature or research, and to determine whether any data sources exist already that can be brought to bear on the problem at hand. This is also referred to as secondary research. Just as each study relies on earlier work, it will provide a basis for future work by other researchers. A literature review summarizes, interprets, and evaluates existing "literature" (or published material) in order to establish current knowledge of a subject. The purpose for doing so relates to ongoing research to develop that knowledge: the literature review may resolve a controversy, establish the need for additional research, and/or define a topic of inquiry.

The Purposes of a Literature Review:

– To demonstrate familiarity with a body of knowledge

– To establish credibility

– To illustrate the development of research on the idea from past to present

– To integrate and summarize what is known in the area

– To learn from others and stimulate new ideas

Utility of Literature Review is evident in the following areas:

– Boosts researcher's confidence with the topic

– Places the proposed research in context relative to the bigger picture

– Traces the development of the issue over time

– Provides a basis for theoretical comparison

– Provides insights into variations in methodological inputs

– Summarizes the state of Knowledge in an area at a particular point in time

Sources of a Literature Review:

– Scholarly Journals

– Books

– Dissertations

– Government documents

– Policy Report

– Conference and Seminar Papers

Searching for Literature

– Articles in Scholarly Journals

– Subject Matter Index/Abstract

– Scholarly books/Dissertations/Government Documents

– Policy Reports/Papers Presented

What to Capture :

– Full Citation (author's name, titles, volume, issue, pages, etc)

– Use cards or computers

– Record more than you may need

– Photocopying saves time but it is expensive

What to Record

– Hypotheses

– Measurement strategies for Concepts in the study

– Main findings

– Research Design

– Sampling Details

– Main Findings

– Bibliography/References

One of the most important early steps in a research project is the conducting of the literature review. This is also one of the most humbling experiences you're likely to have. Why? Because you're likely to find out that just about any worthwhile idea you will have has been thought of before, at least to some degree. Every time I teach a research methods course, I have at least one student come to me complaining that they couldn't find anything in the literature that was related to their topic. And virtually every time they have said that, I was able to show them that was only true because they only looked for articles that were *exactly* the same as their research topic. A literature review is designed to identify related research, to set the current research project within a conceptual and theoretical context. When looked at that way, there is almost no topic that is so new or unique that we can't locate relevant and informative related research.

Some tips about conducting the literature review. First, **concentrate your efforts on the scientific literature**. Try to determine what the most credible research journals are in your topical area and start with those. Put the greatest emphasis on research journals that use a

blind review system. In a blind review, authors submit potential articles to a journal editor who solicits several reviewers who agree to give a critical review of the paper. The paper is sent to these reviewers with no identification of the author so that there will be no personal bias (either for or against the author). Based on the reviewers' recommendations, the editor can accept the article, reject it, or recommend that the author revise and resubmit it. Articles in journals with blind review processes can be expected to have a fairly high level of credibility. Second, **do the review early** in the research process. You are likely to learn a lot in the literature review that will help you in making the tradeoffs you'll need to face. After all, previous researchers also had to face tradeoff decisions.

What should you look for in the literature review? First, you might be able to find a study that is quite similar to the one you are thinking of doing. Since all credible research studies have to review the literature themselves, you can check their literature review to get a quick-start on your own. Second, prior research will help assure that you include all of the major relevant constructs in your study. You may find that other similar studies routinely look at an outcome that you might not have included. If you did your study without that construct, it would not be judged credible if it ignored a major construct. Third, the literature review will help you to find and select appropriate measurement instruments. You will readily see what measurement instruments researchers use themselves in contexts similar to yours. Finally, the literature review will help you to anticipate common problems in your research context. You can use the prior experiences of other to avoid common traps and pitfalls.

OBJECTIVES :

The **OBJECTIVES** of a research project summarise what is to be achieved by the study. Objectives should be closely related to the statement of the problem. For example, if the problem identified is low utilisation of child welfare clinics, the general objective of the study could be to identify the reasons for this low utilisation, in order to find solutions.

The **general objective** of a study states what researchers expect to achieve by the study in general terms. It is possible (and advisable) to break down a general objective into smaller, logically connected parts. These are normally referred to as **specific objectives.**

Specific objectives should systematically address the various aspects of the problem as defined under 'Statement of the Problem' and the key factors that are assumed to influence or cause the problem. They should specify **what** you will do in your study, **where** and **for what purpose**.

A study into the cost and quality of home-based care for HIV/AIDS patients and their communities in a country, developed at a workshop, for example, had as its general objective:

> To explore to what extent community home-based care (CHBC) projects in the country provide adequate, affordable and sustainable care of good quality to people with HIV/AIDS, and to identify ways in which these services can be improved.
>
> It was split up in the following specific objectives:
>
> 1. To identify the full range of economic, psychosocial, health/nursing care and other needs of patients and their families affected by AIDS.
> 2. To determine the extent to which formal and informal support systems address these needs from the viewpoint of service providers as well as patients.
> 3. To determine the economic costs of CHBC to the patient and family as well as to the formal CHBC programmes themselves.

4. To relate the calculated costs to the quality of care provided to the patient by the family and to the family/patient by the CHBC programme.
5. To determine how improved CHBC and informal support networks can contribute to the needs of persons with AIDS and other chronically and terminally ill patients.
6. To use the findings to make recommendations on the improvement of CHBC to home care providers, donors and other concerned organisations, including government.

The first specific objective usually focuses on quantifying or specifying the problem.
This is necessary in many studies, especially when a problem has been defined (but not quantified) for which subsequently the major causes have to be identified. Often use can be made of available statistics or of the health information system. In the study on the high defaulter rate of TB patients, this rate should first be established, using the records, and only then would the contributing factors to defaulting be analysed.

In the example given, the needs of AIDS patients and their relatives for care and support have been defined in the first objective. The objectives which follow concentrate on adequacy, cost and quality of care provided whereas the last two objectives specify possible improvements with respect to CHBC, and to whom the results and recommendations of the study will be fed back.

Note:

It may be helpful to use the diagram as a point of departure and check whether the **problem** and all **major, directly contributing factors** (analytic study) or **major components** (descriptive or evaluation study) have been covered by the objectives. An objective indicating **how the results will be used** should be included in every operational study, either as part of the general objective or as a specific objective.

Why should research objectives be developed?

The formulation of objectives will help you to:

- **Focus** the study (narrowing it down to essentials);
- **Avoid** the collection of data which are not strictly necessary for understanding and solving the problem you have identified; and
- **Organise** the study in clearly defined parts or phases.

Properly formulated, specific objectives will facilitate the development of your research methodology and will help to orient the collection, analysis, interpretation and utilisation of data.

How should you state your objectives?

Take care that the objectives of your study:

- Cover the different aspects of the problem and its contributing factors in a **coherent** way and in a **logical sequence**;
- Are **clearly phrased** in **operational terms,** specifying exactly what you are going to do, where, and for what purpose;
- Are **realistic** considering local conditions; and
- Use **action verbs** that are specific enough to be evaluated.

Examples of action verbs are: to determine, to compare, to verify, to calculate, to describe, and to establish.

Avoid the use of vague non-action verbs such as: to appreciate, to understand

Keep in mind that when the project is evaluated, the results will be compared to the objectives. If the objectives have not been spelled out clearly, the project cannot be evaluated.

Using the previous example on cost and quality of CHBC, we may develop more specific **research questions** for the different objectives, such as:

- Do rural and urban CHBC projects differ with respect to the adequacy, quality, affordability and sustainability of HBC provided?
- How satisfied are AIDS patients, relatives and service providers with the care provided? Are there differences in perceptions between those groups?
- Is the stigma attached to being HIV+ the same strong for women as for men? Or are there gender differences in stigma?
- What impact does the care provided to AIDS patients have on the economy of the homestead? Is there competition with other basic needs (e.g. schooling of children, purchases of food)?

VARIABLES:

The purpose of a research study is to discover unknown qualities of persons or things. To measure these qualities we define variables. Variable is a concept that can take different quantitative values (height, weight, income). Qualitative attributes can also be quantified. In a study there are several classes of variables.

Types:

1. Continuous variable : Takes different values including decimals. There is no real gap between the values. e.g. length, income.
2. Discreet variable : Takes values only in integer from – real gaps –
   e.g. No. of children in a family.
3. Dependent variable : Depends upon or is a consequence of other variables.
4. Independent variable : That which is antecedent to dependent variable.
5. Control variable : Variable that is controlled for nullifying their effect on dependent variable

6. Moderating variable : Variable that cannot be controlled but it does have its effect on dependent variable. So you measure it and study its contribution to the dependent variable, at different level.
7. Intervening variable : Independent variable that are not related to the purpose of study but which affect dependent variable.

In a good experiment, the researcher must be able to **measure** the values for each variable. Weight or mass is an example of a variable that is very easy to measure. However, imagine trying to do an experiment where one of the variables is love. There is no such thing as a "love-meter." You might have a **belief** that someone is in love, but you cannot really be sure, and you would probably have friends that don't agree with you. So, love is not measurable in a scientific sense; therefore, it would be a poor variable to use in an experiment.

Researchers use an experiment to search for **cause and effect** relationships in nature. In other words, they design an experiment so that changes to one item cause something else to vary in a predictable way.

These changing quantities are called **variables**. A variable is any factor, trait, or condition that can exist in differing amounts or types. An experiment usually has three kinds of variables: independent, dependent, and controlled.

1. **Independent (or experimental) variable**: There are two types of independent variables: **Active and Attribute**. If the independent variable is an active variable then we manipulate the values of the variable to study its affect on another variable. For example, we alter anxiety level to see if responsiveness to pain reduction medication is enhanced. Anxiety level is the active independent variable. An attribute variable is a variable where we do not alter the variable during the study. For example, we might want to study the effect of age on weight. We cannot change a person's age, but we can study people of different ages and weights The **independent variable** is the one that is changed by the researcher. To insure a

fair test, a good experiment has only one independent variable. As the scientist changes the independent variable, he or she **observes** what happens.

2. **Dependent variable (or Criterion measure):** This is the variable that is affected by the independent variable. Responsiveness to pain reduction medication is the dependent variable in the above example. The dependent variable is dependent on the independent variable. Another example: If I praise you, you will probably feel good, but if I am critical of you, you will probably feel angry. My response to you is the independent variable, and your response to me is the dependent variable, because what I say influences how you respond.

The researcher focuses his or her observations on the **dependent variable** to see how it responds to the change made to the independent variable. The new value of the dependent variable is caused by and depends on the value of the independent variable.

3. **Control variable:** A control variable is a variable that effects the dependent variable. When we "control a variable" we wish to balance its effect across subjects and groups so that we can ignore it, and just study the relationship between the independent and the dependent variables. You control for a variable by holding it constant, e.g., keep humidity the same, and vary temperature, to study work comfort levels in any department.

Experiments have **controlled variables**. Controlled variables are quantities that a researcher wants to remain constant, and he must observe them as carefully as the dependent variables. For example, if we want to measure how much water flow increases when we open a faucet, it is important to make sure that the water pressure (the controlled variable) is held constant. That's because both the water pressure and the opening of a faucet have an impact on how much water flows. If we change both of them at the same time, we can't be sure how much of the change in water flow is because of the faucet opening and how much because of the water pressure. In other words, it would not be a fair test. Most experiments have more than one controlled variable. Some people refer to controlled variables as "constant variables. "In the design of experiments and data analysis, **control variables** are those variables that are

not changed throughout the trials in an experiment because the experimenter is not interested in the effect of that variable being changed for that particular experiment. (In other words, control variables are extraneous factors, possibly affecting the experiment, that are kept constant so as to minimize their effects on the outcome.) In a scientific experiment, the controlled variable never changes; it is the same for every setup.

4. **Intervening variable:** This is a variable that probably does influence the relationship between the independent and dependent variables, but it is one that we do not control or manipulate. Intervening variables which influence the study in a negative manner are often called confounding variables.

An **intervening variable** is a hypothetical concept that attempts to explain relationships between variables, and especially the relationships between independent variables and dependent variables. It is often distinguished from a hypothetical construct in that it has no properties other than those observed in empirical research. That is, it is simply a summary of the relationships observed between independent and dependent variables.

For example, hunger is a hypothetical internal state which has been used to explain the relationships between independent variables such as length of time without food, or amount of food consumed, and dependent variables which are measures of eating. Intervening variables may be useful in reducing the number of relationships which need to be explained; for example, in attempting to explain the relationships between five independent variables and two dependent measures of eating, the use of the intervening variable of hunger reduces the number of relationships to be explained from ten to seven (five between the independent variables and hunger, and two between hunger and the dependent variables).

On the other hand, one can make the statement that acquaintance with members of other races and exposure to anti-racist education reduces intolerant behaviour towards members of other races and increases social interaction with members of other races. This statement is phrased so generally that it must imply relationships which have not been observed. A

hypothetical construct of tolerance could be posited as a means of explaining the relationships between these and other variables.

5. Moderator variables - "In general terms, a moderator is a qualitative (e.g., sex, race, class) or quantitative (e.g., level of reward) variable that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable. Consider a case in which a variable **M** is presumed to change the **X** to **Y** causal relationship. So for instance, a certain form of psychotherapy may reduce depression more for men than for women, and so we would say that gender (**M**) moderates the causal effect of psychotherapy (**X**) on depression (**Y**)..

Variables must be defined in terms of measurable behaviors. The operational definition of a variable describes the variable. There are two ways by which we can **operationally define** a variable; by how it is measured and by how it is used to classify subjects. Later we will use specialized terms for how variables are defined (continuous or categorical) and the nature of the data obtained (nominal, ordinal, or interval).

The first way of defining a variable is to describe how we measure it. We cannot just say we will "reduce anxiety." We must define how anxiety will be measured and just what is a reduction in anxiety.

The second way of defining a variable is to describe how you have classified subjects (people) into groups or categories. This is important since two researchers could be studying the same variable but if they each classify their subjects differently they may get different results. For example, suppose we wanted to study the income levels of single adults. If one researcher classified his single adult subjects into these three categories (17 through 22, 23 through 27, and 28 through 33), he would get different results than this second researcher who used three different categories (20 through 40, 41 through 60, and 61 and over). The first researcher is interested in young adults and the second in all ages. Thus, without operational definitions we could think that they both were studying the same variable. When

we use behavioral (operational) definitions for variables, we define exactly what we are studying and enable others to understand our work. This is called operationalisation of terms or variables.

HYPOTHESES:

Once the research question has been stated, the next step is to define testable hypotheses. Usually a research question is a broad statement, that is not directly measurable by a research study. The research question needs to be broken down into smaller units, called hypotheses, that can be studied. **A hypothesis is a statement that expresses the probable relationship between variables.**

The problem thus delimited to make it more specific & manageable, several interrelated steps, e.g. formulation of hypotheses, explication of concepts that enter into the hypotheses & consideration of methods for relating the study to other studies using similar or kindred concepts. These steps are so closely intertwined that they cannot be worked on, one at a time. But for the sake of clarity only discuss them individually. The suggested explanations or solutions to the problem formulated as propositions are called hypotheses. Such tentative explanations, i.e. hypotheses may be the solutions to the problem. The inquiry is directed at finding out whether they really are solutions to the problem. Whether or not explicit hypotheses are proposed at this stage, it is needed to define the concepts which would be used in organizing the data. Such definitions include formal definitions that are designed to convey the general nature of the process or phenomenon subsumed by the concept. The test of hypotheses is its proof or disproof. If the hypotheses is proved, the problem of which it was tentative solution is answered, but if it is not proved, alternative hypotheses or solutions would be required to be formulated and tested.

Some operations have to be devised that yield data which will serve as satisfactory tangible indicators or referents of the given concepts. To study critically the work already done in the field & formulate problem in terms so general & abstract as to make clear its relation to other knowledge & permit replication of study in other concrete situations.

Hypothesis is a presumptive statement of a preposition or a reasonable guess based upon available evidence, which a researcher tries to prove through his study. A tentative or working preposition suggested as a solution to a problem.
Theory is the final hypothesis, which is well supported by evidence.

Hillway – Since knowledge arrived at through the scientific method is subject to revision in the light of new data, a theory is in only one sense always only a working assumption. Thus the distinction between a theory and hypothesis is only a relative one.

Hypothesis helps researcher to relate theory to observation and observation to theory.
For fact finding or exploratory studies hypothesis may not be required as that itself is the aim of that research.

Importance of Hypothesis:

1. Facilitate the extensions of knowledge in an area.
2. Provide with rational statements, logical order of relationship
3. Provide direction to research
4. Provide bases for reporting conclusions of the study

Formulations of Hypothesis: (Conditions required for)

a) Richness of background knowledge
b) Versatility of intellect (of researcher)
c) Analogies and other practices
d) (New situation and old situations are similar with regard to factor 'X', the old situation 'X' is related to 'Y' and 'Z' as well as 'X'. Inference – new situation may be related to 'Y' and 'Z' (though it is not researched)

Criteria of stating hypothesis:

1. clearly and precisely stated
2. Testable
3. State the expected relationship between variables
4. Limited in scope
5. Consistent with the most known facts
6. Stated in simple terms- avoid jargons
7. Amendable to testing within a reasonable time.

Types of hypotheses

One type of hypotheses asserts that something is the case in a given instance; that a particular object, person or situation has a particular characteristic. Another type of hypotheses deals wit the frequency of occurrences among variables. Yet another type of hypotheses asserts that a particular characteristic is one of the factors which determine another characteristic, i.e. X is the producer of Y (product). Hypotheses of this type is known as causal hypotheses.

Hypotheses can be classified in a variety of ways.

(a) At the lowest level of abstraction are the hypotheses which state existence of certain empirical uniformities. For instance, it may be hypothesized with reference to India that in the cities men will get married between the age of 22 and 24 years.

It has often been said by way of criticism of such hypotheses that these are not useful in as much as they merely state what everyone seems to know already. Secondly, what everyone knows may well be mistaken.

(b) At a relatively higher level of abstraction are hypotheses concerned with complex ideal types. Such hypotheses are indeed purposeful distortions of empirical exactness and owing to their remoteness from empirical reality, these constructs are termed ideal types. The function of such hypotheses is to create tools and formulate problems for further research in complex areas of investigation. e. g. Analysis of minority groups brought to light empirical

uniformities in the behaviour of members of a wide variety of minorities. It was subsequently hypothesized that these uniformities pointed to an ideal type.

(c) We now come to the class of hypotheses at the highest level of abstraction. Such hypotheses are statements about how changes in one property will effect another property. This level of hypothesizing is not only more abstract compared to others; it is also the most sophisticated and flexible mode of formulation.

Sources of Hypotheses

Hypotheses may be developed from a variety of sources.

(1) The history of science is full of instances of discoveries made just because the right person happened to make the right observation owing to his characteristic life-history and exposure to a unique mosaic of events. Personal life histories are a factor in determining the kinds of a persons perception and conception and this factor may in turn direct him to certain hypotheses quite readily.

(2) Analogies are often a fountainhead of valuable hypotheses. Students of sociology and political science in the course of their studies would have come across analogies wherein society and state are compared to a biological organism, the natural law to the social law, etc. Such analogies, notwithstanding the fact that analogies as a class suffer from serious limitations , do provide certain fruitful insights which formulated as hypotheses stimulate and guide inquires.

(3) Hypotheses may also rest on the findings of other studies wherein the researcher may hypothesize that similar relationship between specified variables will hold good in the present studies too.

(4) A hypotheses may stem from a body of theory which may afford by way of logical deduction, the prediction that if certain conditions are present, certain results will follow. Theory represents what is known; logical deductions from this constitute the hypotheses which must be true if the history is true.

(5) It is worthy of note that value –orientation of the culture in which a science develops may furnish many of its basic hypotheses .That certain hypotheses and not others capture the attention of scientists or occur to them in particular societies or cultures may well be attributed to the cultural emphases.

Characteristics of Usable Hypotheses

(a) A hypotheses should be empirically testable. The concepts embodied in the hypotheses must have clear empirical correspondence and should be explicitly defined. e.g. 'bad parents beget bad children', is hardly a statement that can qualify as usable hypotheses, since bad cannot be explicitly defined.

(b) Hypotheses should be closest to things observable. Failing this it would not be possible to test their accord with empirical facts.

(c) The concepts utilized in the hypotheses should be clearly defined. Formal definition or explication of the concepts will clarify what a particular concept stands for. It is advisable that the concepts embodied in the hypotheses be defined in a manner commonly accepted and communicable.

(d) The hypotheses must be specific. We need to know what will happen as soon as we commit ourselves to one view or another we become vulnerable; our prediction will be refuted if what we said would happen does not happen.

(e) Advisedly, the hypotheses should be related to a body of theory or some theoretical orientation. If the hypothesis is related to some theory, research will help to qualify, support,

correct, or refute the theory. One of the valuable attributes of a good hypotheses is its power of prediction.

(f) Hypotheses should be related to available techniques. The hypotheses should be formulated only after due thought has been given to the methods and techniques that can be used to measure the concepts or variables incorporated in the hypotheses.

Null hypotheses:

It is akin to the legal principle that a man is innocent until he is proved guilty. A null hypotheses in its other form may assert that the results found in research do not differ significantly from the results to be expected on a probability basis or as stipulated in terms of a certain theory. An alternative hypotheses may state, for instance, that:

H1: The females commit suicide often than the males.

The null hypotheses (Ho) may be stated as:

Ho: The females and males do not differ in respect of the rate of suicide.

A null hypothesis is decidedly more useful than other hypotheses because it is exact. It is easier to disprove the contrary of a hypothesis than to prove it with complete certainty.

Formulation of alternative hypotheses

This involves the following steps:

(1) A measure of efficiency applicable to all the alternative courses of action is selected (Examination Score, sales, productivity, etc.)

(2) On the bases of this selected measure of efficiency a set of acceptance conditions for each alternative course of action is assigned.

(3) The acceptance conditions are reformulated as hypotheses which are mutually exclusive and jointly exhaustive.

In all research (theoretical or action oriented) alternative courses of action (solutions , explanations) acceptance conditions (economy, predictions, etc) or hypotheses should be made explicit.

In a research involving more than two hypotheses, it is advisable to formulate the points of disagreement symbolically in a matter indicated to facilitate the construction of hypotheses. Ideally there should be one hypotheses for each alternative course of action. Such a problem is one which involves estimation, eg estimating an optimum number of workers for a production unit – 100, 250, 300, etc. The selection of the most efficient course of action depends on an estimate of the value of a critical variable (i.e. the exact number of workers). In each case, it is not economical to formulate explicitly each alternative course of action and to associate a hypotheses with each.

SAMPLING:

Sampling is the process of selecting participants for a research project.

One has to define the 'population' or 'universe' of the study, i.e., the total number of items/objects/people of a specified class which is directly related to or covered by the research problems. It is rarely necessary and feasible to study all the items that constitute the 'universe' or 'population' in order to provide an accurate and reliable estimate of its characteristics. More often, a sample of the population under study is enough to afford a reliable basis for making estimates about its characteristics. One has to draw a sample from the 'universe in such a manner that the findings based on it which closely match those that would have been obtained had the 'universe' in toto been studied.

The method consisting of the selecting for study, a portion of the universe' or 'population' is known as sampling.

Sampling unit or element: This refers to a single thing selected for inclusion in a research project. For example if you sample students from a college, one student would be your sample unit or element.

Population: All the possible units or elements

Sample : A portion of the elements in a population is considered a sample. Any given sample can be part of more than one population. Does this sound like one of those jargons again? Let us unpack this statement by looking at the following example. You and four of your classmates can be a sample of your class, a sample of your university students, a sample of your country and so on. We can therefore define a sample as a more concrete portion of a population or populations if such a term ever exists.

Sampling frame: Is a listing of the elements in a population. In a university's admissions office, the list of names may include all the students who have been admitted into the college even the ones who never show up or those who have decided to quit. The sample frame is therefore the largest possible sample of a population. That is everything that can be selected from.

A parameter: Is a value associated with a population and can only be estimated in inferential statistical terms using a sample. Why? This is because a parameter is usually figured in terms of an abstract value. What does this mean? We cannot calculate the mean of a population if we cannot measure and do not know the exact number of units in the population. However since a sample is more concrete, we can use statistics to estimate parameters. Since these are only estimates that may contain various amounts of error it is usually referred to us inferential statistics.

Sampling error: Is a term used to refer to the extent to which a sample statistics incorrectly estimates a population parameter.

Confidence level: This is a probability associated with the accuracy of an inferential statistic since we do not know exactly what is and what might have not been included in a given population.

Sampling Designs:

The basic distinction in the modern sampling theory is between Probability sampling & the Non-probability sampling. The idea of probability or chance arises when one is not sure about something, that is, when one does not have enough information & therefore can only guess. A way to appreciate the concept of probability is to view the probability of an event occurring as the proportion of times the event has taken in the past, usually based on long series of observations. In fact we do employ the concept of probability all our lives practically. e. g. We decide to visit a public park with our families on a day and at a time when there is a low probability of the park being too crowded.

1. Probability Sampling design:

Probability sampling is the only approach that makes possible the formulation of determinable representative sampling plans. That is, the investigator, if he used probability sampling, can estimate the size of a sample that he will need if he wants to have a given degree of confidence that his simple-finding will not differ by more than a specified amount from the finding or result that study of total population would yield.

a) **Simple Random Sampling:-** Simple Random Sampling is in a sense, the basic theme of all scientific sampling. It is primary probability sampling design. A simple random sample is selected by a process that not only gives to each element in the population an equal chance of being included in the sample but also makes the selection of every possible combination of cases in the desired size, equally likely.

b) **Lottery Method:-** Each member or item in the 'population' is assigned a unique number. Each number is noted on a separate card or a chip. Each chip or card should be similar to all the others with respect to weight, size & shape etc.

The cards or chips are placed in a bowl & mixed thoroughly. A blind -folded person is asked to pick up any chip or card from the bowl. Under these circumstances, the

probability of drawing any one card can be expected to be the same as the probability of drawing any other card. Since each card represents a member of the population, the probability of selecting each would be exactly the same. Such a procedure would ultimately yield a simple random sampling.

c) Systematic Sampling:

This type of sampling is for all practical purposes, an approximation of simple random sampling. e.g. a frame consists of 1000 members each with a unique number i.e. from 1 to 1000. Let us say we want to select a sample of 100. We may start by selecting any number between 1 to 10. Suppose we make a random selection by entering the list & get 7. We then proceed to select numbers, starting form 7, with a regular interval of 10. The selected sample would thus consist of elements bearing Numbers 7, 17, 27, 37, 47….977, 987, 997. These elements together would constitute a systematic sample.

3. Stratified Random Sampling:

In stratified random sampling, the population is first divided into a number of strata. Such strata may be based on a single criterion. (e.g. educational level, yielding a number of strata corresponding to the different levels of educational attainment.) or on a combination or more criteria (e.g. age & sex) In stratified random sampling, a simple random sample is taken from each of the strata & such sub-samples are bought together to form the total sample.

Two forms of Stratified samples are

a) Proportionate Stratified Sampling:- In proportionate sampling, cases are drawn from each stratum in the same proportion as they occur in the universe. E.g. we know that 60% of the population is male & 40% of it is female. Proportionate stratified sampling with reference to this 'population' would involve drawing a sample in a manner that this same division among sexes is reflected, i.e. 60:40, in the sample.

If the systematic sampling procedure is employed in a study, the basis on which the list is made determines whether or not the resulting sample is a proportionate stratified sample.

b) **Disproportionate Stratified Sampling:-** A stratified sample in which the number of elements drawn from various strata is independent of the sizes of these strata may be called a disproportionate stratified sample. This same effect may well be achieved alternatively by drawing from each stratum an equal number of cases, regardless of how strongly or weakly the stratum is represented in the population.

4. Optimum Allocation Sample:

In this sampling procedure, the size of the sample drawn from each stratum is proportionate to both the size & the spread of values within any given stratum. A precise use of this sampling procedure involves the use of certain statistical concepts which have not yet been adequately or convincingly introduced.

5. Cluster Sampling:

In cluster sampling, the sampler first samples out from the population, certain large groupings, i.e. "cluster". These clusters may be citywards, households, or even several geographical or social units. The sampling of clusters from the population is done by simple or stratified random sampling methods. From these selected clusters, the constituent elements are sampled out by recourse to procedures ensuring randomness.

6. Multi-phase Sampling:

It is sometimes convenient to confine certain questions about specific aspects of the study to a fraction of the sample, while other information is collected from the whole sample. This procedure is known as 'multi-phase sampling'. Multi-phase sampling facilitates stratification of the sub-sample since the information collected from the first phase sample can sometimes

be gathered before the sub-sampling process takes place. It will be remembered that panel studies involve multi-phase sampling.

2. Non-probability Sampling Design

Non-probability design in contradistinction to the probability sampling design is that sampling procedure adopted in this design does not afford any basis for estimating the probability that each element in the population has an equal chance of being included in the sample. The major forms of non-probability samples are:

a) Accidental Samples:-

In accidental sampling the researcher simply reaches out & picks up the cases that fall to hand, continuing the process till such time as the sample acquires a desired size. E.g. researcher may take the first 150 persons he meets on any one of the pedestrian paths of a street, who are willing to be interviewed.

b) Quota Samples:- The basic objective of Quota sampling is the selection of a sample that is a replica of the 'population' with the respect to which one would wish to generalize. Ouota sampling, by & large, affords the insurance that diverse elements in the 'population' will be included in the sample and that these elements will be taken account of in proportion in which they obtain in the population.

Quota sampling usually proceeds in three steps:

a. The population is classified in terms of properties known or assumed to be pertinent to the characteristics being studied.
b. The proportion of the population falling into each class is determined on the basis of the known, assumed or estimated composition of the population.
c. Lastly, each observe or interviewer is assigned a quota of respondents. The responsibility of selection the respondents or subjects is theirs.

c) **Purposive or Judgment Samples:-** The basic assumption behind judgment or purposive sampling is that with the exercise of good judgment & appropriate strategy one can handpick the right cases to be in included in the sample & thus develop samples that are satisfactory in relation to one's research needs. The selection of elements proceeds under the assumption that errors of judgment in the selection will tend to counter-balance each other.

3. Combinations of Probability & Non- probability Sampling

Combining probability & non-probability procedures in certain instances, may involve an opposite strategy. The investigator may take a probability sample of elements within a non-probability sample of areas; the areas are selected as a purposive or judgment sample. The districts may be selected on the ground that these have been particularly successful in reaching the developmental targets and from each of these, the sampler then selects a probability sample of the developmental blocks. The typical districts selected purposively may be regarded as defining a population. If a probability sample of this population is taken, the mathematical theory of probability sampling is completely applicable & hence one can estimate the degree of confidence that may be placed in the assumption that findings of the sample are a good representation of the 'population' returns. The researcher can then generalize the inferences based on this restricted sub-population to the national population, subject to the assumption that the typical districts are still typical of their respective stages. So long as & to the extent that this assumption is valid, the sampling plan described above will produce most dependable results at a minimum cost.

ESSENTIAL CHARACTERISTICS OF MEASURING INSTRUMENTS

(Data Collection Tools)

A measuring instrument has to be constructed with utmost care and precision. Each tool must satisfy certain criteria without which the data collected will not be authentic. The results obtained and conclusions drawn on such 'unreliable' data would not be 'true'.

Essential characteristics –

1. Validity
2. Reliability
3. Objectivity
4. Adequacy
5. Usability
6. Discriminating power

1. **Validity** – An instrument is valid if it measures, what it is supposed to measure.
   Types – Content, Construct, Criterion (predictive, concurrent)
   1. Content validity – Refers to adequate representativeness of the content or subject of the measuring instrument. It is essentially a judgment of item in a test being a representative of the content.
   2. Construct validity – Refers to the adequate representativeness of the construct under study. This is mainly about theoretical constructs. E.g. creativity, commitment
   3. Predictive validity – refers to the prediction to an outside criterion and checking the instrument against some outcome or measure. E.g. aptitude tests predict future achievement.
   4. Concurrent validity – refers to validation through comparison with external, pre established criteria, which measure the attribute under study.

2. **Reliability** – An instrument is reliable, if it is consistent in its repeated measurements, of the same subjects (sample)

   Methods: test-retest, parallel (alternate) forms, split-half, all rational equivalence.

   1. Test-retest: Same test is given to the same sample after a sufficient gap of time and coefficient of correlation is calculated between these two measurements.

   2. Parallel forms: Two equivalent parallel forms are prepared. Care is taken to ensure equivalence in all respects, i.e. content and difficulty level. Test retest method is weak if the subjects get to 'learn' the test in the initial administration i.e. the subject develops 'test-wiseness'. In order to get over this limitation, two identical forms are administered at two different occasions the scores on which are then subjected to coefficient of correlation, for establishing reliability. It is however difficult to construct two exactly identical forms.

   3. Split-half – In order to overcome the difficulty of construction of two identical forms as in parallel forms methods, this method advocates construction of only one test long enough o be split into two hales. All the odd numbered test items form one set and all the even numbered test items form another set. Both these sets are administered with a gap of a few days or in single administration. The scores on both these tests are then subjected to coeff of correlation or any other statistical technique to establish reliability.

   4. Rational equivalence – It is a test of internal consistency. Many a times the same sample may not be available for repeated administrations. Also two forms may not be available. This method permits single administration and using statistical formula reliability can be established. Kuder- Richardson formula is used.

3. **Objectivity**: An instrument is said to be objective if it scores the scale irrespective of subjectivity. The objectivity of a test improves validity and reliability.

4 **Adequacy**: A test is adequate if it measures all the aspects of a variable / content / concept. When a variable is operationally defined, its various aspects, which are observable and measurable, are identified. If a test has to be adequate, it must be able to incorporate all these identified aspects.

5. **Usability**: a test is usable or practicable if it is easy to use. This ease of using refers to three different stages.

6. **Discriminating power** : A test is said to be possessing discriminating power it if is able to discriminate or differentiate between high and low achievers

All the measuring tools should possess these characteristics, so as to make the data collected, a reliable one.

DATA COLLECTION TOOLS:

Depending on the nature of the information to be gathered, different instruments are used to conduct the assessment: forms for gathering data from official sources such as police or school records; surveys/interviews to gather information from youth, community residents, and others; and focus groups to elicit free-flowing perspectives. For purposes of the data-collection process, the following discussion provides information on the types of data-collection tools most commonly used.

Critical Reasons for Conducting Surveys

Organizations conduct surveys to discover answers to certain questions. These questions are diverse, and vary widely depending on how you plan to apply the data to your survey problem, and what data-driven decisions you will make as a result of the data acquired.

Below are four critical reasons for organizations to conduct surveys:

1. To Discover What's Going On

In a non-threatening survey environment, your organization will learn about what motivates survey respondents and what's important to them.

2. To Provide An Opportunity To Discuss Key Topics With Your Target Population

Communicating with respondents about your survey topic allows for deeper insight into your survey problem, and can shed light on topics related to your survey problem within a larger context.

3. To Prioritize Your Actions Based on Objective Data

Rather than relying on subjective "gut" feelings, you can gather objective information to make sound data-driven decisions. Therefore, you can immediately address issues that are important, rather than wasting resources on things that no one cares about.

4. To Provide a Benchmark

Surveying provides a "snapshot" of your target population and their attitudes about your survey problem. This helps you to establish a baseline from which you can compare whether target population attitudes and perceptions relative to the survey problem are getting better or worse over time.

Type of Survey	Sample Questions
Market Research	• How well-positioned is my product or service? • Would I increase my market share if I changed an aspect of my product or service? • How do visitors use my Web site?
Product Development	• Will our new idea for a product or service work? • Will our target population be excited about our new product? • What does our target population need that they can't find?
Employee Performance Evaluation	• Do clients think our staff is courteous and helpful? • What do our clients think of the service they receive from our employees?

Determining Your Survey Audience

Being aware of the needs and preferences of your customers or clients is key to your success. Survey audiences are diverse, and you need to plan appropriately.

Ask yourself:

Who am I going to interview?

This group is called your target population. More than likely, you can not interview every person in your target population, so you will need to interview a smaller sub-group of

respondents, known as a sample. Your sample size, survey methodology, and survey goals will also impact budget, time and available resources, so plan carefully.

How many people am I going to survey?

The larger the sample, the more closely it will represent attitudes in your overall target population. To help determine your sample size, use the Sample Calculator here.

Types of Survey Problems and Audience Selection

Survey problems vary widely, depending on the specific goals and needs of each organization. Organizations conduct surveys to answer questions like those listed in the table below:

Type of Survey	Sample Questions
Customer Satisfaction	• How satisfied are my customers with my product or service? • Are staff members meeting customer expectations?
Employee Satisfaction	• What do employees think about the company, benefits, management? • What can we do to reduce employee turnover? • Is management communicating effectively with employees?
Lead Qualification	• Who likes the product but is not ready to purchase? Why? • Who is interested in purchasing now? • Who is not interested in purchasing?

Which Type of Survey Should I Choose?

There are many types of surveys from which to choose. After determining your survey design, use the comparison chart below to help you decide whether Web surveys, mail surveys, telephone surveys, or personal interview surveys are best suited to your specific needs and applications:

Type of Survey	Advantages	Disadvantages	Recommendation
Web Survey	• Very low cost • Extremely fast • Complex questioning assures better data • Anonymity of respondents results in more honest answers to sensitive topics • Respondents provide more detail to open-ended questions. • Survey software simplifies compilation and analysis of data collected.	• Do not reflect population as a whole • Respondent completion rates lower for longer surveys • Random respondents may reply if your survey appears on Web page.	• When desired target population consists mainly of Internet users. Examples: Business-to-business research • Employee Attitude surveys
Mail Survey	• Frequently used for social research • Low cost (almost 75% less than personal	• May result in biased sample • Low response rate • Time! Need to wait at	• Target population is highly literate or is

	interviews) • Eliminates potential bias	least several weeks for all responses to arrive	in a group with specialized interests
Telephone Survey	• Reach 96% of all homes • CATI software streamlines process • Interviewers can ask for clarification on responses; additional detail	• Sales calls often pose as "research" calls • Typical calling window interrupts respondents' personal time • Call screening is common • No visual support	• General population surveys
Personal Interview Survey	• Frequently used to gauge attitudinal behavior • Very good response rates • Longer interviews tolerated	• Do not reflect population as a whole • Respondent completion rates lower for longer surveys • Random respondents may reply if your survey appears on Web page.	• When desired target population consists mainly of Internet users. Examples: • Business-to-business research • Employee Attitude surveys

Self-Administered Survey

Self-administered surveys have special strengths and weaknesses. They are useful in describing the characteristics of a large population and make large samples feasible. In one sense, these surveys are flexible, making it possible to ask many questions on a given topic. This also provides flexibility in the analysis of the responses. On the other hand, standardized questionnaire items often represent the least common denominator in assessing people's attitudes, orientations, circumstances, and experiences. By designing questions that will be appropriate for all respondents, it is possible to miss what is most appropriate to many of the respondents.

Some advantages of the self-administered survey are:

Low Cost. Extensive training is not required to administer the survey. Processing and analysis are usually simpler and cheaper than for other methods.
Reduction in Biasing Error. The questionnaire reduces the bias that might result from personal characteristics of interviewers and/or their interviewing skills.
Greater Anonymity. Absence of an interviewer provides greater anonymity for the respondent. This is especially helpful when the survey deals with sensitive issues such as questions about involvement in a gang, because respondents are more likely to respond to sensitive questions when they are not face-to-face with an interviewer.

Some of the disadvantages are:

Requires Simple Questions. The questions must be straightforward enough to be comprehended solely on the basis of printed instructions and definitions.
No Opportunity for Probing. The answers must be accepted as final. Researchers have no opportunity to clarify ambiguous answers.

Personal Interviews

The interview is an alternative method of collecting survey data. Rather than asking respondents to fill out surveys, interviewers ask questions orally and record respondents' answers. This type of survey generally decreases the number of "do not know" and "no answer" responses, compared to self-administered surveys. Interviewers also provide a guard against confusing items. If a respondent has misunderstood a question, the interviewer can clarify, thereby obtaining relevant responses. As noted previously, personal interviews are a good way to gather information from community leaders, particularly those who might be unwilling or too busy to complete a written survey.

Some of the advantages of the personal interview are:

Flexibility. Allows flexibility in the questioning process and allows the interviewer to clarify terms that are unclear.
Control of the interview situation. Can ensure that the interview is conducted in private, and respondents do not have the opportunity to consult one another before giving their answers.
High response rate. Respondents who would not normally respond to a mail questionnaire will often respond to a request for a personal interview.

Some of the disadvantages are:

Higher cost. Costs are involved in selecting, training, and supervising interviewers; perhaps in paying them; and in the travel and time required to conduct interviews.
Interviewer bias. The advantage of flexibility leaves room for the interviewer's personal influence and bias, making an interview subject to interviewer bias.

Lack of anonymity. Often the interviewer knows all or many of the respondents. Respondents may feel threatened or Personal interviews are a good way to gather information from community leaders, particularly those who might be unwilling or too busy to complete a written survey, intimidated by the interviewer, especially if a respondent is sensitive to the topic or some of the questions.

Personal Interview Surveys

Personal Interview surveys are recommended when your desired sample consists of respondents in a very specific target population. For example, if you are interested in surveying respondents about a film they have just viewed, it would be significantly easier to find them outside a movie theater than by mail. In addition, interviewers have the ability to extensively probe respondents on their impressions of a service or product, observe individual or group behavior, and this method allows for the exchange of material and/or information between respondent and interviewer (see "personal interviews" section of related article).

Advantages of this method include: response rates are very good; respondents have the ability to see, feel and/or taste a product; longer interviews are sometimes tolerated; and attitudinal behavior can be best observed with this method.

Disadvantages of this method include: it is very expensive; it can be time-consuming if travel is involved; and a non-representative sample may result if the respondents from the location where the interviewing takes place does not match with the desired target population.

The Bottom Line

Survey efforts that would benefit most from a personal interview survey are those requiring a sample of respondents within a very specific target population. The survey effort will have a

focus on capturing attitudinal behavior, and the ability to extensively probe respondents on their responses.

Web Surveys

Surveying via the Web is rapidly gaining popularity for data collection efforts focusing on segments of the Internet user population. Whether to implement a personal interview survey vs. a Web survey relies largely on the target population in your survey effort: Web surveys will go to Internet users only, while personal interview surveys will focus on the in-depth attitudes of a very specific target population.

Advantages of Web surveys include: faster speed of responses, substantially reduced cost, and increased respondent flexibility. A survey posted on a popular Web site can collect thousands of responses in just a few hours. Further, once setup is completed, there is virtually no cost associated with a web survey; therefore, data from both large and small samples cost the same to process. In addition, Web surveys are a great tool if you want to target a specific population, such as other businesses in your industry or internal employee attitudes.

Disadvantages of Web surveys include: they typically do not reflect the general population; respondent survey completion rates are lower for longer surveys; and random respondents – outside of your target population – may reply if your survey appears on a Web page without password protection or other means of controlling access.

The Bottom Line

Survey efforts that may benefit most from a Web survey are those requiring a sample of a specific Internet user population, with the ability to keep costs low and analyze data rapidly.

Mail Surveys

Surveying by mail is a recommended option when your desired sample consists of respondents with higher educational and literacy levels, and people with an interest in the subject being surveyed. In addition, special mailing lists are available to assist you in reaching your target population. It is also possible to have a larger universe (sample of respondents) with a mail survey because it does not require personal contact between the respondents and the researcher.

Surveying by mail is a recommended option when your desired sample consists of respondents with higher educational and literacy levels, and people with an interest in the subject being surveyed. In addition, special mailing lists are available to assist you in reaching your target population. It is also possible to have a larger universe (sample of respondents) with a mail survey because it does not require personal contact between the respondents and the researcher.

Advantages of this method include: it is easy and relatively low-cost to let the postal service do the leg work of delivering the surveys; mailing costs are geographically uniform; respondents can answer at their leisure; and any potential interviewer bias may be reduced due to lack of contact with the interviewer.

Disadvantages of this method include: response rates from individuals with lower literacy levels are often too small to be useful, thereby eliminating immigrant populations in many areas that represent substantial markets; overall response rates are historically very low, averaging approximately 20% (see related article) and, depending on your target population, sending surveys only to people with high literacy levels or with specialized interests could result in a biased sample.

The Bottom Line

Survey efforts that may benefit most from a mail survey are those requiring a sample of respondents with a high literacy rate, or those with specialized interests (assuming the sample is in alignment with your desired target population). The survey effort will have a focus on keeping costs low, making survey completion convenient for respondents, and reaching a larger universe.

Telephone Surveys

Surveying by telephone is recommended when your desired sample consists of the general population (i.e., not Internet users only). The scope of reach possible with telephone surveys is vast, with 96% of homes in the United States having a telephone.

Advantages of this method include: rapid contact with respondents, especially when integrated with the use of a CATI (computer-assisted telephone interviewing) system (see related article); interviewers can elicit more complete and substantive answers from respondents as well as ask for clarification and elaboration concerning responses; and survey software is available to integrate previous survey data with current data.

Disadvantages of this method include: phone surveying is more expensive than web surveying; sales calls often masquerade as "research" calls, which results in higher call screening and lower respondent contact rates; the typical calling window of 6:00 p.m. to 9:00 p.m. often interrupts the respondents' limited personal time; and no visual support can be implemented.

The Bottom Line

Survey efforts that would benefit most from a telephone survey are those requiring a sample of the general population, with the ability to ask for clarification and expansion on respondent answers.

Basics of Question Development

There are several basic principles to remember when developing your questions. Below are some key items to keep in mind as you write your survey questions.

Make sure your survey questions match your research objectives

You must always determine why you intend to conduct your survey research before you are able to properly write survey questions. For example, if you plan to conduct an exploratory research survey, your survey will usually not need to be as detailed as when you plan to conduct a confirmatory research survey. (See related article).

Understand your research participants

Remember that your target population, not you, are the ones completing the survey. Try to develop an ability to think like your potential respondents. If you can effectively consider how your research participants will interpret and react to each question on your survey, then your resulting data is likely to provide useful information.

Use natural and familiar language

Use language that is understandable to the type of respondents whom you are targeting. Consider the age of your respondents, their educational level, and any other relevant cultural characteristics of your respondents when deciding how to phrase your questions.

Types of Survey Questions

Survey questions vary according to what type of information they are trying to collect from the respondents, and how this information will apply to the goals of the survey. There are two basic types of survey questions: Open-ended and Closed-ended.

Open-ended

This type of question allows participants to respond in any way they choose. Open-ended questions provide primarily qualitative data, and are frequently used in exploratory research.

Example

What is your current marital status?

A: [Participants provide answers in their own words]

Closed-ended

In contrast to open-ended questions, closed-ended questions require participants to choose from a limited number of responses predetermined by the researcher. There are 5 basic types of closed-ended questions: Multiple-choice; Categorical; Likert-scale; Numerical; and Ordinal. Closed-ended questions provide primarily quantitative data, and are frequently used in confirmatory research.

Multiple Choice

Use a multiple-choice question when you want your respondents to choose the best possible answer among all options presented.

Example

What is your current marital status? (Select one.)

○ Single ○ Married ○ Divorced ○ Separated ○ Widowed

Categorical

Use a categorical question when the possible answers are categories, and the respondent must belong to one category.

Example

What is your gender? ○ Male ○ Female

Likert-Scale

Use a Likert-scale question when you are trying to determine respondents' attitudes or feelings about something.

Example

How important do you think SAT scores are to a college student's success? (select one):

Not very important ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 Extremely important

Rating Scales:

This involves qualitative description of a limited number of aspects or traits. A scale is provided for assigning values to each of these aspects.

Good – "Rating is an estimate made according to some systematized procedure of the degree to which as individual person or thing possesses any given characteristics, may be expressed quantitatively or qualitatively."

Types of rating scales:

1. **Numerical** – The scale is in number form

e.g. Rate the following items on their relevance to a product :

Items: Cost effective, Utility etc

3- highly relevant 2- somewhat relevant 1- irrelevant

2. **Graphic** – The scale provides cues or categories to the rater

e.g. Interest in the subject

Never Rarely Sometimes Often Always Not at all

Traits – Sincerity

Least To some extent Undecided To a great extent Fully

Merits:

1. Requires less time for respondents
2. Applicable in many situations
3. "Extent" is known
4. Composite score on the entire scale can be obtained

Limitations:

1. Error of leniency – easy or hard rates
2. Error of central tendency – reluctance to give extreme judgments
3. Error of halo effect – systematic bias due to subjectivity of the rater

Ordinal

Sometimes you may want your respondents to rank order their responses. A ranking indicates the importance assigned by a participant to an attitudinal object.

Example

Please rank the importance of the following qualities in a team leader. (Please fill in your rank order in the spaces provided using the numbers 1 through 5)

☐ A team leader that is sincere

☐ A team leader that gets resources for the team

☐ A team leader that is an advocate for the team

☐ A team leader that is a strong disciplinarian

☐ A team leader that is a good motivator

Numerical

When the answer must be a number, ask a numerical question.

Example

What is your current age? (select one)

○ Less than 18 ○ 18 to 29 ○ 30 to 39 ○ 40 to 49 ○ 50 or older

Remember: How you develop your questions depends on why you are conducting your survey, and how you plan to apply the data from your survey to your survey problem. Educate yourself on the various types of survey questions, and what purpose they serve before developing questions for your own survey project.

Techniques for Preventing Response Bias

There are many ways to prevent response bias in your surveys. Below are several key suggestions to consider when developing your survey questions.

Write questions that are clear, precise, and relatively short

Because every question is measuring something, it is important for each to be clear and precise. Your goal is for each respondent to interpret the meaning of each survey question in exactly the same way. If your respondents are not clear on what is being asked in a question, their responses may result in data that cannot or should not be applied to your survey goals.

Keep questions short; long questions can be confusing and stressful for respondents (see related article).

Do not use “loaded” or “leading” questions

A loaded or leading question biases the response given by the participant. A loaded question is one that contains loaded words. For example, politicians often avoid the loaded word “environmentalist” because it creates a negative reaction in some people regardless of the content of the statement.

A leading question is phrased in such a way that suggests to the respondent that the researcher expects a certain answer:

Example

Don’t you agree that social workers should earn more money than they currently earn?

- Yes, they should earn more
- No, they should not earn more
- Don’t know/no opinion

The phrase “Don’t you agree” leads the respondent. A more neutral wording would be:

Do you believe social worker salaries are a little lower than they should be, a little higher than they should be, or about right?

- Social worker salaries are a little lower than they should be
- Social worker salaries are a little higher than they should be
- Social worker salaries are about right
- Don’t know/no opinion

Avoid double-barreled questions

A double-barreled question combines two or more issues or attitudinal objects in a single question.

Example

Do you think professors should have more contact with university staff and university administrators?

Clearly, this question asks about two different issues: Do you think professors should have more contact with university staff? AND Do you think that teachers should have more contact with university administrators?

Combining the two questions into one question makes it unclear which attitude is being measured, as each question may elicit a different attitude. Tip: If the word “and” appears in a question, check to verify whether it is a double-barreled question.

Avoid double negatives

When respondents are asked for their agreement with a statement, double negatives can occur.

Example

Do you agree or disagree with the following statement?
Teachers should not be required to supervise their students during recess.

If the respondent disagrees, you are saying you do not think teachers should not supervise students. In other words, you believe that teachers should supervise students. If you do use a negative word like "not", consider highlighting the word by underlining or bolding it to catch the respondent's attention.

Construction Principles

Below are two critical construction principles you should apply to prevent survey bias.

Use both mutually exclusive and exhaustive response categories for closed-ended questions

Categories are mutually exclusive when there is no overlap:

Example

What is your current age?

○ 10 or less ○ 10 to 20 ○ 20 to 30 ○ 30 to 40 ○ 40 to 50 ○ 50 or greater

These categories are not mutually exclusive because there is overlap present. For example, a person who is 20 years old could be placed into two separate categories (same with those respondents aged 30, 40 and 50).

Categories are exhaustive when there is a category available to all potential responses. Below is an example of a question where categories are not exhaustive:

Example

What is your current age?

○ 1 to 4 ○ 5 to 9 ○ 10 to 14

The categories are not exhaustive because there is no category available for respondents more than fourteen years old or respondents less than one year old.

Here is an example of response categories that are **both** mutually exclusive and exhaustive:

What is your current age? (Check one box only.)

○ Less than 18 ○ 18 to 29 ○ 30 to 39 ○ 40 to 49 ○ 50 or older

Reverse the wording in some of the questions to help prevent response sets.

A response set is the tendency for a respondent to answer a series of questions on a certain direction regardless of their content.

One technique used to prevent response sets is to reverse the wording in some of the survey items. Below is an example of this in a rating scale question:

Please rate your manager on each of the following descriptive scales. Place a checkmark on the space between each pair of words that best indicates your opinion:

Sociable	○ 1	○ 2	○ 3	○ 4	○ 5	Unsociable
Kind	○ 1	○ 2	○ 3	○ 4	○ 5	Cruel
*Hard	○ 1	○ 2	○ 3	○ 4	○ 5	Soft
Successful	○ 1	○ 2	○ 3	○ 4	○ 5	Unsuccessful
*Wise	○ 1	○ 2	○ 3	○ 4	○ 5	Foolish
Strong	○ 1	○ 2	○ 3	○ 4	○ 5	Weak

You can see that items 3 and 5 (with asterisks) are "reversed" when compared to the rest of the items, i.e., most of the left-hand descriptors are associated with positive attributes while the right-hand descriptors are associated with negative attributes.

Important: Avoiding response bias is key to the success of your survey project. Implementing the above strategies will ensure that your survey delivers valid data that you will be able to effectively apply to your survey problem.

Focus Groups

Another method of collecting information is the focus group. Focus groups are useful in obtaining a particular kind of information that would be difficult to obtain using other methodologies. A focus group typically can be defined as a group of people who possess certain characteristics and provide data of a qualitative nature in a focused discussion.

Focus groups generally are composed of seven to twelve people. The size is conditioned by two factors: it must be small enough for everyone to participate, yet large enough to provide diversity. This group is special in terms of purpose, size, composition, and procedures. Participants are selected because they have certain characteristics in common that relate to the topic at hand, such as parents of gang members and, generally, the participants are unfamiliar with each other. Typically, more than one focus group should

be convened since a group of seven to twelve people could be too atypical to offer any generalizable insights on the gang problem.

A trained moderator probes for different perceptions and points of view, without pressure to reach consensus. Focus groups have been found helpful in assessing needs, developing plans, testing new ideas, or improving existing programs Exhibit below provides guidelines for conducting focus groups.

Focus groups offer several advantages:

 Flexibility allows moderator to probe for more in-depth analysis and ask participants to elaborate on their responses.
 Outcomes are quickly known.
 May cost less in terms of planning and conducting than large surveys and personal interviews.

Limitations include:
 A skilled moderator is essential.
 Differences between groups can be troublesome to analyze because of the qualitative nature of the data.
 Groups are difficult to assemble. People must take the time to come to a designated place at a particular time. Focus groups are a good method to get people involved in this assessment process by having them provide input on the topic.

Guidelines for Conducting a Focus Group

Focus group discussions are a popular method of obtaining information and opinions. They can provide insight into issues that cannot be covered through surveys or interviews. Focus groups are a good method to get people involved in this assessment process by having them provide input on the topic.
The following discussion provides a general overview of the focus group process. It is recommended that a person with experience with focus groups (preparing the discussion guide, moderating, and preparing the report) be contacted to assist in the process.
When preparing for the focus group discussions, there are several considerations: What questions will be asked? Who will participate? Where will the discussions be held? Who will conduct the sessions?

The first order of business is to develop a discussion guide.

Develop the Discussion Guide

The discussion guide contains the questions that will be posed to participants during the focus group sessions. A limited number of questions should be used for each discussion. Avoid spending too much time on background information and concentrate on the important issues. There are two elements that should be considered when drafting the guide: (1) whom you wish to obtain information from and (2) what information you wish to obtain. When developing the questions, keep in mind that all groups should follow the same discussion format. By using a general format for each question, it allows an analyst to make comparisons among the responses of various groups.

Reserve a Time and Place

Reserving a time and place to conduct the discussion is something that should be done well in advance of the actual date of the discussion sessions. By finding a location quickly, it will allow time to contact potential participants with the necessary logistical information. When selecting a location, try to find the most convenient and accessible location for the participants.

Provide an Incentive for Participation

Individuals taking part in a focus group session should be compensated for their participation. When contacting potential participants, use an incentive to encourage or persuade an individual to take part in the discussion session. Various forms of compensation can be used with the more common being a cash payment, lunch, or dinner. Snacks and beverages also may be provided. This often eases the tension created by the focus group setting and makes participants more open to discussing the topic.

Selection of Focus Group Participants

It is necessary to identify each group that will participate in the discussion sessions; e.g., parents, community residents, school personnel. This will provide an indication as to the number of discussion groups that will be conducted. Time, money, and the number of

potential participants available will determine the number of groups that are feasible for each community.

A good size for a focus group is between seven to twelve participants per session. However, the discussion can still take place if fewer than seven participants show up. The size is conditioned by two factors: it must be small enough for everyone to participate and large enough to provide diversity of perceptions. Group participants are selected because they have certain characteristics in common that relate to the topic of the focus group. For example, if the assessment is interested in finding out parents' perceptions of gangs in school, a focus group might consist of parents who have school-age children.

Moderating the Discussion

An experienced focus group moderator should conduct the sessions. Moderating the discussion is difficult, and effective leadership is essential if the group is to accomplish its purpose. The moderator must not only be in tune with the purpose of the group but also have the necessary skills to effectively guide the group process. If it is not possible to use an experienced moderator, the following are a few key points that should be considered when moderating a focus group.

Keep the conversations flowing. The moderator needs to keep control of the discussion session. If participants get off track, it is the role of the moderator to pull the group back together. The moderator should keep the discussion as informal as possible and should encourage all participants to speak what is on their minds. The moderator is in charge of the discussion, and it is his or her duty to draw information from the participants.

Length of discussion. The session should last approximately 1 ½ hours. The participants will most likely dictate the length of the sessions based on the amount of information they have and their willingness to participate. Be neutral. One benefit of having an outside person moderate the discussion is that the person can be neutral. People may disagree during the discussion, and the moderator must give equal time to all viewpoints. The moderator should not provide information. It is not the moderator's place to offer or convince participants of any particular point of view.

Analysis of the Results

After each focus group, the moderator or a neutral observer should write a report describing the discussion for the Assessment Team. The written report should follow the questions contained in the discussion guide. The report can be broken down into the following sections.

Background and objectives. This section provides basic information regarding the initiative, the purpose, and objectives of the assessment.

Methodology. This section should describe how, when, and where the focus groups were conducted. It should describe the characteristics of the focus group participants and why they were selected. It should inform readers of this report that the results from the discussions are the opinions of a small sample size and should be viewed with caution.

Summary. The summary is approximately one or two pages in length and should provide the reader with a summary of the important findings. It is suggested that this section be a bullet or number format.

Highlights of findings. This section provides the reader with an in-depth analysis of the questions contained in the discussion guide. This is the section where quotes and comments should be used to support the research finding.

THE DESIGN OF RESEARCH

Once the research problem is formulated in clear-cut terms such that the types of information needed to answer it are clearly indicated, then comes the task of working out a design for the study. A study/research design is a plan comprising the decisions about the procedures of sampling, data collection & analysis of data in respect of a given study, which aims to fulfill the objects or purpose of the study without a wasteful expenditure of time, energy & money. If one can anticipate problems or difficulties that he may have to face subsequently, that is, before he actually conducts a given inquiry, to that extent he is in a position to face them as & when they arise & to decide beforehand what can be done to overcome them. In the process of making decisions one is also required to evaluate the methodological basis for making such decisions. The major design decisions are in reference to the following aspects:

(a) What the study is about and what are the types of data needed?
(b) Why the study is being made?
(c) Where the data needed, can be found?
(d) Where or in what area the study will be carried out?
(e) What periods of time the study will include?
(f) How much material or how many cases will be needed?
(g) What bases will be used for selection of cases?
(h) What techniques of gathering data will be adopted?
(i) How will the data be analysed?
(j) How best can these above questions be decided upon?

Now we turn to the needs for methodologically designed research.

(1) A researcher gets into trouble not only when he fails to get results which are accurate enough but also when he gets results that are much too accurate.
(2) Modern research suffers a great deal from a 'lust' for fresh data, without a concern for what they mean, until they are collected. At this stage it is often very late to improve them.
(3) The hope of any future for sciences of society may well depend on the extent to which the social scientists demonstrate how major social problems can be solved effectively in a scientific way.

Designing a research ensures against its failure. It is economical in the long run, because it forestalls the possibility of fruitless inquiry. An idealized research design, is concerned with laying the optimal research procedure that would be followed if there were no practical restrictions. However one has to work in practical situations characterized by varied constraints.

The first step towards obtaining a solution should be in the nature of designing an ideal research procedure that would be liked to be adopted by the researcher for solving a problem if he was completely unrestricted by limitations. This is the idealized research design. The

next design job is to translate the idealized research model into a practical one. The practical requirements of a study in such a manner that compromise between the ideal & the practical aspects are accomplished without much damage to its scientific merit .

The practical research design may be conceived as of comprising the following **four phases:**

(a) The sampling design, which deals with the method of selecting the subjects to be observed for the given study.

(b) The observational design, which relates to the conditions under which the observations are to be made.

(c) The statistical design, which deals with the question of how many subjects ae to be observed and how the observations are to be organized.

(d) The operational design, which deals with the specific techniques by which the procedures specified in the sampling, statistical and observational designs can be carried out..

The research designs differ according to the research purpose. Research purposes may be grouped into four broad categories,

1. Description
2. Diagnosis
3. Exploration
4. Experimentation

Design requirements would understandably vary for different kinds of studies. For example, the studies whose purpose is exploration, require a flexible design, whereas those aiming at description & diagnosis would warrant a more rigid design.

Types of research design

A research design is a plan according to which observations are made and data assembled. It provides the empirical and logical basis for drawing conclusions and gaining knowledge. The research designs vary from general and sketchy statements of intent to carefully detailed and

highly complex investigations. Whichever type of research design is selected it is important to have a research design and the design should be made explicit before the research begins.

1. DESCRIPTIVE DESIGN

This enables researchers to describe or present picture of a phenomena under investigation. The methodology involved in such designs is mostly qualitative in nature producing descriptive data, i.e. people's own written o spoken words and observable behaviour. There are a least three such approaches to record and analyze behavioural patterns.

A. Participant Observation

This refers to research characterized by a period of intense social interaction between the researcher and the subjects. During this period, data are unobtrusively and systematically collected.

Participant observation as a research design has three stages:

1. Pre-field work: Usually all researchers have some general questions in mind when they enter the field. These typically fall into one or two broad categories: one substantive and the other theoretical. The first includes questions related to specific substantive issues in a specific setting. The second category of interests is more closely tied to basic sociological problems and broader theoretical issues. These two categories are interrelated. What distinguishes between participant and qualitative methods from other methods is that the participant observer's questions are framed in general terms.

The pre-field work consists of decisions that the observers must make before they enter the field and initial contacts they must make to conduct their research.

2. Field Work: For doing a meaningful field work skill in the area is a prerequisite. Usually in the first days of field work, Researchers remain relatively passive throughout the course. A

good rule is not to challenge the behaviour of the subjects or to ask questions that are likely to put them on the defensive.

Observers must conduct themselves in such a way that the events that occur during their observations do not significantly differ from those which occur in their in their absence. It is essential for researchers to win the trust and confidence of their subjects and establish rapport with them.

The observer's primary purpose is to collect data. Any participation that interferes with the ability to do so should be avoided. The words and symbols used must have the same meanings in the world of their subjects.

Before entering the field, the researcher must have some broad questions in mind and allow themes and information to emerge before pursuing their own areas of inquiry. After each observation period, field notes should be recorded.

3. Data Analysis: It refers to a process which entails an effort to formally identify themes and to construct hypothesis as they are suggested by data and an attempt to demonstrate support for those hypothesis. Data analysis is often a painstaking and time consuming process. Data analysis is an ongoing process in participant observation research which the participant observer explores themes and hypothesis throughout the course of the study, I is during the post-field work stage of the research that he concentrates most on the analysis and interpretation of data. At this time the data is fresh and exciting.

Some of the ways in which participant observers can analyze and increase their understanding of their data are:

1. Once the observer has code and sorted the data by hypothesis he should examine the extent to which the items in each coded category support the respective hypothesis.

2. It is important that the observer scrutinizes and compares solicited statements, responses to questions and remarks, with unsolicited or volunteered statements.

3. Researchers cannot help but influence the settings they observe when analyzing the data; he must consider the effect his presence had in the setting.

B. Personal Documents

Personal documents is used to refer to an individual's descriptive, first person account off the whole or a part of his life or an individual's reflection on a specific event or topic. All personal documents are valuable. Personal documents may be presented either on their original form or more likely in edited and recognized version .For a number of reasons, it was felt that pseudonyms and fictitious names for researcher induced documents are best to use. More concretely such materials are available in the form of autobiographies, diaries, letters, and long open ended interviews that are recorded verbatim.

Process of collecting personal Documents: The most effective way to locate personal documents is to place an advertisement in the paper describing the kinds of materials you want and the uses to which they will be put .By interviewing also one can collect solicited personal documents. For analysis, personal documents, like participant observation data can be code and examined according to themes or the researcher's hypothesis. However, one caution to be noted would be to examine personal documents in the context in which they were produced.

2. DIAGNOSTIC DESIGN

Diagnostic refers to scientific differentiation among various conditions for the purpose of accurately classifying these conditions. In its broadest sense diagnosis corresponds to the fact finding aspect of clinical practice. Its objective includes screening and classification, personality description, prediction of outcome and attainment of insight. Whether objective diagnostic techniques and statistical prediction formulas can eventually assume the entire diagnostic function remains a moot point.

The diagnostic research paradigm consists of: 1) the emergence of a problem, 2)a diagnosis of its causes, 3)formulation of all the possible avenues of remediation, and 4)recommendations for a possible solution.

Data for diagnosis can be obtained in major ways:

1. Case History: Case study method is concerned with everything that is significant in the history or development of the cases. The purpose is to understand the lifecycle of an individual unit. This unit may be a person, family, a group, or an entire community. This method probes deeply and intensively analysis interactions between the factors that produce change or growth. In each case the element of typicalness is the focus of attention.

The characteristics of a good case study include an adequate data which is valid, continues, carefully synthesized, confidential and which should be useful for follow-up.

2. Interview: The nature of the personal relationship between interviewer and subject requires an expertness and sensibility tat might be well called an art. The interviewer must try to establish a feeling of mental trust with the persons being interviewed being careful not to ask questions that might alarm them.

3. Clinical Observation: Many attributes are inadequately identified through other standardized test instruments or through interview. The skilful diagnostician should be able to detect through observation the proficient use of informal tests. Further informal tests and observation of behaviour provide an opportunity to corroborate findings of the other two areas of assessment.

4. **Formal standardized tests:** They are useful in testing particular aspects of behaviour . They are also useful in obtaining information that helps formulate a diagnosis were the tests are widely used. Psycho diagnostics is applied in educational and vocational guidance and in the determination of particular aptitudes. For problems of aptitude in school work, sport ability (intelligence, concentration, educational maturity tests, etc are very useful.

Collaborative Diagnosis: Once the basic role relationships are worked out, there should be a collaborative diagnosis of the situation by the researcher and at least some part of the client organization. The purpose of this diagnosis is to assess various factors that will be involved in executing the research design-the resistances that maybe encountered, the dynamics of the situation, in regard to the problem of bringing about a change, etc. The ways of going about

such a collaborative diagnosis will vary tremendously, depending upon the problem to be studied, the settings, etc.

The next step should be joint planning based on an adequate diagnosis of the action that must be taken in order to manipulate the independent variable and to control other possibly confounding factors.

Among descriptive and diagnostic designs, descriptive research is particularly appropriate in the behavioural sciences; because many types of behaviour that interest the researcher cannot be arranged in a realistic setting. Descriptive research , sometimes known as non-experimental research, deals with the relationships between variables, the testing of hypothesis, and the development of generalization principles that have universal validity.

3. EXPLORATORY METHOD

The exploratory method represents the earlier stage of science. This significant observation implies that all sciences must have at the beginning had an approach which was purely exploratory. Even as we approach a doctor with an ailment he starts with all sorts of questions, to begin with. From the point of view of the doctor , he is systematically exploring the complaints and is striving to catagorize our symptoms. On the basis of this exploration he will arrive at a conclusion, at least tentatively about the disease. Only then will he ,if necessary call for a pathological report. This example will, while making the meaning clear, also point out the inevitability and universality of the exploratory approach. At this stage one may be tempted to conclude that the moment one envisages his study as exploratory, the investigator has absolute freedom for random and aimless activity. Yet the social scientist should exercise judicious temperance in this approach. The major advantage of this method lies in its ability to generate many ideas that could be further explored in more controlled conditions, apart from overcoming the most difficult portion of an inquiry, which is its initiation. It will also in the long run save him from rancor for having arrived at results which at best could be described as sterile.

The exploratory method should adopt the following steps:

1. Review: of related social science and other pertinent literature. The information thus gathered will serve as leads for further investigation.

2. Survey: of people who had practical experience with the problem to be studied: Persons by virtue of the nature of their jobs are in a position to throw light on the subject matter of interest to the investigator.

3. The analysis of insight-stimulating examples: Social scientists working in an area which is yet to be explored, which incidentally is the usual experience of an innovative social scientist, have found the intensive study of the selected samples to be a particularly fruitful method of stimulating insight. eg. a remarkable theoretical insights of Sigmund Freud was the result of stimulation provided by his intensive studies of patients.

Exploratory studies are conceptualized at two levels; the first is the discovery of the significant variable in the situation and the second is the discovery of relationship between variables. It is imperative for the investigator to delimit the area to be studied specially at the first level.

While discussing the exploratory study as an entity, it is appropriate to consider it as an initial step in a continues research process. They are undertaken with the explicit purpose of formulating a problem for more precise investigation or for developing a hypothesis.

In conclusion it can be said that no research proposal be aborted for want of methodology, as long we have the exploratory method which is flexible enough to permit the consideration of many different aspects of a phenomena. Mostly the results obtained through the exploratory study are to be treated as a sign post for future and further study in the same direction. For this reason they are also known as formulative studies.

4. EXPERIMENTAL METHOD

When an experiment is possible it is the most effective method of testing a hypothesis. i.e. one variable 'X' casually influences another variable 'Y'.

The term variable means that which can be varied or changed or that which changes or varies itself. When the experimenter asks a question, he attempts to answer it by manipulation of one or more variables. He wants to discover the precise effect of manipulation. The variable that is manipulated or changed in some systematic way is Independent Variable; because the experiment creates it and controls its variation. It is independent of all other causative influences.

In practice techniques of manipulating the independent variable are not always separable and blend into each other .The investigator must attempt to make them interesting and forceful and also ensure that the subject must understand the instructions.

The variable which is measured and which is expected to change as a result of the presence of the independent variable is called the dependent variable. If the independent variable is an effective one, the dependent variable measure will show large differences between the subjects in different conditions rather than in the same conditions. The dependent variable should be as straight forward and as easily measurable as possible.

Among other dependent measures often employed are either a behavioural measure or a verbal measure. The terms independent and dependent variables indicates which of them is to be treated as cause and which as an effect. e. g . It is not uncommon to find a student who says that he believes in learning in a number of sessions spread over a period of time ,say , a month before an examination. In effect he believes in regular work. In contrast there may be another who boasts that he will learn the entire study material in one night prior to the examination. In effect he believes in learning in one sitting. Who is to be believed. It will be sufficient to assume that it consists of comparing the effectiveness of learning under two different conditions of practice, i.e. spaced or massed, using same or equivalent materials for both conditions.

One of the essential differences between a descriptive or observational study and an experiment always involves intervention on the part of the scientist.

Before actually beginning to run the experiment, the investigator must consider various types of errors that might arise and having identified, should strive to reduce or if possible

eliminate them. Anything that affects the outcome besides the independent variable is a source of error.

Systematic errors: tend to influence all the scores in one condition in the same direction and to have no effect on the scores in other conditions.

The random error: is due to the more transient aspect of the person. Minor events that occur during particular experimental sessions, which are not controlled by the experimentor and which are equally likely to occur in any of the conditions of the experiment, contribute to this error.

Random assignment: ensures that all extraneous factors that might influence the subjects behaviour in the experiment are approximately equal in two or more conditions.

Although random assignment is essential for eliminating systematic error, it cannot reduce the amount of random error in the experiment. A common means of controlling random error is to hold important extraneous variables constant at a single level.

Inspite of the advantages of an experimental study, the investigator is compelled to resort to non-experimental studies. For instance certain variables like social, a class or cultural background, are difficult to manipulate.

In conclusion it may be said that the distinguishing features of an experimental method are the deliberate manipulation by the experimentor, the random assignment of subjects and the degree of control exercised. Good experimentation is learned primarily by observing good experimentors and doing experiments under their guidance.

The process of working out a research design involves, as has been pointed out, making decisions (with reference to the research problem or purpose) about the techniques to be employed for collection of relevant data, the safeguards to be employed in the interest of validity, reliability & precision of the instrument of data collection, the mode of drawing the sample is a part, organizing or analyzing the data, interpreting the results of analysis & effecting compromises prompted by practical exigencies, without adversely affecting the

quality of work beyond a tolerable limit, etc. One has to anticipate the general & specific difficulties that may pose themselves from time to time & threaten the chances of producing worthwhile results. Deliberate anticipation of the field situation goes a long way towards helping to get prepared & armed against future hazards. Through designing research it is ensured that one will most probably achieve the research objective without having to spend prohibitive amounts of time, money & energy.

Pre experimental Designs and Their Meaning

O X O

Pre experimental Designs

On the surface, the design below appears to be an adequate design. The subjects are pretested, exposed a treatment, and then posttested. It would seem that any differences between the pretest measures and posttest measures would be due to the progamme treatment.

The One-Group Pretest-Posttest Design
Experimental Group: O X O

However, there are serious weaknesses in this design. With the exceptions of selection and morality threat to internal validity, which are not factors due to the lack of a control group, this design is subject to five other threats to internal validity. If a historical event related to the dependent variable intervenes between the pretest and the posttest, its effects could be confused with those of the independent variable. Maturation changes in the subjects could also produce differences between pretest and posttest scores. If paper-and pencil measures are used on a pretest and a different test measure was used on the posttest, a shift of scores from pretest to posttest could occur resulting in a testing threat. Regardless of the measurement process utilized, instrumentation changes could produce variation in the pretest

and posttest scores. Finally, if the subjects were selected because they possessed some extreme characteristic, differences between pretest and posttest scores could be due to regression toward the mean.

In all of these cases, variation on the dependent variable produced by one or more of the validity threats could easily be mistaken for variation due to the independent variable. The fact that plausible alternative explanation can not be ruled out makes it very difficult to say with any kind of confidence the treatment given caused the observed effect.

The next pre experimental design involves comparing one group that experiences the treatment with another group that does not.

Experimental group: X O

Control group: O

In considering this design, it is important to recognize that the comparison group that appears to be a control group is not, in the true sense, a control group. The major validity threat to this design is selection. Note that no random assignment (omission of the letter "R") is the indicator that the comparison group nonequivalent. In the above design, the group compared is picked up only for the purpose of comparison. There is no assurance of comparability between it and the experimental group. For example, we might wish to test the impact of a new type of math test by comparing a school in which the program exists with one that does not have the program. Any conclusions we might reach about the effects of the program might be inaccurate because of other differences between the two schools.

Despite their weaknesses, pre experimental designs are used when resources do not permit the development of true experimental designs. The conclusions reached from this type of design should be regarded with the utmost caution and the results viewed as suggestive at best.

True Experimental Designs and Their Meaning

R O X O

True Experimental Designs

Probably the most common design is the Pretest-Posttest Group Design with random assignment. This design is used so often that it is frequently referred to by its popular name: the "classic" experimental design. In a true experimental design, the proper test of a hypotheses is the comparison of the posttests between the treatment group and the control group.

Experimental group: R O X O

Control group: R O O

This design utilizes a control group, using random assignment to equalize the comparison groups, which eliminates all the threats to internal validity except mortality. Because of this, we can have considerable confidence that any differences between treatment group and control group are due to the treatment.

Why are internal threats to validity removed by this design? History is removed as a rival explanation of differences between the groups on the posttest because both groups would experience the same events. Maturation effects are removed, because the same amount of time passes for both groups. Instrumentation threats are controlled by this design because although any unreliability in the measurement could cause a shift in scores from pretest to posttest, both groups would experience the same effect. By removing threats to internal validity you maintain equivalence between the groups. This enables you to conclude with a high degree of confidence that your treatment caused the observed effect and not some alternate plausible explanation.

With respect to regression, the classic experimental design can control for regression through random assignment of subjects with extreme characteristics. This ensures that whenever regression does take place both groups will equally experience its effect. Regression toward the mean should not, therefore, account for any differences between the groups on the posttest. Randomization also controls for selection threat to internal validity by making sure that the comparison groups are equivalent.

Another true experimental design is the Solomon Four-Group Design which is more sophisticated in that four different comparison groups are used.

Experimental group 1:	**R**	**O**	**X**	**O**
Control group 1:	**R**	**O**		**O**
Experimental group 2:	**R**	**X**		**O**
Control group 2:	**R**			**O**

The major advantage of the Solomon design is that it can tell us whether changes in the dependent variable are due to some interaction effect between the pretest and the treatment. For example, let's say we wanted to assess the effect on attitude about police officers (the dependent variable) after receiving positive information about a group of police officers' community service work (the independent variable). During the pretest, the groups are asked questions regarding their attitudes toward police officers. Next, they are exposed to the experimental treatment: newspaper articles reporting on civic deeds and rescue efforts of members of the police department.

If treatment group 1 scores lower on the attitude test than control group 1, it might be due to the independent variable. But it could also be that filling out a pretest questionnaire has sensitized people to the difficulties of being a police officer. The people in treatment group 1 are alerted to the issues and they react more strongly to the experimental treatment than they would have without such pretesting. If this is true, then experimental group 2 should show

less change than experimental group 1. If the independent variable has an effect separate from its interaction with the treatment, then experimental group 2 should show more change than control group 1. If control group 1 and experimental group 2 show no change but experimental group 1 does show a change, then change is produced only by the interaction of pretesting and treatment.

When using the Solomon Four-Group Design our concern with history and maturation effects is usually only in terms of controlling their effects. The Solomon design enables us to make a more complex assessment of the cause of changes in the dependent variable. However, the combined effects of maturation and history can not only be controlled but also measured. By comparing the posttest of control group 2 with the pretests of experimental group 1 and control group 1, these effects can be assessed. However, our concern with history and maturation effects is usually only in terms of controlling their effects, not measuring them.

The Solomon design is often bypassed because it requires twice as many groups. This effectively doubles the time and cost of conducting the experiment. Many researchers decide that the advantages are not worth the added cost and complexity.

MEASUREMENT & SCALING:

The first determination in any survey design is "What is to be measured?" Although our problem statement or research question will inform us as to the concept that is to be investigated, it often does not say anything about the measurement of that concept. Let us assume we are evaluating the sales performance of group sales representatives. We could define their success in numerical terms such as dollar value of sales or unit sales volume or total passengers. We could even express it in share of sales or share of accounts lost. But we could also measure more subjective factors such as satisfaction or performance influencers.

Measurement is the assignment of numbers to objects or events in a systematic fashion. Four levels of measurement scales are commonly distinguished: nominal, ordinal, interval, and ratio.

In conclusive research, where we rely on quantitative techniques**,** the objective is to express in numeric terms the difference in responses. Hence, a scale is used to represent the item being measured in the spectrum of possibilities. The values assigned in the measuring process can then be manipulated according to certain mathematical rules. There are four basic types of scales which range from least to most sophisticated for statistical analysis (this order spells the French word "noir"):

- nominal
- ordinal
- interval
- ratio

Nominal Scale

Nominal measurement consists of assigning items to groups or categories. No quantitative information is conveyed and no ordering of the items is implied. Nominal scales are therefore qualitative rather than quantitative. Religious preference, race, and sex are all examples of nominal scales. Frequency distributions are usually used to analyze data measured on a nominal scale. The main statistic computed is the mode. Variables measured on a nominal scale are often referred to as categorical or qualitative variables.

Some researchers actually question whether a nominal scale should be considered a "true" scale since it only assigns numbers for the purpose of categorizing events, attributes or characteristics. The nominal scale does not express any values or relationships between variables. Labeling men as "1" and women as "2" (which is one of the most common ways of labeling gender for data entry purposes) does not mean women are "twice something or

other" compared to men. Nor does it suggest that 1 is somehow "better" than 2 (as might be the case in competitive placement).

Consequently, the only mathematical or statistical operation that can be performed on nominal scales is a frequency run or count. We cannot determine an average, except for the mode – that number which holds the most responses -, nor can we add and subtract numbers.

Much of the demographic information collected is in the form of nominal scales.

In nominal scale questions, it is important that the response categories must include **all** possible responses. In order to be exhaustive in the response categories, you might have to include a category such as "other", "uncertain" or "don't know/can't remember" so that respondents will not distort their information by trying to forcefit the response into the categories provided. But be sure that the categories provided are mutually exclusive, that is to say do not overlap or duplicate in any way.

Ordinal Scale

Measurements with ordinal scales are ordered in the sense that higher numbers represent higher values. However, the intervals between the numbers are not necessarily equal. For example, on a five-point rating scale measuring attitudes toward gun control, the difference between a rating of 2 and a rating of 3 may not represent the same difference as the difference between a rating of 4 and a rating of 5. There is no "true" zero point for ordinal scales since the zero point is chosen arbitrarily. The lowest point on the rating scale in the example was arbitrarily chosen to be 1. It could just as well have been 0 or -5.

When items are classified according to whether they have more or less of a characteristic, the scale used is referred to as an ordinal scale. The main characteristic of the ordinal scale is that the categories have a logical or ordered relationship to each other. These types of scale permit the measurement of degrees of difference, but not the specific amount of difference.

This scale is very common in marketing, satisfaction and attitudinal research. Any questions that ask the respondent to rate something are using ordinal scales. For example,

How would you rate the service of our wait-staff?

Excellent 0 Very good 0 Good 0 Fair 0 Poor 0

Although we would know that respondent X ("very good") thought the service to be better than respondent Y ("good"), we have no idea how much better nor can we even be sure that both respondents have the same understanding of what constitutes "good service" and therefore, whether they really differ in their opinion about its quality.

Likert scales are commonly used in attitudinal measurements. This type of scale uses a five-point scale ranging from strongly agree, agree, neither agree nor disagree, disagree, strongly disagree to rate people's attitudes. Variants of the Likert-scale exist that use any number of points between three and ten, however it is best to give at least four or five choices. Be sure to include all possible responses: sometimes respondents may not have an opinion or may not know the answer, and therefore you should include a "neutral" category or the possibility to check off "undecided/uncertain", "no opinion" or "don't know".

Although some researchers treat them as an interval scale, we do not really know that the distances between answer alternatives are equal. Hence only the mode and median can be calculated, but not the mean. The range and percentile ranking can also be calculated.

Interval Scale

Interval scales take the notion of ranking items in order one step further, since the distance between adjacent points on the scale are equal. A good example of an interval scale is the Fahrenheit scale for temperature. Equal differences on this scale represent equal differences in temperature, but a temperature of 30 degrees is not twice as warm as one of 15 degrees.

The Fahrenheit scale is an interval scale, since each degree is equal but there is no absolute zero point. This means that although we can add and subtract degrees (100° is 10° warmer than 90°), we cannot multiply values or create ratios (100° is not twice as warm as 50°). What is important in determining whether a scale is considered interval or not is the underlying intent regarding the equal intervals: although in an IQ scale, the intervals are not necessarily equal (e.g. the difference between 105 and 110 is not really the same as between 80 and 85), behavioural scientists are willing to assume that most of their measures are interval scales as this allows the calculation of of averages – mode, median and mean – , the range and standard deviation.

On interval measurement scales, one unit on the scale represents the same magnitude on the trait or characteristic being measured across the whole range of the scale. For example, if anxiety were measured on an interval scale, then a difference between a score of 10 and a score of 11 would represent the same difference in anxiety as would a difference between a score of 50 and a score of 51. Interval scales do not have a "true" zero point, however, and therefore it is not possible to make statements about how many times higher one score is than another. For the anxiety scale, it would not be valid to say that a person with a score of 30 was twice as anxious as a person with a score of 15. True interval measurement is somewhere between rare and nonexistent in the behavioral sciences. No interval-level scale of anxiety such as the one described in the example actually exists.

Although Likert scales are really ordinal scales they are often treated as interval scales. By treating this type of agreement scale or attitudinal measurement as interval, researchers can calculate mean scores which can then be compared. For instance, the level of agreement for men was 3.5 compared to 4.1 for women, or it was 3.3 for first time visitors compared to 2.8 for repeat visitors.

Ratio Scale

When a scale consists not only of equidistant points but also has a meaningful zero point, then we refer to it as a ratio scale. If we ask respondents their ages, the difference between any two years would always be the same, and 'zero' signifies the absence of age or birth. Hence, a 100-year old person is indeed twice as old as a 50-year old one. Sales figures, quantities purchased and market share are all expressed on a ratio scale.

Ratio scales are like interval scales except they have true zero points. A good example is the Kelvin scale of temperature. This scale has an absolute zero. Thus, a temperature of 300 Kelvin is twice as high as a temperature of 150 Kelvin.

Ratio scales should be used to gather quantitative information, and we see them perhaps most commonly when respondents are asked for their age, income, years of participation, etc. In order to respect the notion of equal distance between adjacent points on the scale, you must make each category the same size. Therefore, if your first category is $0-$19,999, your second category must be $20,000-$39,999. Obviously, categories should never overlap and categories should follow a logical order, most often increasing in size.

Ratio scales are the most sophisticated of scales, since it incorporates all the characteristics of nominal, ordinal and interval scales. As a result, a large number of descriptive calculations are applicable.

There is a relationship between the level of measurement and the appropriateness of various statistical procedures. For example, it would be silly to compute the mean of nominal measurements. However, the appropriateness of statistical analyses involving means for ordinal level data has been controversial. One position is that data must be measured on an interval or a ratio scale for the computation of means and other statistics to be valid. Therefore, if data are measured on an ordinal scale, the median but not the mean can serve as a measure of central tendency.

ANALYSIS OF DATA AND INTERPRETATION:

Having drawn a suitable and numerically adequate sample from the 'universe', then comes the measuring instruments or tools of data collection on the items comprising the selected sample. In order to ensure that the data are reliable and free from bias, one needs to consider what mode of administering the instruments or tools of data collection would be most desirable in view of the kinds of responses sought and the nature of the objects or persons covered by the study.

After the data collection phase is over, then comes the task of analysing them.

Analysis of data involves a number of closely related operations that are performed with the purpose of summarizing the collected data & organizing these in such a manner that they will yield answers to the research questions. The dividing analysis of data & interpretation is difficult to draw. In fact, the two processes are symbiotic & merge imperceptibly. If analysis involves organizing data in a particular manner as we have said it does, then, it is mostly the interpretative ideas that govern this task. Thus, the task to analysis can hardly be said to be complete without interpretation coming into illuminate the results.

Interpretation helps one understand what the given research finding really means & what the underlying abstract principle is, of which the research finding is just one concrete manifestation or reflection at the concrete level of empirical observations.

The processes involved in analysis of data are as follows:-

1. Establishment Of Categories Or Classification Of Data

The research question or hypothesis, provides a good logical basis for selecting a classificatory principle. Suppose, the hypothesis in a study is, " Students who have had an experience of studying in co-educational schools will have more favorable attitude toward the system of co-education". Here, obviously, one of the principles of classification of responses will be whether or not the respondent has had prior experience of co-educational system.

The set of categories should be derived from a single classificatory principle. This requirement is quite understandable because if more than one principle of classification is employed, a single response may be claimed by more than one category. The second requirement is that the category-set should be exhaustive, that is, it should be possible to place every response in one of the categories within the set. "No response" should be left out for want of an appropriate category in the set that will include it. The last requirement is that the categories within the set should be mutually exclusive, that is, the categories should not overlap.

Let us take a very simple example:

Suppose the researcher considers three attributes e.g. sex (male or female), age (below 21years of age or above 21 years of age) & martial status (married or single) as constituents of his single (but compound) principle of classification & reduces these to symbols as under:

Male = S, Female = F

Below 21 years of age = A, Above 21 years of age = B

Married = M, Single = G

The resulting category-set will be the exhaustive totality consisting of all possible combinations of these three attributes that comprise the compound classificatory principle. The possible combinations, i.e. categories will be 2*2*2 = 8 in number.

1. SAM
2. FAM
3. SBM
4. SAG
5. FAG
6. SAM
7. SBM
8. SAG

Decoding, i.e. substituting the real connotations for the symbols, we get eight mutually exclusive categories.

1. Males below 21 & married
2. Females below 21 years & married.
3. Males above 21 years & married
4. Males below 21 years & unmarried
5. Females above 21 years & married
6. Females below 21 years & unmarried
7. Males above 21 years & unmarried
8. Females above 21 years & unmarried.

2. Application of Categories to Raw Data Through Coding

Coding consists in assigning symbols, usually numerals, to each answer which falls in a predetermined class. In other words coding may be regarded as the classification process necessary for subsequent tabulation. Through coding, raw data are transformed into symbols that may be tabulated & counted. 'Coder' is the official title for a person after the recorded noted have been brought to the office. Coding may take place at three different points in a study at each of which, different kinds of persons may be responsible for assigning codes to the raw data. For e.g. when the respondent is asked to indicate which of the classes (say income groups) he belongs to e.g. a) below 300 rupees p.m. b) Rs. 301/- to Rs. 600/- p.m. c) Rs. 601/- to Rs. 900/- p.m. d) Rs. 901/- & above, the respondent codes his response simply by ticking off his position among the given alternatives. The second point at which the coding can take place is when in the course of data collection, the interviewer or observer categorizes the subject's responses. The final point at which coding can take place is, of course, when the raw uncategorized data (collected especially through unstructured instruments of data collection) are deposited in the project office & the official coders here exercise their judgment to assign particular codes to particular responses or data.

On the spot coding judgment, the judgment of data-collectors may be colored by many factors, viz, responses to previous questions, mannerisms, etc. Secondly, there is a danger of the data-collectors lacking in uniformity when coding responses. There are many things that may operate to make the judgment of coders unreliable. Many of the difficulties that occur in coding results from the inadequacies of data. These difficulties, however, can generally be overcome by careful editing of data. The process which consists in scrutinizing the data to improve the data to improve their quality for coding is known as editing.

Editing involves a careful scrutiny of the interview or observation schedules.

a) Completeness:- The editors need to see that all items are duly filled in.

b) The editor should examine the interview or observation schedules to find out whether the handwriting or the symbols or codes assigned by interviewer or observer can be easily understood by the coder.

c) Editing also involves examining the schedules for comprehensibility.

d) The data should also be examined or checked to find out whether there are certain inconsistencies in regard to the responses recorded in the schedule.

e) It is also necessary to check the degree of uniformity with which the interviewers have followed instructions in collecting & recording data.

f) It should be noted that some response may simply appear to be irrelevant for the purposes of the investigation, then the data should be carefully examined with a view to segregating the inappropriate responses from the appropriate ones.

It is obvious that the quality of coding is affected by the competence of the coders. Training of coders is thus an important step in any study.

Firstly, the various codes are explained to the trainees & explained with examples from the data categorized.

Secondly, all the trainee-coders then practice on a sample of the data problems.

Thirdly, clues resulting from practice-coding are used to effect revisions in the categories to make the better applicable to the material.

Fourthly, at some point in the practice period when relatively few new problems arise, the coders work on an identical portion of data without consulting one another.

Lastly, periodical checks are made to ensure that coders do not become careless with more experience.

It should be noted that the types of codes used in a study will differ according to whether the data are to be tabulated by machine o by hand.

3. The Tabulation of Data

Tabulation is a part of the technical process in the statistical analysis of the data. The essential element in tabulation is the summarization of results in the form of statistical tables. Tabulation naturally depends upon establishing categories for raw data, editing & coding of responses (punching and running he cards through machines for mechanical tabulation & sorting & tallying for hand tabulation.) Experienced researchers generally develop tabulation plans at about the same time as they draft or construct the data-collection instruments & make sampling plans.

Tabulation as already suggested, may be done entirely by manual methods, this being known as hand tabulation. Alternatively it can be done by mechanical methods utilizing automatic & fast power machines for the bulk of data. Data may, however, be presented in other ways, i.e. instead of presenting them in a tabular form, the researcher may present them in the form of diagrams or graphs.

4. Statistical Analysis of Data

Statistics, a branch of applied Mathematics, is regarded as mathematics applied to observational data. Conceivably everything dealing with the collection, processing, analysis & interpretation of numerical data belongs to the domain of statistics.

Functions of Statistics

Statistics has patently two broad functions is description & the summarizing of information in a manner so as to make it more usable. The second function of statistics is induction, which involves either making generalizations about some 'population' on the basis of a sample drawn from this population or formulating general laws on the basis of repeated observations.

Statistics in Business Research

There are essentially two reasons why the expertise in statistics & the need to study statistics have grown enormously in the field of social sciences. One reason is that huge amount of data collected by researchers needs simplification so as to render them capable of being commonly understood without much difficulty. The second & even more important reason is the increasing quantitative approach being currently employed in business research.

Depending upon the objectives & hypotheses the type of statistics is applied.

The Descriptive statistics is used for describing the data. Use of Measures of Central Tendencies, Dispersion, Normal Distribution, Correlation are mainly used for the purpose.

The Inferential Statistics is used for testing of Hypotheses. Depending upon the hypotheses, t-test. Z test or F-test could be used. Multiple Regression, Factor Analysis also are used at times.

Most important thing a researcher has to keep in mind is that before finalizing the statistical technique to be used he must account for the :

1) Objectives of the study
2) Type of Data Scale
3) The type of Hypothesis
4) Level of Significance (95 % or 99 %)
5) Tails of the Tests (One tailed or Two tailed)

Once the data is analyzed & the hypotheses are tested the conclusions are to be drawn.

The researcher must show that his observations have a meaning much broader & deeper, than the one it appears to have on the surface level. It is through interpretation that the researcher can understand the real significance of his findings. This search has two major aspects:

The first aspect involves the effort to establish continuity in research through linking the results of a given study with those of another. It is through interpretation that the researcher can unravel or comprehend the abstract principle beneath the concrete empirical observations.

In a somewhat different sense, interpretation is necessarily involved in the transition from exploratory to experimental research. The interpretation of the findings of the former category of researches often leads to hypothesis for the latter. Since, an exploratory study does not have a hypothesis to start with, the findings or conclusions of such a study have to be interpreted on a 'post-factum' basis. Interpretation is often a hazardous game fraught with dangerous implications. Such an interpretation involves a search for a godfather in the nature of some theory or principle that would adopt (i.e. explain) the finding of the study.

Secondly, interpretation leads to the establishment of explanatory concepts. As has been pointed out, interpretation of findings involves efforts to explain why the observations or findings are, what they are. In accomplishing this task, theory assumes central importance. It is a sensitizer & a guide to the underlying factors & processes (explanatory bases) beneath the findings.

Thus, interpretation serves a twofold purpose. First, it gives an understanding of the general factors that seem to explain what has been observed in the course of a study & secondly, it provides a theoretical conception which can serve in turn as a guide for further research. It is in this manner that science comes to cumulatively disengage more successfully by the basic processes which shape the portion of the empirical world with which a researcher is concerned.

Based upon the conclusions, the major recommendations are made to the organization. These recommendations should be the basis of the decision making in the organizations.

RESEARCH REPORT

Reporting the findings & conclusions of the research is the final stage of research process. After the research is conducted, it is of importance to report it and circulate it to the concerned people, agencies.

Research findings must be made known to the workers in the field as one of the important functions of research is to disseminate knowledge.

Layout of the research report:

A comprehensive layout of a research report has 3 main parts;

1. Preliminary Section
2. Main Text
3. End Section

1. The Preliminary Section deals with the Title page, Certification, Acknowledgement, Table of Contents, List of Tables, Graphs, Figures, Abbreviations etc.
2. The Main Text or Body has following scheme of chapterization :
   Ch.1 – Introduction
   Ch.2 – Review of related literature
   Ch.3 – Research Design
   Ch.4 – Data Analysis – Qualitative (Descriptive) and Inferential
   Ch.5 – Interpretation (Testing of Hypotheses) and Conclusions.
   Ch.6 – Summary and Recommendations
3. End Section contains Bibliography, Appendices & such other information which is related to research but does not form the part of the main text.

Mechanics of writing a Research Report :

There are definite and set rules regarding mechanical aspects of research framed by American Psychological Association (APA). All the rules are strictly observed.

These rules pertain to size and type of paper to be used, spacing margin, etc. They also mention about the systems of giving footnotes, documentation style, pagination, etc.

The researcher has to be aware of all the rules and should follow them meticulously.

RESEARCH PROPOSAL:

The preparation of a research proposal is an important step in the process of research. Research proposal is a systematic plan that helps the researcher to carry out the research process. The initial research proposal may undergo slight changes as per the constructive criticism, expert's comments or suggestion. However, it does provide a broad outline of the process of research. A research proposal is a blueprint of the actual process to be carried out. Research proposal should include following aspects.

1. **Statement of the problem**: Very often the problem is stated in a declarative form. It may as well be written in a question from. Problems can be derived from theory, prior research results or personal observations and experience.

2. **Review of related Literature**: The theoretical and empirical framework from which the problem arises must be described in brief. It is necessary to provide conceptual framework as it answers inclusion of different variables in the study. It gives brief account of what is already known, researched upon and what is needed to be explored or researched. The researcher must note the title, design, and procedure, tools used,

sampling techniques, variables, objectives, hypotheses and results of all the studies to be included in the review.

3. **Objectives**: The objectives of the studies are to be mentioned in this section. This gives an idea of what the researcher intends to study.
4. **Assumptions**: The assumptions are statements, which the researcher believes to be facts and these, are not subject to verification in the present study. Certain studies do need to assume certain basic facts on which the entire theorization has been done.
5. **Variables**: Different variables that are involved in the study along with their nature must be mentioned. Clear mention of dependent, independent, moderator and control variables must be made.
6. **Operational Definitions**: Certain concepts involved in the study need to be defined operationally, if it is not done properly, there is every likelihood of misinterpretation. These definitions help to establish proper frame of reference, with which the researcher approaches the problem. Certain variables or concepts cannot be observed directly. They are vague and ambiguous. Hence, they must be mentioned in operational terms i.e. how they can be observed and measured must be clearly stated.
7. **Limitations**: These are the conditions beyond the control of the researcher that may place restrictions on the conclusions of the study and their applications to other situations. Sometimes researcher may have to manage with only one class instead of required number of two classes.
8. **Delimitations**: Delimitations are boundaries of the study. These may be conceptual, geographical or procedural (e.g. sampling, medium, gender, etc.)

9. **Hypotheses**: The major and minor hypotheses are written down in this section. The hypotheses may be stated either in null from or as declarative statements, but the researcher must ensure that the hypotheses satisfy all the required criteria.
10. **Sampling**: The number and type of sample along with the process of sampling are to be clearly stated.

11. **Methodology**: Methodology should mention the type of research study i.e. survey, experimental, case study, historical, etc. It should state the tools to be use along with their purpose. The details of method to be used for data collection should also be given. Brief mention of proposed method of data analysis also should find place in this section.
12. **Significance of the study**: How the study will help various agencies or organizations is to be mentioned in this Section e.g. Teachers, Principals, Patents, NGOs, Government, Textbook Bureau, etc.
13. **Bibliography**: Mention of few main references is to be made in this part.
14. **Time schedule or phasing**: How does the researcher plan to complete the research is to be mentioned along with the time schedule. Dividing the project into manageable parts and assigning dates for their completion helps researcher to systematize the work and manage the time.
15. **Budget**: The research proposal which is submitted to the government, autonomous bodies or financing institutions like UGC, NCERT, ICSSR, etc, should include budget proposal estimating funds for data collection, travel, typing, printing, purchases of tools or test books and other related material.

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