Research Methodology:

Definitions

Research in common parlance refers to a search for knowledge. One can also define research as a scientific and systematic search for pertinent information on a specific topic.

Research=Re+ search, which means search again and again

Research is an academic activity and the term should be used in a technical sense.

(a) –William Emory defines Research as "any organised enquiry designed and carried out to provide information for solving a problem"

(b) The new Oxford English Dictionary defines research is "the scientific investigation into and study of material, sources etc in order to establish facts and the reach new conclusions".

(c) Redman and Mory defines, research as "a systematised effort to gain new knowledge''.

(d) "A careful investigation or inquiry specially through search for new facts in any branch of knowledge" Advanced Leaner's Dictionary.

Characteristics of Research

The above definitions reveal the following characteristics of Research

1. Research is a systematic and critical investigation into a phenomenon.
2. It is not mere compilation of facts.
3. It adopts scientific method.
4. It is objective & Logical
5. It is based on empirical evidence.
6. Research is directed towards finding answers to questions & solutions to Problems.
7. It emphasis the generalisation theories and principles.

Objectives of Research

The objectives of Research can be grouped under the following heads

1. To gain familiarity with a phenomenon or to achieve new insights to it.
2. To portray accurately the characteristics of a particular individual situation or agroup.
3. To determine the frequency with which something occurs or with which it is associated with something else.
4. To test a hypothesis of a casual relationship between variables.

Criteria of Good Research

I. ---------James Harold Fox in "criteria of good research" says that scientific research shouldsatisfy the following conditions.

1. The purpose of Research should be clearly defined and common concepts should be used

2. The Research procedure used should be described in sufficient detail to pertinent other researcher to repeat the research for further advancement, keeping the continuity of what has been attained.
3. The design of the Research should be carefully planned to yield results that are as objective as possible.
4. The Research report should be complete and should be frank and without any flows.
5. Collection and analysis of data should be adequate and the reliability should be checked carefully.
6. Conclusions should be justified by data
7. Researches must be an experienced person with goal reputation.

II. In other way

1. Good Research is systematic
2. Good Research is logical
3. Good Research is empirical
4. Good Research is replicable (Denny N Bellenger and Burnet A Green Berg)

HYPOTHESIS:

When a researcher observes known facts and takes up a problem for analysis, he firsthas to start somewhere and this point of starting is Hypothesis. In other words, one has toproceed to formulate tentative solution. This purposed solutions constitute the Hypothesis.
The collection of facts (data) will be fruitful if they are either for or against this proposed solution. The tentative explanation or solutions are the very basis for research process.

When to make a Hypothesis?

Hypotheses are not given to us readymade. This is so specially in social sciences. Because there is not a system of highly developed theoretical order in many social sciences. As a result in many social science researchers a considerable portion of research is developed for hypothesis making. So it should be remembered that research can begin only with a well-formulated Hypothesis.

Definition

1. In the words of George A. Lund Burg " a hypothesis is a tentative generalizatiothe validity of which remains to be tested……. In its most elementary stage thehypothesis may be very bunch, guess,

imaginative data, which becomes thebasis for action or investigation".

2. Goode and Hatt defined it as " a proposition which can be put to test to
determined validity".
3. Rummel " a hypothesis is a statement capable of being tested and there by varified or rejected".

Need (importance) of Hypothesis:

In all analytical and experimental studies hypothesis should be set up in order to givea proper direction to them. Hypothesis are useful and the guide Research Process in properdirections. In addition to put in the theory to test, a hypothesis has to performe certain otherfunctions.

In many ways it is a guiding print to research. Young says "Formulation of hypothesisgives definite the point of enquiry aids in establishing direction in which to proceed and helpto delimit the field of enquiry".

The use of hypothesis prevents a blind search and indiscriminate gathering of datawhich may later prove irrelevant to the problem under study.

In the data collection hypothesis serves as the forerunner.

A Researcher based on hypothesis can save a lot of time and keep the researcher fromconsiderable amount of confusion.

Hypothesis is helpful in directing the researcher to find out order among facts.Hypothesis have also certain practical values to society besides serving as ameans for seeking solution to various problems, they help in understanding the socialphenomena in the proper perspective.

Sources of Hypothesis:

Hypothesis can be derived from various sources.

1. Theory

This is one of the main sources of hypothesis. It gives direction to research by stating what is known. Logical deduction from theory leads to new hypothesis.

2. Observation

Hypothesis can be derived from observation. For example, from observation of price behaviour in a market the relationship b/w price and demand of an article can be hypothesised.

3. Analogies

Analogies are another sources of hypothesis. Julian Hexley has pointed out that causal observation in nature or in the framework of another science may be a fertile source of Hypothesis.

4. Intuition and personal experiences;

Intution and personal experiences may also contribute to the formulation of hypothesis. Personal life and experience of person determine their perception and conception these may, in term direct a person to certain hypothesis more quickly.
The story Newton and falling apple, the flash of wisdom to Sree Buddha under Banyan tree Illustrate this accidental process
5. Findings and Studies
Hypothesis may be developed out of the findings of other studies in order to repeat the test.
6. Culture
Another source of hypothesis is the culture in which the researcher is nurtured. For example sociology as an academic discipline originated from western culture. Over the past decade a large part of the hypothesis on American society examined by researchers were connected with violence. Indian society is caste-ridden. It is riddled with inequalities and privileges.

Characteristics of a Good hypothesis:

What is a good hypothesis? What are the criteria of for judging it. An acceptable
hypothesis should fulfill certain conditions.

1. Conceptual Clarity
A hypothesis should be conceptually clear. It should consist of clearly defined andunderstandable concepts
2. Specificity
A hypothesis should be specific and explain the expected relation b/w variables andthe conditions under which these relations will hold.
3. Testability
A hypothesis should be testable and should not be a moral judgement. It should bepossible to collect empirical evidences to test techniques.
4. Availability of techniques
Hypothesis should be related to available techniques. Otherwise they will not be researchable therefore the research must make sure that methods are available fortesting his proposed hypothesis.
5. Consistency
Hypothesis should be logically consistent. The propositions derived should not be contradictory
6. Objectivity
Scientific hypothesis should be free from value judgment. The researcher system of values has n o placing Research.
7. Simplicity

A hypothesis should be as simple as possible. Simplicity demands insight. The more insight the researcher has into a problem, the simpler will be his hypothesis.

Types of Hypothesis:

1. Descriptive Hypothesis

These are propositions, they described the characteristics of a variable. The variable may be an object, person, organisation, situation or event. For ex. "The rate of unemployment among arts graduates is higher than that of commerce graduates".

2. Relational Hypothesis

These are propositions which describe the relationship b/w two variables. The relation suggested many be positive or negative for ex. 'Families with higher income spent more for recreation'. 'Upper class people have more children than lower class people'.

3. Causal Hypothesis

Causal Hypothesis states that the existence of, or a change in, one variable causes forleads to an effect on other variable. The 1st variables is called independent variable later the dependent variable.

4. Common Sense Hypothesis

These represent the commonsense ideas. They state the existence of empirical uniformities received through day to day observations.

5. Analytical Hypothesis

These are concerned with the relationship of analytic variables. These hypothesis occurs and the higher level of abstraction.

6. Null Hypothesis-(H_0)

Null means 'Zero' When a hypothesis is stated negatively. It is called Null Hypothesis. The object of this hypothesis is to avoid the personal bias of the investigator. In the matter of collection of data. A null hypothesis is used to collect additional support for the known hypothesis.

OR

There is no significant difference between population mean and sample mean .

7. Alternative Hypothesis-(H_1)

There is a significant difference between population mean and sample mean .

8**. Barren Hypothesis**

A hypothesis from which no consequences can be deducted is called a Barren Hypothesis. It is a hypothesis which cannot to test. Ex. The child fell ill because a wicked women's eye felt upon it. This is a baseless hypothesis because it cannot be verify.

Testing of Hypothesis :

Science does not admit anything as valid knowledge until satisfactory test confirm the validity. A hypothesis should be subjected to regrets test and. Type I and Type II errors should be eliminated.

TYPES OF RESEARCH

Research is classified into different forms on the basis of intent & methods.
The following are the different types of research.

1. Descriptive Vs Analytical

Descriptive research includes Surveys or fact-finding enquiries of different kinds. The major purpose of descriptive research description of the state of affairs as it exist at present. The main characteristics of this method is that the researcher has no control over the variables; He can only report what has happened or what is happening.
In Analytical research, on the other hand the researcher has to use facts or information already available & analyse this to make a critical evaluation, of the material.

2. Applied Vs Fundamental

Research can either be applied (or action) research fundamental (or pure) research Applied Research aims at finding a solution for an immediate problem facing a society or an organisation whereas Fundamental Research is mainly concerned with Generalisation and with the formulation of a theory. 'Gathering knowledge for knowledge' is termed pure research. Research studies concerning natural phenomenon, human behaviour etc are examples of Fundamental Research. But Research aims at certain conclusion facing a concrete social problems is an example of applied Research.

3. Qualitative Vs Quantitative

Quantitative Research is based on the measurement of quantity or amount. It is applicable to a phenomenon that is phenomenon relating to or involving quality or kind. Qualitative Research is specially important in the behavioural sciences were the aim is to discover the underlying motives of human behaviour.

4. Conceptual Vs Empirical

Conceptual Research is that related to some abstract ideas for theory. It is generally used by philosophers and thinkers to develop the new concepts or to interpret existing On the other hand Empirical Researches relie on experiments or observation alone, often without due regard for system of theory. It is data based research coming up with conclusions which are capable of been variable of observation and experiment.

5. One Time Research or Longitudinal Research
In the formal case the research is confined to a single time period, whereas the later case the research is carried on over several time periods.

6. Laboratory Research and Field setting Research
This classification is based on the environment in which research is carried out.

7. Historical Research
Historical Research is that which utilities historical sources like documents remains etc to study events ideas of the past including the philosophy of persons and groups at any remote point of time

SURVEY RESEARCH:

Survey is a fact finding study. It is a method of research involving collection of data directly from a population or sample thereof at particular time. It must not be confused with mere clerical routine of gathering and tabulating figures. It requires expert and imaginative planning carefull analysis and rational interpretation of the findings.

Definitions
1. Mark Abraham defines survey as "a social survey is a process by which Quantitative facts are collected about the social aspects of a community composition and activities".
2. Herman N Morse defines It as "a method of analysis on scientific and orderly form for defined purpose of given social situations and activities."
The Characteristics of Survey
1. It is a field study; It is always conducted in a natural setting.
2. It seeks responses directly from the respondents.
3. It can cover a very large population.
4. A survey involves an extensive and intensive study.
5. A survey covers a definite geographical area, city, a district or a state

Steps involved in a Survey:

The sequences of the task involved in carried out a survey from the 1st stage of planning to the Final stage of preparing the report is presented below.
a) Selection of problem and its formulation
b) Preparation of the research design.
c) Operationalization of concepts and construction of measuring indexes and states.
d) Sampling
e) Construction of tools for collection of data and there pre-test.

f) Field work and collection of data
g) Processing of data and tabulation
h) Analysis of data
i) Reporting

The Purpose of the Survey

1. The purpose of survey is to provide information's do government or planners or business enterprises.
2. Many enquiries aim to explain phenomenon
3. Surveys may be designed to make comparison of demographic groups.
4. Surveys are useful for making predictions

Types of Survey

1. General or Specific survey

When a survey is conducted for collecting general information about population institution or phenomenon without any particular object or hypothesis it is known as general survey.

Specific survey are conducted for specific problems or for testing the validity of some theory or hypothesis.

2. Regular and Adhoc Survey

Some surveys are regular in nature and must be repeated after regular intervals. Such a survey is called Regular Survey.

Adhoc survey is are undertaken ones for all.

3. Preliminary And Final Survey

A Preliminary survey is generally known as 'Pilot study' and it is a fore run of the Final Survey. Final survey is made after the pilot study has completed.

4. Senses and Sample Survey

A survey make our all the units of a given universe then it is called a sense survey. If the survey covers only a fraction of the universe, then it is called sample survey.

Advantages of Survey

The major advantages of the survey method are

1. The versatility of the survey method is its greatest strength. It is the only practical way to collect many types of information from individuals, socio-economic data, attitudes, opinions, experience and expectations.
2. The survey method facilitates drawing generalisations about large populations on the basis of studies of representative sample.
3. The survey method is flexible to permit the use of various methods of collection of data.
4. The survey help the researches to face unanticipated problems.
5. Survey is useful in verifying theories.

Limitations of Survey:

1. Survey method is primarily meant for collection of data from primary sources. So its success depends upon the willingness and co-operations of the respondents.
2. The survey method depends primarily on verbal behaviour. The respondent can give misleading answers.

3. A sample survey is subject to sampling error.
4. There is a limit of the number of items of information that can be collected in a single survey. There is an optimal length of time for an interview.
4.A survey is very expensive in terms of time and cost.

PROBLEM FORMULATION

In Research process, the 1st and foremost step is that of selecting properly and defining a research problem. The researchers must find the problem and formulate it so that it becomes susceptible research like a doctor a researches must examine all the symptoms concerning a problem before he can diagnosis correctly.

"A problem well put is half solved. This saying highlights the importance of proper formulation of the selected problem. The primary task of Research is the collection of relevant data and the analysis of data or finding answers to research questions.
The proper performance of this task depends upon the identification of correct data and information required for the study. Once the problem is formulated he can execute the other steps without any vaste of time and energy. Thus formulation is a direction andspecific focus to research effort. It helps to delimit the field of enquiry and prevent blindresearch and indiscriminate gathering of data. A proper formulation help to solve allmajor tasks for research like sampling, collection of data, construction of tools, plan of analysis etc.

What is a Research Problem?

A Research problem in general refers to some difficulty the researches experiences in the context of a theoretical or practical situation and wants to obtain a solution for the same.
"The term problem means a question or issue to be examined"
The term problem originate from the Greek word 'Probellim' – meaning anything that thrown forwards, a question proposed for solution, a matter stated for examination.
What is formulation?

Formulation means "translating and transforming the selected Research problem in to a scientifically researchable question".

Selection of a Problem

The Research problem undertaken for study must be carefully selected the task is a difficult one, although it may not appear to this. So in this connection researcher can seek the help of a guide. However the research problem cannot be borrowed. A problem must spring from the mind of researcher like a plant spring from its seed. A research guide can only help a researcher to choose the subject. The following paints may be observed by the researcher in selecting a research problem.
1. Subject which is overdone should not be chosen.
2. Controversial subjects should not be taken.
3. Too narrow or too wide problems should be avoided.

4. The subject selected for research should be familiar and feasible.
5. The subject should be within our time limit.
6. The subject should be within our affordable budget.

Sources of Problem

The sources from which one may be able to identity research problems are:

1. Reading

When we critically study books and articles relating to subject of our interest, pertinent questions may arise in our mind. Similarly areas of research may strike to our mind when we read research reports.

2. Academic Experiences

Classroom lectures, class discussions seminar discussions and out –of-class exchanges of ideas with fellow students and professors will suggest many stimulating problems to be studied.

3. Daily Experience

Life is dynamic. We learn new things and undergo new experiences every day. It we are all inquisitive and sensitive to like situation we may bit upon questions worth of investigation. The story about Newton testifies to this. Apples have fallen on the beads of people before Newton. But it was sensitive Newton alone raised the question regarding fall of apple which led to the discovery of Law of gravitation.

4. Consultation

Discussion with experts, researchers etc. will help to identify meaningful problems of research.

5. Field situation

Field visits, training and extension work provide exposure to problems which call for study.

6. Brain storming

Intensified discussion within a group of interested person may often be a means of identifying pertinent questions and of developing new ideas about a problem.

7. Intuition

Sometimes new ideas may strike to one's mind like a flash reflective mind is spring of knowledge. Eg. Sri Buddha.

Techniques of formulating Research Problem

How to define a Research Problem is undoubtedly a herculian task. However it is a task that must be talked intelligently. The usual approach is that the Researcher should himself pose a question and set techniques and procedure for throwing tight non the problem.

Defining a Research Problem properly and clearly is a crucial part of Research study and must in no case should accomplished hurriedlly. However in practice this is frequently overlooked. **The techniques involved in defining and formulating a Research problem are as follows**.

1. Statement of the problem in a general way
2. Understanding the nature of the problem
3. Surveying the available literature
4. Developing ideas through discussion
5. Rephrasing the Research Problem.

1. Statement of the problem in a General way

First of all the problem should be stated in broad general way keeping in view either some practical concern or some scientific or intellectual interests. For the purpose the researcher must immerse himself thoroughly in the subject matter concerning which he wishes to pose a problem. In Research, some preliminary survey or Pilot Survey is desirable. Then he can himself states the problem or be can seek the help of a guide. Ofter the guide puts forth the problem in general terms, and then it is upto the Researcher to narrow it down and phrase the problem in operational term. The stated problem may have various ambiguities that must be resolved by cool thinking and thinking at the same time the feasibility of particular solutions has to be consider and the same should be kept in view wild stating the problem.

2. Understanding the nature of the problem.

The next step in defining the problem is to understand its orgin and nature clearly. The best way of understand the problem is to discuss it with those who 1st raised it in orderto find out how the problem originally came out and with what objectives in view. If theresearcher has stated the problem himself, he should consider once again all those pointsthat induced him to make a general statement concerning the problem. For a betterunderstanding of the nature of the problem involved, he can enter into discussion with those who have a good knowledge of the problem concerned or similar other problems. The researcher should also keeping you the environment within which the problem is to be studied or understood.

3. Surveying the available literature

All the available literature concerning the problem at hand must necessarily be surveyed and examined before a definition of research problem is given. He must be conversant with relevant theories in the field, report and the records as also of all other relevant literature. He must devote sufficient time in reviewing of research already undertaken on related problems. This is done to find out what data and other materials, if any, are available for operational purposes. This would also help the researcher to know if there are certain gaps in the theories or whether the existing theory applicable to the problem study are in consistent with each other, or whether the findings of different studies donot follow pattern consistent with the theoretical expedition and so on. All these enable a research to take new strides in the field of Furtherance of knowledge that he can move to starting from the existing premise studies on related problems are useful for indicating the type of difficulties that may be encountered in the present study as also the possible analytical short coming. At times such studies also suggest useful and even new lines of approach to the present problem.

4. Developing ideas through discussion

Discussion concerning a problem often produces useful information. Various new ideas can be developed through such an exercise, hence, a researcher must discuss him problems with his colleagues and others who have enough of experience in the same area or
in working on similar problems. This is known as experience survey. People with rich experience are in a position to enlightened the researcher firm

5. Rephrasing the Research Problem

Finally the researcher must patiently sit to rephrase the research problem into a working proposition- Once the nature of the problem has been clearly understood, the

environment (with in which the problem has to be studied) has been defined, discussion over the problem have taken place and the available literature has been surveyed and examined rephrasing the problem into analytical or operational terms is not a difficult task. Through rephrasing the researcher puts the research problem in as specific terms as possible so that it may become operationable and may help in the development of working hypothesis.

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While defining a Research Problem the following points also may be noted.

a) Technical terms should be clearly defined
b) Basic Assumptions should be clearly defined
c) A straight forward approach should be provided
d) The suitability of time period and the source of data must be considered.
e) The scope of investigation and the limit of investigation should also we defined.

RESEARCH DESIGN:

Meaning

"A Research Design is the logical and systematic planning in directing the research. The design research from translating a general scientific model into varied research problem. But in practices in most of the basis it is just a plan of study. The research designcan either be formal or informal.

Definition

1. "It constitutes the blue print for the collection, measurement and analysis of data" - Philips Bernard S

2. It "provides a systematic plan of procedure for the researcher to follow" -Best John N

3. "The design research from controlling general scientific model into varied research procedure"- P.V. Young

4. "A research design is "the programme that guides the investigator in the process of collecting, analysis and interpreting observations". – David and Shava

A research design addressers itself to certain key issues such as:

a) What is the problem study?
b) What is the major research question?
c) What is the area of the study?
d) How many people will be study?
e) How this people will be selected?
f) What methods and techniques will be used to collect data from them?

Features of Research Design

a) It is a plan that specifies the objectives of study and the hypothesis to be tested.
b) It is an outline that specifies the sources and types of information relevent to the research question.
c) It is a blueprint specifying the methods to be adopted for gathering and analysis of data.
d) It is a scheme defining the procedure involved in a research process.

Features of a good Design

A good design has the following features.
1. Flexibility
2. Efficiency
3. Appropriate
4. Economical
5. Minimum error
6. Maximum reliability
7. Smallest experimental error
8. Maximum information

Why a Research Design?

1. Research Design is needed because it helps in the smooth sailing of Research operations. A Research without a pre-drawn plan is like an ocean voyage without mariners compus.
2. The Research Design helps in providing direction our study.
3. It prevents welter in a study.
4. The use of Research Design prevents blind search.
5. A Research Design fixes clear cut boundaries to a research.
6. It makes the research systematic
7. It help us to meet unexpected events.

Contents of a Research Design:

Usually a Research Design consist of the following details
1. What is the study about?
2. Why is the study being made?
3. Where will the study be carried out?
4. What type of data is required?
5. Where can the required data be found?
6. What period of time will the studied include?
7. What will be the sample design?
8. What technique of data collection will be used?
9. How will the data we analyse?
10. In what style the report will be prepared?

By way of conclusion it can be said that research design must contain at least:

a) Statement of a problem
b) Procedure and techniques
c) Sampling frame
d) Processing and analysis of data

Types of Research Design

1. Exploratory Research Design (Formulative Research)

Exploratory Research studies are also termed as formulative research studies. Exploratory Research is preliminary study of an in familiar problem about which the researcher has little or no knowledge. It is similar to a doctor initial investigation of patient suffering from an in familiar malady for getting some clues for identifying.

2. Descriptive Research Design

Descriptive study is fact finding investigation with adequate interpretation. It is the

sample type of research. It is more specific than the exploratory study. As it has focus on particular aspects or dimensions of the problem studied. It is design to gather descriptive informations and provides information for formulating more sophisticated studies. Data are collected by using of appropriate methods.

3. Action Research

Action Research is a type of evaluation study. It is a concurrent evaluation study of an action programme launched for solving a problem. Action research is otherwise called Apply Research.

The following are the different phases in action research.
1. A base lane survey of the pre-action situation.
2. A feasibility study of the proposed action programme
3. Planning and launching the programme.
4. Concurrent evaluation of the programme
5. Making modifications and changes in the programme and its methods of implementations in the light of research finding.
6. Final Evaluation

SAMPLING

Need of sampling

Sometimes it is not feasible to study a whole group or an extremely large group. For example social work researcher may be interested in learning about the mentally challenged children, mentally ill, prison inmates, street children or some other large group of people. It would be difficult or rather impossible to study all members of the groups. Here comes the process called sampling, which allows to study a manageable number of people from the large group to device inferences that are likely to be applicable to all the people of the large group.

Another reason why we would study a sample is that the results of obtained from the sample are more precise and correct than the results obtained from the study of the whole group.

Cost involved in studying all units of a large group is yet another factor which suggest to study a small group of people.

Associated with cost there are certain other factors such as time available for the study. Above all, the point to be kept in mind is if we can get almost same result by studying a carefully selected small group of people, why should we study the large group at all.

Some Technical terms

1**) Population or Universe**

Population or universe is the aggregate of all units possessing certain specified characteristics on which the sample seeks to draw inferences.

2**) Frame** :- The frame describes the population interms of sampling units .It may be a geographical area. In essence a frame lists or maps elements of the universe.

3**) Census** :- Census denotes a total enumeration of individuals elements for units in defined population.

4**) Sample** : A Sample is composed of some fractions or part of the total number of elements or units in a defined population.

5) Design: The Designing means the method by which sample to chosen.

6) Unit: any population or universe should contain some specifications in terms of content units, extent and time for Eg: “A farmers household in a district in Punjab in 1975” There is a unit determination in a household and time destination of the population .
7) Parameter : Parameter is the value of a variable calculation from the population which is being studied.
8) Precision : Precision of is a sample is designated by the computation of slandered error.
9) Stratification: It makes which the segmentation of a sample. It is a number of data.

Characteristics of Good sample

a) Representativeness: A sample must be representative of the population. In measurement terms as well as in quality.
b) Accuracy: Accuracy is defined as the degree to which has to absent which sample.
c) Precision: The sample must yield précised estimate. Standard error should be minimized.
d) Size: A good sample must be adequate in size. It should not too small or too big.

Advantages of sampling

1. Sampling reduces time and cost of research studies.
2. Sampling saves labour
3. The quality of study is often better with sampling.
4. Sampling provides much quicker results.

Limitations

1. In the absence of a thorough knowledge, sampling methods the result option may be incorrect or misleading.
2. A complicated sampling may require may labour than a complete coverage.
3. A pure representation is impossible in most cases

Sampling Methods

Sampling methods may be classified into two types.
a) Probability or Random sampling
b) Non Probability or Non- Random sampling

Probability sampling is the following types:
a) Simple Random sampling
b) Stratified Random
c) Systematic Random
d) Random Sampling with probability proportional to size.
e) Cluster sampling
f) Area sampling

Non Probability sampling may be classified into:
a) Convenient sampling
b) Purposive sampling
c) Quota sampling
d) Snow-Ball sampling
Probability sampling Methods

A) Simple Random Sampling

1**. Lottery Method**: This is the simplest and most familiar procedure of random sampling. If a simple of ten students is to be taken out of a list of 50 students take 50 equals size in a global container and thoroughly shuffle them. Take to steps from the container one after another each time before drawing a stip shuffle the container. Thus we can take the decide sample from a population using Random methods.

2. Use of table of Random numbers

10 06 96 43 27 15
37 73 44 36 91 60
08 54 72 90 74 22
09 25 88 94 65 04
12 11 66 99 49 17

This method is developed by Fisher, Yates and Tippest (Tippet table) to select a Random sample out of a given frame. One should simply start to read number from the tableof Random Number.

We can select from the second column from the row we get sample 77,47,44,01 and 80 one thus the decide number of sample can be taken from a table of Random number

3. Use of Computer

If the population is very large and if computer facilities are available, a computer may be used for drawing a Random sample. The computer can be programmed to printout a series
of Random member as the research decides.

B) Stratified Sample

This is an improved type of random probability sampling. In this method the population is subdivided into homogenous groups or strata and from each strata from random sample is drawn. For eg. University students may be divided on the basis of discipline and each discipline group may again be divided into junior and seniors; The employees of a business firm may be divided into managers and non managers and each of this group may be subdivided into salary, grade wise strata.

C) Systematic sampling (**Fixed Interview Method**)

This method of sampling is an alternative to random selection. It consists of every nth item in the population after a random start with an item from 1 to N. Suppose it is decided to select a sample of 20 students from a list of 300 students, divide the population total of 300/20. The quotation is 50 (Fraction in the division is not taken) select a number at a random b/w 1 and 15 by using lottery method. Suppose the selected number is '9' then the student numbered '9', '24' (9+15), 39 (24+15), 54 (39+15) etc. are selected as sample.As the Interval between sample units is fixed, this method is also known as fixed interval method.

Non Probability Sampling Methods

a) Convenience Accidental Sampling

This is a non probability sampling. It means selecting sample units in a just 'Hit and Miss' fashion. Example interviewing people whom will happen to meet. For example, a teacher may select ten students in his class. This method is also known as accidental sampling because the respondents whom the researcher meets accidently are included in the sampling. It has some advantages.

a) It is the cheapest and simplest method of data.

b) It does not require a list of population

c) It does not require any statistical experience. It has some limitations also
a) It may not yield the desirable
b) It is not a reliable sample method

1. Purposive or Judgment Sampling
This method is deliberate selection of sampling units. It is also known as Judgment sampling. Here the chance depends upon the judgment of the researcher.
It has some merits
1. It is less costly and more convenient. It has demerit. It does not mensure proper representation.
2. It requires prior information about people.
2. Quota Sampling

This a form a convenience sampling involving selection of Quota groups such as ; sex, age, social class. Here each investigators may be given an assignment Quota requires and
sample is selected from Quota assigned to be.

3. Snow ball Sampling

REPORT WRITING

Report writing is the last activity of the research process. The Research report is a means for communicating our research experiences to others and adding them to pond of knowledge.

Meaning and purpose of a research report: A research report is a formal statement of the research process and its results it narrates the problem studied methods used for studying it and findings and conclusion of the study. It is a technical activity which requires considerable thought, effort, skill and penetration and overall approach to the problem data analysis as well as firm control over language and greater objectivity.

Functions of Research Reports
1. It serves as means for presenting the problem studied, methods and techniques used for collecting and analysing data the findings, conclusions and recommendation.
2. It serves as a basic reference material for future use
3. A report serves as a means for judging the quality of the completed research book.
4. It is a means for evaluating the researchers ability and competence to the research.
5. It provides systematic knowledge on problems and issues analysed.

Types of Report

1. Technical Report (Thesis)
This is a comprehensive full report of the research process and its outcome. It is primarily meant for academic community. It is a formal long report covering all the aspects of research process. It is also comprehensive and complete that the study can be duplicated by others.

2. Popular Report(Gist)
This type of Report is designed for an audience of executives and other non technical users. The format of this report is different from that of a technical report. The style may be more journalistic.

3. Interim Report
When there is a long time lag b/w data collection and presentation of a result. In case of sponsored project, the sponsor may be asked to present an Interim report. It contains what has been done so far.
4. Summary Report
A summary Report is a report of two or three pages.
5. Research abstract
This a short summary of the research report.
6. **Research Article** :- It is designed for publication in a professional Journal.

Format of Research Report

A) Preliminary Section
a) Title Page
b) Certificate
c) Declaration
d) Acknowledgement
e) Preface and forward
f) Table of contents
g) List of tables (if any)
h) List of figures (if any)
B) Main body of the Report
a) Introduction
1. Statement of the problem
2. Significance of the study
3. Purpose
4. Definition of important terms
5. Objectives
6. Hypothesis
7. Methodology
8. Period of the study
9. The study area
10. The data
11. Chapterisation
b) Review of literature
1. Critical analysis of the previous research
2. Brief statement of the present study
c) Design of the study
1. Procedure used
2. Methods of gathering data
3. Description of data
d) Presentation and Analysis of data
1. Text
2. Tables
3. Figures
e) Summary and conclusion
1. Brief re-statement of the study
2. Description of the procedure used
3. Main findings and conclusions
4. Recommendation for further research
f) Reference Section

1. Bibliography
2. Appendix
3. Index

TESTING OF HYPOTHESIS

Statistical Inference:

Statistical inference refers to the process of selecting and using a sample statistic to draw conclusions about the population parameter. Statistical inference deals with two types of problems.

They are:-

1. Testing of Hypothesis
2. Estimation

Hypothesis:

Hypothesis is a statement subject to verification. More precisely, it is a quantitative statement about a population, the validity of which remains to be tested. In other words, hypothesis is an assumption made about a population parameter.

Testing of Hypothesis:

Testing of hypothesis is a process of examining whether the hypothesis formulated by the researcher is valid or not. The main objective of hypothesis testing is whether to accept or reject the hypothesis.

Procedure for Testing of Hypothesis:

The various steps in testing of hypothesis involves the following :-

1. Setting Up a Hypothesis:

The first step in testing of hypothesis is to set p a hypothesis about population parameter. Normally, the researcher has to fix two types of hypothesis. They are null hypothesis and alternative hypothesis.

Null Hypothesis:-

Null hypothesis is the original hypothesis. It states that there is no significant difference between the sample and population regarding a particular matter under consideration. The word “null” means ‘invalid’ of ‘void’ or ‘amounting to nothing’. Null hypothesis is denoted by H_0. For example, suppose we want to test whether a medicine is ```effective in curing cancer. Hence, the null hypothesis will be stated as follows:-

H_0: The medicine is not effective in curing cancer (i.e., there is no significant difference between the given medicine and other medicines in curing cancer disease.)

Alternative Hypothesis:-

Any hypothesis other than null hypothesis is called alternative hypothesis. When a null hypothesis is rejected, we accept the other hypothesis, known as alternative hypothesis. Alternative hypothesis is denoted by H_1. In the above example, the alternative hypothesis may be stated as follows:-

H_1: The medicine is effective in curing cancer. (i.e., there is significant difference between the given medicine and other medicines in curing cancer disease.)

2. Set up a suitable level of significance:

After setting up the hypothesis, the researcher has to set up a suitable level of significance. The level of significance is the probability with which we may reject a null

hypothesis when it is true. For example, if level of significance is 5%, it means that in the long run, the researcher is rejecting true null hypothesis 5 times out of every 100 times. Level of significance is denoted by α (alpha).
α = Probability of rejecting H_0 when it is true.
Generally, the level of significance is fixed at 1% or 5%.
3. **Decide a test criterion**:
The third step in testing of hypothesis is to select an appropriate test criterion. Commonly used tests are z-test, t-test, X_2 – test, F-test, etc.
4. **Calculation of test statistic**:
The next step is to calculate the value of the test statistic using appropriate formula. The general from for computing the value of test statistic is:-
Value of Test statistic = Difference/Standard Error
5. **Making Decision**:
Finally, we may draw conclusions and take decisions. The decision may be either to accept or reject the null hypothesis.
If the calculated value is more than the table value, we reject the null hypothesis and accept the alternative hypothesis.
If the calculated value is less than the table value, we accept the null hypothesis.

Sampling Distribution
The distribution of all possible values which can be assumed by some statistic, computed from samples of the same size randomly drawn from the same population is called Sampling distribution of that statistic.

Standard Error (S.E)
Standard Error is the standard deviation of the sampling distribution of a statistic. Standard error plays a very important role in the large sample theory. The following are the
important uses of standard errors:-
1. Standard Error is used for testing a given hypothesis

2. S.E. gives an idea about the reliability of a sample, because the reciprocal of S.E. is a measure of reliability of the sample.
3. S.E. can be used to determine the confidence limits within which the population parameters are expected to lie.
Test Statistic
The decision to accept or to reject a null hypothesis is made on the basis of a statistic computed from the sample. Such a statistic is called the test statistic. There are different types of test statistics. All these test statistics can be classified into two groups. They are
a. Parametric Tests
b. Non-Parametric Tests
PARAMETRIC TESTS
The statistical tests based on the assumption that population or population parameter is normally distributed are called parametric tests. The important parametric tests are:-
1. z-test
2. t-test
3. F -test
Z-test:

Z-test is applied when the test statistic follows normal distribution. It was developed by Prof.R.A.Fisher. The following are the important uses of z-test:-
1. To test the population mean when the sample is large or when the population standard deviation is known.
2. To test the equality of two sample means when the samples are large or when the population standard deviation is known.
3. To test the population proportion.
4. To test the equality of two sample proportions.
5. To test the population standard deviation when the sample is large.
6. To test the equality of two sample standard deviations when the samples are large or when population standard deviations are known.
7. To test the equality of correlation coefficients.
Z-test is used in testing of hypothesis on the basis of some assumptions. The important assumptions in z-test are:-

1. Sampling distribution of test statistic is normal.
2. Sample statistics are close the population parameter and therefore, for finding standard error, sample statistics are used in place where population parameters are to be used.

T-test:

t-distribution was originated by W.S.Gosset in the early 1900.
t-test is applied when the test statistic follows t-distribution.

Uses of t-test are:-

1. To test the population mean when the sample is small and the population s.D.is unknown.
2. To test the equality of two sample means when the samples are small and population S.D.
is unknown.
3. To test the difference in values of two dependent samples.
4. To test the significance of correlation coefficients.

Aassumptions in t-test:-

1. The population from which the sample drawn is normal.
2. The sample observations are independent.
3. The population S.D.is known.
4. When the equality of two population means is tested, the samples are assumed to be independent and the population variance are assumed to be equal and unknown.

F-test:

F-test is used to determined whether two independent estimates of population variance significantly differ or to establish both have come from the same population. For carrying out the test of significance, we calculate a ration, called F-ratio. F-test is named in honour of the great statistician R.A.Fisher. It is also called Variance Ratio Test.
F-ratio is defined as follows:-
F = Greater Variance/Smaller Variance

Uses of F-distribution:-

1. To test the equality of variances of two populations.
2. To test the equality of means of three or more populations.
3. To test the linearity of regression

Assumptions of F-distribution:-

1. The values in each group are normally distributed.
2. The variance within each group should be equal for all groups.
3. The error (Variation of each value around its own group mean) should be independent for each value.

TYPES OF ERRORS IN TESTING OF HYPOTHESIS:

In any test of hypothesis, the decision is to accept or reject a null hypothesis. The four possibilities of the decision are:-

1. Accepting a null hypothesis when it is true.
2. Rejecting a null hypothesis when it is false.
3. Rejecting a null hypothesis when it is true.
4. Accepting a null hypothesis when it is false.

Out of the above 4 possibilities, 1 and 2 are correct, while 3 and 4 are errors. The error included in the above 3rd possibility is called type I error and that in the 4th possibility is called type II error.

Type I Error

The error committed by rejecting a null hypothesis when it is true, is called Type I error.

The probability of committing Type I error is denoted by α (alpha).

α = Prob. (Type I error)

= Prob. (Rejecting H_0 when it is true)

Type II Error

The error committed by accepting a null hypothesis when it is false is called Type II error.

The probability of committing Type II error is denoted by β (beta).

β = Prob. (Type II error)

β = Prob. (Accepting H_0 when it is false)