

BALAJI INSTITUTE OF I.T AND MANAGEMENT KADAPA

**BUSINESS RESEARCH METHODS
(21E00204)**

ICET CODE: BIMK

5 Units Material

ALSO DOWLOAD AT <http://www.bimkadapa.in/materials.html>



Name of the Faculty: **T.HIMMAT**

Units covered : **1 to 5 Units Material.**

E-Mail Id : himmatbimk@gmail.com

(21E00204) BUSINESS RESEARCH METHODS

Course Code	BUSINESS RESEARCH METHODS		L	T	P	C
21E00204			4	0	0	4
Semester			II			
Course Objectives:						
<ul style="list-style-type: none">To introduce business research, types and technology used in business research.To explain in detail on research process involved in business research.To discuss sources of data and instruments to collect dataTo provide knowledge on analysis and interpretation of outcome of the data in a scientific way.To provide knowledge on descriptive and inferential statistical analysis.To impart competence skills to undertake business research problem and carryout scientific research.						
*Standard Statistical tables shall be allowed in the examination						
Course Outcomes (CO): Student will be able to						
<ul style="list-style-type: none">Learn types of business research, technology used in business research in technological era.Identify research problem, appropriate research design and sample design for the problem, formulate hypothesis, testing process of hypothesis.Understand sources of data, instruments to collect data, analyse and interpretation of data.Prepare and present the research report effectively and efficiently.						
UNIT - I					Lecture Hrs:08	
Introduction to Business Research: Definition-Types of Business Research. Scientific Investigation, Technology and Business Research: Information needs of Business - Technologies used in Business Research: The Internet, E-mail, Browsers and Websites. Role of Business Research in ManagerialDecisions.						
UNIT - II					Lecture Hrs:12	
The Research Process: Problem Identification: Broad Problem Area-Preliminary Data Gathering. Literature Survey - Hypothesis Development - Statement of Hypothesis- Procedure for Testing of Hypothesis. The Research Design: Types of Research Designs: Exploratory, Descriptive, Experimental Designs and Case Study -Measurement of Variables- Operational Definitions and Scales-Nominal and Ordinal Scales- Rating Scales- Ranking Scales- Reliability and Validity - Sampling and Methods of sampling						
UNIT - III					Lecture Hrs:12	
Collection and Analysis of Data Sources of Data-Primary and Secondary Sources of Data - Data Collection Methods- Interviews: Structured Interviews and Unstructured Interviews- Observational Surveys: Questionnaire Construction: Organizing Questions- Structured and Unstructured Questionnaires – Guidelines for Construction of Questionnaires.						
UNIT - IV					Lecture Hrs:12	
Data Preparation and Analysis: Data preparation process, problems in preparation process - An overview of Descriptive, Associational and Inferential- Statistical Measures.						
UNIT - V					Lecture Hrs:12	
The Research Report: Research Reports-Components-The Title Page-Table of Contents-The Executive Summary-The Introductory Section-The Body of the Report-The Final Part of the Report-Acknowledgements – References-Appendix - Guidelines for Preparing a Good Research report - Oral Presentation.						
Textbooks:						
<ol style="list-style-type: none">Research Methodology – methods & Techniques, C.R. Kothari, Vishwa prakashan.Research Methods for Business–A Skill Building Approach, Uma Sekaran, John Wiley & Sons (Asia) Pvt. Ltd, Singapore.						

UNIT-I

INTRODUCTION TO BUSINESS RESEARCH

1. DEFINITION:-

1.1: MEANING AND DEFINITION OF BUSINESS RESEARCH:

- **Research:** - Refers to a search for Knowledge.
- **Research:** - Is a scientific and Systematic search for pertinent information on a specific topic.
- The term 'Research' refers to the systematic method consisting of defining the problem, formulating a hypothesis, collecting the facts or data, analyzing the facts and reaching certain conclusions either in the form of solutions or certain generalizations for some theoretical formulation.

BUSINESS RESEARCH:-

- Business Research refers to any type of researching done when starting or running any kind of business.
- Business Research is a systematic and objective process of gathering, recording and analyzing data to aid in making business decision.
- It helps in developing new tools, devices, concepts, theories etc., for a better study or understanding of unknown phenomenon.
- The inventions and discoveries are the results of research only.
- The purpose of business research is to discover answers to questions through the application of scientific procedures.

DEFINITION:-

“ Research is the manipulation of the things, concepts or symbols for the purpose of generalizing to extend, correct or verify knowledge, whether that knowledge aids in construction of theory or in the practice of an art”.

- D.Slesinger and M.Stephenson,

Business research is defined as, “ defining and redefine problems, formulating hypothesis or suggested solutions, collecting, organizing and evaluating data, making deductions and reaching conclusions”

- Clifford woody.

Research can be defined as “any organized inquiry designed and carried out to provide information for solving a problem”.

- E Mory

1.2.OBJECTIVES OF RESEARCH :-

The main aim of research is to find out the truth which is hidden and which has been not discovered as yet. The general objectives of research are given here as follows:

- a. To **gain familiarity** with a phenomenon or to achieve new sights into it.
- b. To **portray accurately** the characteristics of a particular individual, situation or a group.
- c. To **determine the frequency** with which something occurs or with which it is associated with something else.
- d. To **test a hypothesis** of a casual relationship between variables.

2. TYPES OF BUSINESS RESEARCH:-

The basic types of research are as follows:

Types of Business Research: - 1.Descriptive Vs Analytical

2. Applied Vs Fundamental

3. Quantitative Vs Qualitative

4. Conceptual Vs Empirical

5. Others

1) DESCRIPTIVE VS ANALYTICAL:

DESCRIPTIVE RESEARCH:

- Descriptive research includes surveys and fact finding enquiries of different kinds.
- The major purpose of descriptive research is description of the state of affairs as it's exists at present.
- The main characteristic 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 social science and business research, descriptive research often called as '**Ex Post facto research.**'

Example: Frequency of shopping, preferences of people or similar data.

ANALYTICAL RESEARCH:-

- In Analytical research, the researcher has to use the facts or information already available, and analyze these to make a critical evaluation of the material.

II) APPLIED VS FUNDAMENTAL:-**APPLIED RESEARCH:-**

- Applied research aims at finding a solution for an immediate problem facing a society or an industrial, business organization.
- The central aim of applied research is to discover a solution for some pressing practical problems.
- Research to identify social, economic, and political trends that may affect a particular institution, marketing research, and evaluation research are examples of applied research.

FUNDAMENTAL RESEARCH:-

- Gathering Knowledge for Knowledge's sake is termed fundamental research.
- It aims to extension of Knowledge; it may lead to either discovery of a new theory (or) refinement of an existing theory.
- Research concerning some natural phenomenon or relating to pure mathematics, and about human behavior are examples of fundamental research.

Example: - How did the universe begin.

- What are protons, neutrons, electrons composed of.

III) QUANTITATIVE VS QUALITATIVE:**QUANTITATIVE RESEARCH:-**

- Quantitative research is based on the quantitative measurements of some characteristics. It is applicable to phenomena that can be expressed in terms of quantities.
- It is data based and more objective and popular.
- The objective of this research is to develop and employee mathematical models, theories and hypothesis pertaining to phenomena.

Example: - Heights – measured in meters.

Weight - measured in kilograms.

QUALITATIVE RESEARCH:-

- Qualitative research is concerned with qualitative phenomenon, i.e., phenomena relating to or improving quality or kind.
- Qualitative research is especially important in the behavioral sciences where the aim is to discover the underlying motives of human behavior.
- Techniques in qualitative research include ;
 - Word association tests,
 - Sentence completion tests,
 - Story completion tests etc.,

IV) CONCEPTUAL VS EMPIRICAL:-**CONCEPTUAL RESEARCH:-**

- Conceptual research is related to some abstract ideas or theory.
- It is generally used by philosophers and thinkers to develop new concepts or to reinterpret existing ones.
- It requires using brain not the hands. Hence, it also called as ‘**analytical**’.

EMPIRICAL RESEARCH:-

- Empirical research relies (depends) on experience or observation alone, often without due regard for system and theory.
- It is data-based research, coming up with conclusions which are capable of being verified by observation or experiment.
- Hence, it is also called as experimental type of research.
- Evidence gathered through empirical or experimental studies are considered to the most powerful support possible for testing a given hypothesis.

V) OTHERS:-

- One-time Research**– Research is confined to single time-period.
- Longitudinal Research**– Research is carried on over several time periods.
- Field –Setting or Laboratory Research**– This type of research depends upon the environment in which it is to be carried out.
- Historical Research**– It utilizes historical sources like documents etc., to conduct research.
- Conclusion – Oriented Research:-** In this, a researcher is free to pick a problem, redesign the enquiry as he proceeds and is prepared to conceptualize as he wishes.

- f. **Decision – Oriented Research**:- Researcher in this type, not free to embark upon research according to his own inclination.

Eg:- operations research.

3) SCIENTIFIC INVESTIGATION:-

Scientific investigation is a *systematic way in which the scientists or researchers approach to answer the questions and communicate the result to the people around the world*. It involves questioning, hypothesis (proposed explanation made on the basis of invited evidence as starting point of further investigation), experimentation, analyzing it and conclusion. Scientific investigation is a quest to find the answer to a question using the scientific method.

Note:

- a) Scientific method is a systematic process that involves using measurable Observations to formulate, test or modify a hypothesis.
- b) People who engage in scientific investigation usually do so because they don't know or unsure of some aspects of the observation or because they want to confirm a hunch about the observation.

3.1.TYPES OF SCIENTIFIC INVESTIGATION:-

- Scientific Investigation is of mainly three types as follows ;

Types of Scientific Investigation: - i. Description Investigation

ii. Comparative Investigation

iii. Experimental Investigation

i. DESCRIPTION INVESTIGATION:-

- Description Investigation use careful observations and measurements to develop descriptive findings about as organism, substance, reaction, or natural process. Descriptive Investigations involve collecting qualitative and/or quantitative data to draw conclusions about a natural or man-made system (e.g., rock formation, animal behavior, cloud, electrical circuit).
- It includes both quantitative and/or qualitative data.
- Description investigation include following parts of scientific inquiry ;
 - a. Observations
 - b. Scientific research questions
 - c. Procedure
 - d. Data, graphs, analysis
 - e. Conclusion
 - f. Do not include hypothesis or predictions.

- This type of investigation can be identified with ;(ODLI)
 - a. Observe
 - b. Describe
 - c. List
 - d. Identify.

Example: - Observing cells under a microscope and diagramming what is seen.

ii) **COMPARATIVE INVESTIGATION:-**

- Comparative investigation involve collecting data on different organisms/ objects/ features, or collecting data under different conditions (e.g., times of year, temperatures, locations) to make comparisons.
- It involves looking for patterns or trends by comparing similarities and differences over time and under various circumstances.
- It includes following parts of scientific inquiry;
 - 1) Observations
 - 2) Scientific research question
 - 3) Hypothesis
 - 4) Procedure
 - 5) Variables (dependent and independent)
 - 6) Data, graphs, analysis
 - 7) Conclusion.
- Do not include a control group
- It can be identified with key words like ;
 - 1) Compare / contrast
 - 2) Similarity / difference
 - 3) Categorize

Example: -

- 1) Comparing two different types of leaves to see which one has a greater rate of transportation.
- 2) Comparing two employees to find out best level of performance.

iii) **EXPERIMENTAL INVESTIGATION:**

- This type of investigation involve a process in which a 'fair test' is designed and variables are actively manipulated, controlled, and measured an effort to gather evidence to support a casual relationship.
- It involves determining how a variable affects a control and experimental group.

- Scientific inquiry of this investigation includes ;
 - a) Observations
 - b) Scientific research question
 - c) Hypothesis
 - d) Procedure
 - e) Variables (depends and independent)
 - f) Control and experimental group
 - g) Data, graphs, analysis
 - h) Conclusion
- It can be identified with;
 - 1)Control and experimental groups
 - 2)Constants
 - 3)Testing the effects of

Example: - testing to see how the height of a ramp effects how for a marble will roll.

Investigation	Purpose	Includes a Hypothesis	Has Variables (independent & dependent)	Has a control and experimental group
Description	To draw conclusions	No, but does answer a question	NO	NO
Comparative	To determine relationship	Yes	Yes	NO
Experimental	To determine casual relationship	Yes	yes	Yes

3.2. CHARACTERISTICS OF SCIENTIFIC INVESTIGATION:-

Characteristics of Scientific investigation are as follows: -

- I) Verifiable
- II) Provisional
- III) Replicable
- IV) Empirical
- V) Deterministic
- VI) Rationalism
- VII) Ethical and ideological neutrality

I) VERIFIABLE:-

- Observations made through scientific method are to be verified again by using the senses to confirm or refute the previous findings.
- Such confirmations may have to be made by the same researcher or others.

II) PROVISIONAL:-

- Results obtained through the scientific method are provisional.
- These results are open to question and debate.
- If new data arise that contradicts a theory, that theory must be modified.

III) REPLICABLE:-

- Scientific experiments are replicable. Thus, if another person duplicates the experiment, he or she will get the same results.
- Scientists are supposed to publish enough of their method so that another person, with appropriate training, could replicate the results. This contrasts with methods that rely on experiences that are unique to particular individual.

IV) EMPIRICAL:-

- The Scientific method is empirical.
- Scientific method relies on direct observations of the world, and disdains (consider to be unworthy of one's consideration) hypothesis that run counter to observable fact.
- This contrasts with methods that rely on pure reason and with methods that rely on emotional or other subjective factors.

V) DETERMINISTIC:-

- Science is based on the assumption that all events have antecedent causes that are subject to identification and logical understanding.
- For the scientist, nothing “just happens” it happens for a reason.

- The Scientific researchers try to explain the emerging phenomenon by identifying its causes.

VI) RATIONALISM:-

- Science is fundamentally a rational activity, and the scientific explanation must make sense.
- Religion may rest on custom, or traditions, gambling on faith, but science must rest on logical reason.

VII) ETHICAL AND IDEOLOGICAL NEUTRALITY:-

- The conclusions drawn through interpretation of the results of data analysis should be objective.
- That means, such conclusions should be based on the facts of findings derived from actual data, and not on our own subjective or emotional values.

3.3. METHODS FOR CONDUCTING SCIENTIFIC INVESTIGATION:-

There are three basic methods for conducting scientific investigation and they are:-

- Methods :-**
- i) **Hypothetic – Deductive Method**
 - ii) **Action Research**
 - iii) **Case studies**

I. HYPOTHETIC – DEDUCTIVE METHOD :-

- Hypothetic –deductive method also known as “**H-D Method**”.
- It is a procedure for the construction of a scientific theory that will account for results obtained through direct observation and experimentation.
- The Hypothetic – deduction method is an approach to research that begins with a theory about how things work and derives hypothesis from it.
- It is a form of deductive reasoning in that it begins with general principles, assumptions, and ideas, and works from there to more particular statements.

II. ACTION RESEARCH :-

- The researcher begins with a problem that is already identified and gathers relevant data to provide a tentative problem solution.
- This solution is then implemented, with the knowledge that there may be unintended consequences following such implementation.

- The efforts are then evaluated, defined and diagnosed and the research continues on an ongoing basis until the problem is fully resolved.

III. CASE STUDIES :-

- Case studies involve in depth, contextual analysis of similar situations in the other organizations, where the nature and definition of the problem happens to be same as experienced in current situation.
- Case study, as a problem solving technique, is not often undertaken in organizations because such studies dealing with problems similar to the one experienced by a particular organization of a particular size and in particular type of setting are difficult to come by.

3.4. BENEFITS OF SCIENTIFIC INVESTIGATION:-

Benefits of Scientific Investigation include;

- i. Scientific investigation results into probabilistic predictions.
- ii. It relies on Empirical evidence.
- iii. It utilizes Relevant Concepts.
- iv. It is committed to objective considerations.
- v. Its Methodology made known to all concerns for critical scrutiny and for use in testing the conclusions through replication.
- vi. It aims at nothing but making only adequate and correct statements about population object.
- vii. Scientific investigation is **free from personal bias** or prejudice.
- viii. Scientific method, a method to ascertain a demonstratable quality of a phenomenon capable of being verified.

3.5. LIMITATIONS OF SCIENTIFIC INVESTIGATION:-

Limitations of Scientific Investigation are given here under;

- a) It is extremely dependent on researchers.
 - Peer – review process doesn't guarantee quality, especially the quality of the data.
 - Too much trust in authors.
 - Duplication, plagiarism, data manipulation, negligence, and other misconduct in science are present.
 - Slow process of gathering and dissemination results.
 - It is expensive and time consuming.
- b) The benefits do not extend to everyone, especially people in poor countries.
- c) Outreach has been inefficient.

- Inefficient communication strategy.
- Few researchers effectively engage in educational and outreach programs.
- Perception from society shows concerns about research limits and practices of science.

4. TECHNOLOGY AND BUSINESS RESEARCH:

Business is an organization or a firm involved in the trade of goods, services or both to the customers. Most of the businesses are privately owned. Now, most business is conducted over computers or communication devices. Technology has changed the way business is done in today's world. Companies are reluctant to deploy new technologies. Now, it is impossible to be in business without considering the issues of technology.

Technology refers to all hardware, software, and other communication aids that achieve the desired business results. New online applications are increasingly common in everyday use, such as wikis, face book, twitter, flick, you tube etc., are also beginning to be used in research. There are various technologies that facilitate managers that facility in decision making, particularly as they relate to business research.

For example:

If we have to send out a professional business letter, word processing software would be the technology employed for the purpose.

5. INFORMATION NEEDS OF BUSINESS:-

Data, information and knowledge management managers make a distinction between data and information. **All business decisions are based upon information obtained from evaluation of data.** Information system is a foundation for conducting business today. In many businesses, survival and ability to achieve strategic business goals is difficult without extensive use of information technology.

FOLLOWING ARE THE REASONS WHY BUSINESS NEEDS INFORMATION;

I. OPERATIONAL EXCELLENCE:-

- Business improves the efficiency of their operations in order to achieve high profitability.
- Information systems are important tools available to managers for achieving higher levels of efficiency and productivity in business operation.

E.g. Wal-Mart that uses a Retail Link system, which digitally links its suppliers to every one of Wal-Mart's stores.

II. COMPETITIVE ADVANTAGES:-

- When firms achieve one or more of these business objectives, (new products & services, business models, customer/ supplier intimacy and improved decision – making) chances are they already achieved a competitive advantage.
- Doing things better than our competitors, charging less for superior products, and responding to consumers and suppliers in real time all add up to higher sales, high profits.

E.g. Toyota production system focuses on organizing work to eliminate waste, making Continuous improvements.

III. NEW PRODUCTS, SERVICES AND BUSINESS MODELS:-

- Information is a major tool for firms to create new products & services, and also an entirely new business model.

E.g. Apple Inc., transformed an old business model based on its iPod technology platform that include iPod, the iTunes music service, and the iPhone.

IV. DAY TO DAY SURVIVAL:-

- Business firms invest in information system and technology because they are necessities of doing business.

Eg:- Citibank introduced first ATM to attract customers through higher service levels and its competitors rushed to provide ATM to their customers to keep up with Citibank.

V) IMPROVED DECISION-MAKING:-

- Many managers operate in an information bank, never, having the right information at the right time to make an informed decision.
- Information system made it possible for managers to use real time data from market place when making decision.

VI) CUSTOMER / SUPPLIER'S INTIMACY:-

- When a business serves its customers well, the customers generally respond by returning and purchasing more. This raises revenue and profits.

- The more a business engages its suppliers, the better the suppliers can provide virtual inputs.

E.g:- Mandarin oriental in Manhattan use computers to keep track of guest's preferences, such as their preferred room temperature, check-in-time, television programs.

6. TECHNOLOGIES USED IN BUSINESS RESEARCH:-

Following are the common technologies used in research are;

7. INTERNET:-

- Companies seeking to remain competitive in international markets must constantly re-engineer in the pursuit of innovation.
- To create viable new products and services, companies need to know more than they do.
- For example, the Internet can help companies conduct market research in two ways
- First, it enables companies to **strengthen their own knowledge** bases by incorporating insights from widely varying perspectives and coordinating how that insight can be crafted into viable business strategies.
- Second, the Net enables companies to **pay attention to their markets** at a level of detail never before possible.

There are a number of ways the Internet can be used to conduct research

- i. Read discussions from the appropriate user groups. If you can't find the answer, post a question.
- ii. Many website have libraries. Check these out.
- iii. User groups and libraries are useful in identifying the "experts" in each field. Send them an e-mail asking for their assistance. Be reasonable in your request.
- iv. Commercial services have on-line magazines and databases that can be searched. There is often an additional cost associated with these, but may well be worth it.

HERE ARE 10 TIPS ON USING THE INTERNET AS A RESEARCH TOOL:**i. DON'T FOCUS ON A SINGLE INFORMATION SOURCE:**

- The information is never complete.
- Cross-check the information from as many sources on the Net as possible.

ii. DON'T BE LAZY:

- The send-a-lot-of-e-mail-messages approach to information gathering gets you poor-quality information and a lot of angry correspondents.
- So do your homework and ask specific questions of qualified people.

iii. USE THE RIGHT TOOL FOR THE JOB:

- This means you've got to use newsgroups, discussion forums, mailing list archives, websites and on-line databases.

iv. KEEP YOUR OWN DATABASES:

- Web browsers let you add bookmarks when you find a particularly useful spot.
- Build a database with pointers to websites, mailing lists and other useful information.

v. CHANGE YOUR PERSPECTIVE AS YOU SEARCH:

- Be flexible in approach your problems and be willing to change directions to accommodate different viewpoints.

vi. IF YOU NEED TO ASK FOR HELP, ASK THE RIGHT PERSON:

- Find out who the important people in are in a field in which you have questions. Then send them an e-mail, write or call them.
- Don't assume all people on the Internet have the answers.

vii. GIVE IT SOME TIME:

- If you need an answer by tomorrow, go to the library.
- For any serious research effort, plan to spend at least two weeks, preferably a month.
- There is nothing ruder than going into a new mailing list and demanding a response ASAP.

Viii. BE CRITICAL:

- The Internet is full of misinformation.
- Do not accept any information as fact until you verify it, preferably from non-Internet sources.
- This is particularly true if you're going to use the data for something important.

Ix. BE GRATEFUL:

- If someone does provide data, advice or assistance, be sure to send them an e-mail thank you.
- They will be more willing to help you in the future.

x. GIVEUP IF NECESSARY:

- Everything you ever wanted to know is not on the Internet.
- If you make a good effort to find something and can't, give up and try other sources.

8. E-MAIL:-

- E-mail is the most wide spread of communication function.
- It is a method of creating, transmitting or storing primary text-based human communication with digital communication systems.
- It consists of part separated by '@' symbol.
- It is very simple to understand.
- It solves basic problems of communication.
- E-mail is the principal means of communication between employees, suppliers and customers.
- Message can be retrieved by the concept of the receipt; users can edit, sort, classify and forward the message.

8.1. SIGNIFICANCE OF E-MAIL:-**Significance of E-mail**

Cost effective
Reduce paper wastage
Message storage facility
High speed
Easy to use
Time saving

A) Cost effective:-

- The message sent through e-mail costs very low than other mediums.
- It is very cheaper than courier or fax or telegram.
- A courier may cost us hundred rupees or a fax can cost us the same price but same message can be sent through e-mail at low cost.

b) Reduced paper wastage:-

- A lot of paper work is saved which also reduces file maintenance.

c) Message Storage Facility:-

- It provides also the storage facility for future purpose.

d) High Speed:-

- E-mail can be sent very fast that is within seconds to almost places of world.
- And similarly messages sent by others can also be received instantaneously.

e) Easy to use:-

- It is easy to use e-mail tool on the internet.
- One doesn't have to go post office for buying envelopes or postage stamps.

f) Time saving:-

- It saves a lot of time.
- One does not have to use papers to write multiple copies of the letters.
- Just write letter on the appropriate place using the keyboard and then click ok to send it.

9. BROWSERS:-

- Browser is a software application which enables a user to display and interact with text, images, music etc.,
- The word 'browser' seems to have originated prior to the web as a general term or user interfaces that let you browse (navigate through and read) text files online.
- The information typically located on a web page at a website on the World Wide Web (or) a local area network.
- Web browsers come in many different styles.

There are several types of browsers which include the following:-**a. Microsoft internet Explorer:-**

- Microsoft internet explorer is a series of graphical web browsers developed by Microsoft and included as part of Microsoft windows line of operating systems.

b. Google chrome:-

- Google chrome is a web browsers developed by Google.
- Google chrome aims to be secure, fast, simple and stable.

c. Mozilla Firefox:-

- Mozilla Firefox is a free and open source web browsers developed from Mozilla application suite and managed by Mozilla Corporation.
- Features include tabbed browsing, spell checking, live bookmarking, a downloaded manager, location-active, browsing based exclusively on a Google service.

10. WEBSITES:-

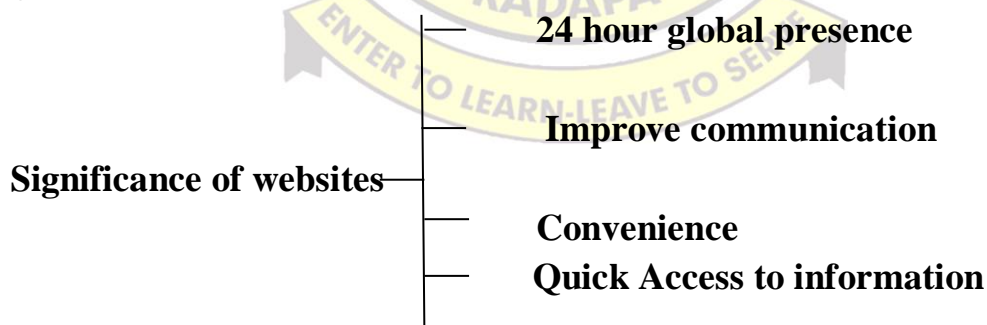
- Websites is a collection of related web pages, images, videos that are hosted on one web server, usually accessible via the internet.
- All publically accessible websites are seen collecting, consulting the “world wide web “.
- Some of most comprehensive and widely used websites like google.com, yahoo-http://www.yahoo.com.
- A website consists of one or more web pages with related information about a particular topic.

E.g:- An organization website might include pages about its mission, careers etc.,

- Internet provides a very powerful and flexible tool that can increase efficiency and productivity using website.

10.1. SIGNIFICANCE OF WEBSITES:

Significance of website includes:

**i. 24 HOUR GLOBAL PRESENCE:-**

- The websites are always active, and researchers around the world can look up information and conduct research at their convenience.

ii. IMPROVE COMMUNICATION WITH OTHER RESEARCHERS:-

- A website enhances communication between researchers and website owners.
- These owners may be the concerned individuals required for data collection.

iii. CONVENIENCE:-

- Researchers can have access to different types of information without performing any difficult task like filed work.
- It provides a convenient channel for data collection.

iv. QUICK ACCESS TO INFORMATION:-

- Websites are known for quick access to large amount of information.
- These sites contain historic records and information in several fields.
- These provide relevant data for research studies.

11. ROLE OF BUSINESS RESEARCH IN MANAGERIAL DECISION MAKING:

- The role of research has greatly increased in the field of business and economy as a whole.
- The study of research methods provide individual with the knowledge and skills they need to solve the problems and meet the challenges of today's modern pace of development.
- Three factors stimulate the interest in a research to decision making.
 - The manager's increased need for more and better information.
 - The availability of improved techniques and tools to meet this need.
 - The resulting information overload.
- Before undertaking any research it is essential to delimit the primary objectives of the project and then to define the methodology in as much detail as possible. This shall help the researcher to utilize the research for decision- making.

11.1. COMMON USES OF RESEARCH IN DECISION-MAKING:-

Following are the areas in which research methodology can help in better decision-making;

IMPORTANCE OF RESEARCH IN DECISION-MAKING:

- i. Marketing Research
- ii. Government policies and economic system
- iii. Solving various operational and planning problems
- iv. Social relationship

i. MARKETING RESEARCH:-

- Product research: -Assessment of suitability of goods with respect to design and price.
- Competitive positive and trends research.
- Sales research: Analysis of sales records.
- New product launching and product positioning.
- Advertising and promotion research:- testing and evaluating, advertising and promotion.
- Size of market (quantitative) : market potential, total sales quota, quota for individuals, concentration of sales and advertising efforts, appraisal of efficiency etc.,

ii. GOVERNMENT POLICIES AND ECONOMIC SYSTEM:-

- Research helps a decision-maker in number of ways;
E.g:- it can help in examining the consequences of each alternative and help in bringing out the effect on economic conditions.
- Other examples such as;
- Problems of big and small industries due to upgradation of technology and its impact on labor and supervisory deployment.
- Effects of government's liberal policy.
- WTO (world trade org. and its gaudiness).
- ISO 9000/14000 standards and their impact etc.,

iii. SOLVING VARIOUS OPERATIONAL AND PLANNING PROBLEMS:-

- Various types of researches, e.g., market research, operations research and motivational research, when combined together, help in solving various complex problems of business and industry in number of ways.
- These technologies help in replacing intuitive business decisions by more logical and scientific decisions.

iv. SOCIAL RESEARCH:-

- Research in social sciences is concerned with both knowledge for self and knowledge for helping in solving immediate problems of human relations.

- It is a sort of formal training which help an individuals in better way etc.,
- It helps professionals to earn their livelihood.
- It helps students to know how to write and report various findings.
- It helps in developing new styles for creative work.
- It may help researchers, in general, to generalize new theories.

IMPORTANT QUESTIONS:

UNIT-1:

1. Discuss the role of business research in managerial decisions.
2. Discuss the types of technologies used in business research.
3. Define research. Explain the types of business research with examples.

CASESTUDY:

UNIT-1:

WORKFORCE TURNOVER

Why do business organizations need research? A company faced with the problem of rate of workforce turnover wants you to conduct a research on this problem.

QUESTION

PREPARE A BLUEPRINT ON THE RESEARCH PROCESS YOU WILL FOLLOW.

ONE POSSIBLE SOLUTION

1. ESTIMATING EXPENSES: Business, especially new ones often cost more than their owners anticipate. Nonetheless **research is needed to estimate at least a year's worth of business expenses to create a budget.**

2. PRICE DETERMINATION: Research helps businesses get a handle on pricing and prevent them from pushing themselves out of the market by setting prices too high.

3. MANAGING COSTS: Be it a capital investment or the day to day expenses, it is critical to forecast how much one is going to spend on the business. Just planning the costs without forecasting the expenses will lead to a chaotic

situation in the business. One of the key needs of business research methods is **to evaluate the costs involved in conducting a business.**

4. ASSISTING MANAGERS IN DECISION MAKING: Business research is necessary **to assist managers in the decision making process so they have a clear path to follow and all the steps run smoothly in the research.** It formulates or organizes ideas and tells the reader what one wants to do why he is doing it what he wants to achieve and how he plans to do it.

5. EVALUATING MARKET TRENDS: The business research methods such as questionnaires, surveys and focus groups are widely used by business to gain insights on evaluating the market trends. Through business research models, **one can check if the market is huge enough to earn revenue by selling the company product or by offering its services.**

6. ACHIEVING COMPETITIVE ADVANTAGE: There are **consumer research methods that help to analyze how the competition is performing.** Social media is ruling the marketing world now. By analyzing the marketing techniques of successful competitions and by adopting the best practices through business research methods, organizations can achieve a competitive advantage.

BLUEPRINT ON THE RESEARCH PROCESS

1. DEFINING RESEARCH PROBLEM: The first step in research problem. It is most important stage in applied research as poorly defined problems will not yield useful results. After a problem has been chosen the next task is to formulate it precisely. In this case the research problem would be reasons for increasing rate of workforce turnover.

2. EXTENSIVE LITERATURE SURVEY: Once the problem is formulated, the next step is **to write down a brief summary.** For this purpose the abstracting and indexing journals published or unpublished bibliographies are the first place to go to. In this case the researcher would go for available literatures on managing the increased workforce turnover rate in organization.

3. FORMULATION OF HYPOTHESIS: Now the researcher should state in clear terms the working hypothesis. In this case of increasing rate for workforce turnover the reasons could be low employee salary, poor working conditions and improper timely increment.

4. PREPARING THE RESEARCH DESIGN: The researcher should **specify the approach he intends to use with respect to the proposed study**. In this case the researcher should be casual research design as it seeks to find out the cause effect relationship of the phenomenon under study.

5. DETERMINING SAMPLE DESIGN: The research must decide the way of selecting a sample or the sample design. **A sample design is a define plan determined before any data is actually collected for obtaining a sample from a given population**. In this case the researcher may use simple random sampling as this is the simplest and most population technique of sampling and in it each unit of the populating has equal chance of being included in the sample.

6. COLLECTING THE DATA: The next step is to determine the sources of data to be used. In this case researcher should **use primary data through questionnaires** as it the one which is collected by the investigator himself for the purpose of a specific inquiry or study.

7. EXECUTION OF THE PROJECT: The research should see that project is executed in a systematic manner and in time. **Occasional checks should be made to ensure that the interviewers are doing their assigned job sincerely and efficiently**.

8. ANALYSIS OF DATA: After the data have been collected the researcher turns to the task of analyzing them. The analysis of data requires a number of closely related operations such as establishment of categories, the application of these categories to raw data through coding, tabulation and then drawing statistical inference.

9. TESTING OF HYPOTHESIS: After analyzing the data the researcher has to test the hypothesis, various tests such as chi-square test, t-test, f-test, have been developed by statisticians for the purpose.

10. GENERATION AND INTERPRETATION: If a hypothesis is tested and upheld several times it may be possible for the researcher to arrive at **generalization i.e. to build a theory**. If the researcher had no hypothesis to start with he might seek to explain his findings on the basis of some theory. It is known as interpretation. In this case the researcher would arrive at the conclusion that which factors are responds for workforce turnover.

11. PREPARATION OF THE REPORT OR THE THESIS: Although report writing needs some skill which can be developed with practice, the researcher should follow the main principles of writing a report. In this case the researcher would document the findings and present the report in front of management so that they can apply the findings.

PREPARED BY;

HIMMAT T

ASSOCIATE PROFESSOR, MBA.

BALAJI INSTITUTE OF IT & MANAGEMENT.

KADAPA.



(21E00204) BUSINESS RESEARCH METHODS

Course Code	BUSINESS RESEARCH METHODS	L	T	P	C
21E00204		4	0	0	4
Semester		II			
Course Objectives:					
<ul style="list-style-type: none">To introduce business research, types and technology used in business research.To explain in detail on research process involved in business research.To discuss sources of data and instruments to collect dataTo provide knowledge on analysis and interpretation of outcome of the data in a scientific way.To provide knowledge on descriptive and inferential statistical analysis.To impart competence skills to undertake business research problem and carryout scientific research.					
*Standard Statistical tables shall be allowed in the examination					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none">Learn types of business research, technology used in business research in technological era.Identify research problem, appropriate research design and sample design for the problem, formulate hypothesis, testing process of hypothesis.Understand sources of data, instruments to collect data, analyse and interpretation of data.Prepare and present the research report effectively and efficiently.					
UNIT - I		Lecture Hrs:08			
Introduction to Business Research: Definition-Types of Business Research. Scientific Investigation, Technology and Business Research: Information needs of Business - Technologies used in Business Research: The Internet, E-mail, Browsers and Websites. Role of Business Research in Managerial Decisions.					
UNIT - II		Lecture Hrs:12			
The Research Process: Problem Identification: Broad Problem Area-Preliminary Data Gathering. Literature Survey - Hypothesis Development - Statement of Hypothesis- Procedure for Testing of Hypothesis. The Research Design: Types of Research Designs: Exploratory, Descriptive, Experimental Designs and Case Study -Measurement of Variables- Operational Definitions and Scales-Nominal and Ordinal Scales- Rating Scales- Ranking Scales- Reliability and Validity - Sampling and Methods of sampling					
UNIT - III		Lecture Hrs:12			
Collection and Analysis of Data Sources of Data-Primary and Secondary Sources of Data - Data Collection Methods- Interviews: Structured Interviews and Unstructured Interviews- Observational Surveys: Questionnaire Construction: Organizing Questions- Structured and Unstructured Questionnaires – Guidelines for Construction of Questionnaires.					
UNIT - IV		Lecture Hrs:12			
Data Preparation and Analysis: Data preparation process, problems in preparation process - An overview of Descriptive, Associational and Inferential- Statistical Measures.					
UNIT - V		Lecture Hrs:12			
The Research Report: Research Reports-Components-The Title Page-Table of Contents-The Executive Summary-The Introductory Section-The Body of the Report-The Final Part of the Report-Acknowledgements – References-Appendix - Guidelines for Preparing a Good Research report - Oral Presentation.					
Textbooks:					
<ol style="list-style-type: none">Research Methodology – methods & Techniques, C.R. Kothari, Vishwa prakashan.Research Methods for Business–A Skill Building Approach, Uma Sekaran, John Wiley & Sons (Asia) Pvt. Ltd, Singapore.					

UNIT-2

THE RESEARCH PROCESS

1. PROBLEM IDENTIFICATION:

1.1. RESEARCH PROBLEM:

A Research problem, in general refers to some difficulty which a researcher experiences in the context of either a theoretical or practical situation and wants to obtain a solution for the same. It is believed that selection of a good research problem is a discovery in itself. A research problem is a question that a researcher wants to answer or a problem that researcher wants to solve. Identification and formulation of the research problem is the first step in research process.

The components of a research problem as under;

- a. There must be an individual or a group which has some difficulty or the problem.
- b. There must be some objective(s) to be attained at. If one wants nothing, one cannot have a problem.
- c. There must be alternative means for obtaining the objective(s) one wishes to attain.
- d. There must remain some doubt in the mind of a researcher with regard to the selection of the alternatives.
- e. There must be some environment(s) to which the difficulty pertains.
 - There are number of factors which may result in making the problem complicated.

FOR INSTANCE: The environment may change affecting the efficiencies of the courses of acting or the values of the outcomes; the large number of alternative courses of action and other factors.

DEFINITION:-

“A problem is an interrogative sentence or statement that asks what relation exists between two or more variables. The answer to question with provides what is having sought in the research”.

– **Ker Linger.**

“A problem is that situation if we modified will bring solution in the difficulty”.

- **K.Person.**

“A problem is a situation for which we have no readymade solution.

- **R.S.Woodworth.**

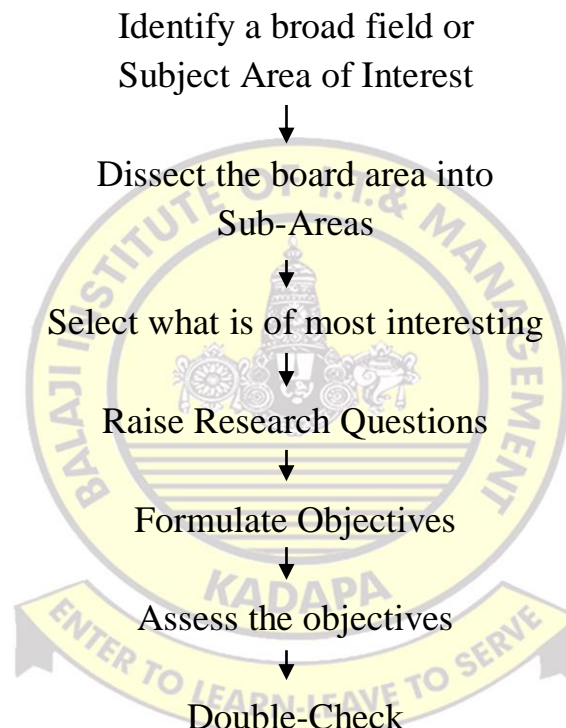
“A problem represents the information's acquired by a researcher and seeks solution for it”.

- **John Dewey.**

1.2 STEPS IN IDENTIFICATION OF RESEARCH PROBLEMS:-

PROBLEM IDENTIFICATION PROCESS:-

Process of problem identification consists of a number of steps which are as follows;



i. IDENTIFY A BROAD FIELD OR SUBJECT AREA OF INTEREST:-

- Here, the researcher should ask himself at what really interests him as a professional. This will help him to find an interesting topic.
- For example, if a person studies a social work, he would be inclined to work in the area of youth welfare, refugees or domestic violence.
- He might take to research in one of these areas.

ii. DISSECT THE BOARD AREA INTO SUB-AREAS:

- At the onset, the researcher will realize that all the board areas have many aspects.
- So, he can select any subject area from field such as community health or consumer research and go through this dissection process.
- In preparing this list of sub-areas he should also consult others who have some knowledge of areas.

iii. SELECT WHAT IS MOST INTERESTING:-

- Out of the list of sub-areas, the researcher should select issues or sub-areas about which he is passionate.
- This is because his interest should be the most important determinant for selection.
- One way to decide what interests him the most is to start with the process of elimination.
- The researcher should go through the list and delete all those sub-areas in which he is not interested.

iv. RAISE RESEARCH QUESTION:-

- At this step, the researcher asks himself, 'what is it that I want to find out about in this sub-area?'
- Within his chosen sub-area, the researcher first lists whatever questions he wants to find answers to.

v. FORMULATE OBJECTIVES:-

- In this step, the researcher formulates his main objectives and his sub-objectives.
- The objectives grow out research questions.
- The main difference between objectives and research questions is the way in which they are written.
- Research questions are obviously those questions.
- Objectives transform these questions into behaviors aims by using action-oriented words such as 'to find' 'to determined', 'to ascertain', and 'to examine'.

vi. ASSESS THE OBJECTIVES:-

- Now the researcher should examine the objectives to ascertain the feasibility of achieving them through the research.
- He should consider them in the light of time, resources (financial and human) and technical expertise at the disposal.

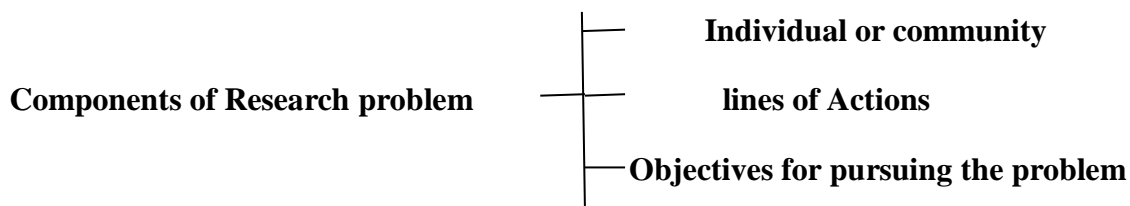
vii. DOUBLE-CHECK:-

- Here, the researcher should go back and give final consideration to whether or not he is interested in the study.
- He should ask himself,

- ‘Am I Really enthusiastic about this study’.
- ‘Does I Really have enough resources to undertake it’?
- Once the researcher answers these questions thought-fully and realistically, if the answer in one of them is ‘no’, he should re-assess the objectives.

1.3: COMPONENTS OF RESEARCH PROBLEM:-

The components of research problem include the following;



I. INDIVIDUAL OR COMMUNITY:-

- An individual or community or an institution to which the problem could be attributed is based on certain geographical area.
- For example: - teacher/ parental factors affecting student’s performance in private management institutes in Noida.
- In this study, there are individuals (parents, teachers, students), there are institutions (private secondary schools), and there is area of study (Noida).

II. LINE OF ACTIONS:-

- There must be at least two lines of action to be taken to attain the objective.
- **FOR EXAMPLE:** - poor academic performance may be attributed to negative teacher and parental factors. Thus altering negative teacher factors and parental factors become the lines of action to be pursued.

III. OBJECTIVES FOR PURSUING THE PROBLEM:-

- There must be some objectives pursuing the problem, otherwise it would be repugnant to reason and common understanding to undertake the research.
- For example: to find out teacher/parental factors affecting the student’s academic performance in management institutes in Noida city.

2. BROAD PROBLEM AREA-PRELIMINARY DATA GATHERING:-

2.1: BROAD PROBLEM AREA:

Broad problem area refers to the entire situation where one sees a possible need for research and problem solving. The process begins with a researcher selecting a topic a general area of study or issue. A topic appears to be too broad for conducting research. Problem currently existing in organizational settings that need to be solved. Areas that a manager believes need to be improve in the organizations

Identification of the broad problem area through the process of observing and focusing on the situation is called broad problem areas. A conceptual or theoretical issues that needs to be tightened up [for the basic researcher to understand certain phenomena. Examples of each type can be provided taking the issue of (that needs to be tightened up for the basic) harassment which is a problem at some organizations has to handle at some point of time.

2.2. EXAMPLES/TYPES OF BROAD PROBLEM AREA:

Examples of broad problem area includes the following,

- a) Broad problem areas that a manager could observe at the workplace.
- b) Training programmes are not as effective as anticipated.
- c) The sales volume of a product is not picking up.
- d) Monitory group members are not advancing in their carriers.
- e) The daily balancing of accounting ledgers is becoming a continuing concern.
- f) The introduction of flexible work hours has created more problems than it has solved in many companies.
- g) Inventory control is not effective.

2.3. PRELIMINARY DATA GATHERING:

- Preliminary data gathering may be considered as part of the exploratory research.
- It is a critical step in the research process because it is the link between theory and practice.
- Such sources provide secondary data which becomes part of the background information like about the origination group of people etc.

- Company policies, procedures and roles can be obtained from the organizations records and documents.
- Data gathered through such existing sources are called secondary data.
- Some secondary sources of data are statistical bulletins, government publications information published or unpublished available from either within or outside the organization.
- Library records data available from previous research online data website and the internet.

3. LITERATURE SURVEY:

3.1. MEANING OF LITERATURE SURVEY:

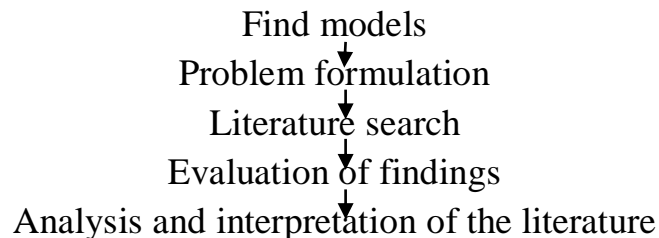
Literature survey is the written and systematic summary of the research which is conducted on a particular topic. It is a summary and synopsis of a particular area of research. It expands upon the reasons behind selection a particular research questions. It also shows the gap between the research curiosity and knowledge of the subject area. It can be just a simple summarize of source but it usually has an organizational pattern and combines both summary and synthesis.

Literature survey reduces the risk of reinventing the wheel confirms that the problem is perceived as relevant and significant. It helps in the development of the theoretical framework and hypothesis for testing. The documentation of relevant studies relating to the author and the year of the study is called literature review/literature survey.

The first step in this process involves identifying the various published and up-published materials that are available to the topics of interest and gaining access to these. The second step is gathering the relevant information either by going through necessary materials' in a library or getting access to online source. The third step is writing up the literature reviews.

3.2. PROCESS OF LITERATURE SURVEY:

Process of literature survey includes the following steps,



I. FIND MODELS:

- The first and foremost step in literature survey is to look for other literature reviews in that discipline and read them to get an idea of themes.
- One can do a database search to find models put the words literature review along with keywords to retrieve reference to articles of this type.

II. PROBLEM FORMULATION:

- One should try to construct a working statement that will form the basis of literature review.
- The statement does not have to argue for position of an opinion.

III. LITERATURE SEARCH:

- The literature search will help the researchers to identify scope and key issues. Efficient searching will help him to identify which authors are interested in his specialism.
- Trace authors who are prominent in that subject.
- Include the authors who would contradict ideas.

IV. EVALUATION OF FINDINGS:

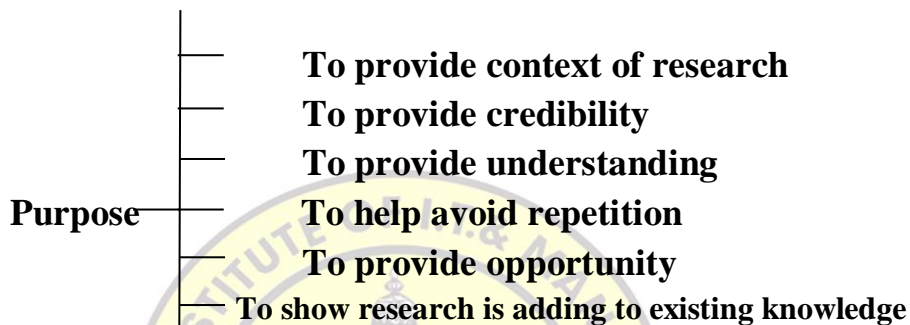
- One must develop a good understanding of the research literature.
- Understanding the literature requires the researchers to read, re-read and assimilate complex ideas.
- Different or badly written articles will be easier to understand if he reads them at last when he has gained familiarity with subject.
- The easiest way is to scan the work using abstract and introductions as guides.

V. ANALYSIS AND INTERPRETATION OF LITERATURE:

- After having an idea of the main ideas of each article final step is to identify the precise methods used and theories tested.
- When researcher compares work of a number of researchers an in-depth understanding of their work is needed.
- A close reading may reveal differences in theoretical outlook.

3.3. PURPOSE OF LITERATURE SURVEY:

The purpose of literature survey include,



- I. TO PROVIDE CONTEXT OF RESEARCH: Literature survey shows where the research fits into the existing body of knowledge
- II. TO PROVIDE CREDIBILITY: literature survey is the part of research where researcher will be given an opportunity to share their research.
- III. TO PROVIDE UNDERSTANDING: without literature survey one cannot acquire understanding about the topic of what has already been done how it has been researched and what the key issues are.
- IV. TO AVOID REPETITION: it ensures the research has not been done before or there are gaps in previous researchers.
- V. TO PROVIDE OPPORTUNITY:
 - Literature survey enables the researcher to learn from previous theory on the subject it illustrates how the subject has been studied previously.
 - It highlights flaws in previous research and outlines gaps in previous research.

VI. TO SHOW RESEARCH IS ADDING TO EXISTING KNOWLEDGE:

- Literature survey shows that the work is adding to the understanding and knowledge of the field.

4. HYPOTHESIS DEVELOPMENT:

4.1. MEANING OF HYPOTHESIS:

- A hypothesis is a proposed explanation for a phenomenon observation or scientific problem.
- The term hypothesis derived from Greek word **HYPOTITHENAI** means **to put under or to suppose**.
- Hypothesis is an explanation for observation phenomenon or scientific problem that can be tested by further observation investigation and or experimentation.
- It refers to the process of selecting and using a sample statistics to draw an inference about a population parameter based on a subject of it the sample draws from the population.

DEFINITION:

A hypothesis in statistics is simply a quantitative statement about a population.

-PROF. MORRIS HAMBURG

4.2. HYPOTHESIS DEVELOPMENT:

- Hypotheses are guesses but these guesses are not merely accidents.
- Collection of factual information alone does not led to successful formulation of hypotheses.
- Hypotheses are the products of considerable speculation and imaginative guess work.
- They are based partly on known facts and explanations and partly conceptual.
- To develop research hypothesis the prime task is to identify the potential variables of the study after which relationship statement is developed on the basis of expected relation between variable.
- Such statement is more focused compared to the research objectives.

4.3. ESSENTIALS FOR HYPOTHESIS DEVELOPMENT:

The essentials of hypothesis development are,

- I.** Richness of background information
- II.** Versatility of intellect
- III.** Analogy and other practices.

I. RICHNESS OF BACKGROUND INFORMATION:

- Background knowledge however is essential for perceiving relationship among variables.
- New knowledge, new discoveries and new inventions should always form continuity with the existing corpus of knowledge.
- Hypothesis may formulate correctly by persons who have rich experiences and academic background.

II. VERSATILITY OF INTELLECT:

- Creative imaginations, the product of an adventure, sound attitude and agile intellect.
- In the hypothesis formulation the researcher worker has to saturate himself with all possible information about the problem.

III. ANALOGY AND OTHER PRACTICES:

- Analogies also lead the researcher to clues that might find useful in the hypotheses development and for finding solution to problems.
- At times conversations and consultations with colleagues and expert from different fields are also helpful in developing useful hypothesis.

5. STATEMENT OF HYPOTHESIS:

A hypothesis can be studied in different forms like,

- i)** If-then statement
- ii)** Null and alternate hypothesis
- iii)** Directional and non-directional hypothesis

i. IF-THEN STATEMENTS:

- A hypothesis is a statement of relationship among variable.
- A hypothesis can also test whether there are differences between two or several groups with respect to any variable or variables.

- To examine whether or not the relationship or difference exist these hypothesis can be set in if-then form.

EXAMPLE, employees who are motivated will perform more honesty or if employees are motivated then they will perform honesty.

ii. NULL AND ALTERNATE HYPOTHESIS:

- In null form, the researcher makes statements that no relationship exists.

EXAMPLE, there is no significant difference between the academic achievement of high school athletics and also non athletics.

- Since null hypothesis tested statistically they also called statistical hypothesis.
- An alternative hypothesis is one in which a difference between two or more variable anticipated by research.
- This follows from tenants of science in which empirical evidence must be found.

iii. DIRECTIONAL AND NON-DIRECTIONAL STATEMENT:

- Directional is when in stating the relationship between variables or comparing two groups such positive, negative, more than, less than etc
- These are direction because the directing of the relationship between variables is indicated.

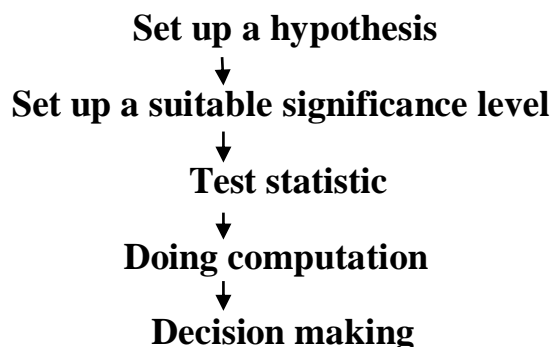
EXAMPLE, women are better managers than men.

- Non direction hypothesis are those that do determine relationship or differences but it don't determine the relation is positive or negative.

EXAMPLE, job satisfaction is related to lifestyle of employee.

6. PROCEDURE FOR TESTING OF HYPOTHESIS:

This includes following steps,



I. SET UP A HYPOTHESIS:

- To set up the hypothesis first set the null hypothesis (denoted by H_0).
- Null hypothesis is tested for possible rejection under the assumption that it is true.
- For every null hypothesis an alternative hypothesis is there (i.e., H_1).

II. SET UP A SIGNIFICANCE LEVELS:

- Ensure that obtained result is free from decision maker's biasness of choice.
- For this the significance level must always be determine before we draw samples.

EXAMPLE, 10% or 50%

III. TEST STATISTIC:

- In this one can select the statistical test for analysis.
- On the basis of the type number and level of data statistical test is decided.

EXAMPLE, Z-test, T-test, F-test

IV. DOING COMPUTATIONS:

- After selecting statistical test, the researcher tests the performance of different calculations from a random sample of size N .

- V. **DECISION MAKING:** here researcher takes decision that null hypothesis is to be rejected or accepted.

7. RESEARCH DESIGN:**7.1. MEANING AND DEFINITION:**

Research design is simply the frame work or plan for a study that is used as a guide in collection or analyzing the data. A research project conducted scientifically has a specific framework of research form the problem identification to the representation of research report. This framework of conducting research is known as research design.

A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevant to research purpose with economy in procedure. It constitutes the blue print for the collection measurement and analysis of data. It contains clear statement of

research problem procedures and techniques to be used for gathering information methods used in processing and analyzing data.

DEFINITION

“Research design is the plan structure and strategy of investigation conceived so as to obtain answers to research questions and to control variance”.

- **KERLINGER**

“A research design is the arrangement of conditions for collections and analysis of data in a manner that aims to combines relevance to the research purpose with economy in procedure”.

- **SILLTIZ ET AL.**

7.2. FEATURES OF GOOD RESEARCH DESIGN:

Features of research design



I. VALIDITY:

- An important characteristic of good research design is its ability to answer the questions in way it was intended to.
- It should focus on the objectives of research and make specific arrangements or plan to achieve that objective.

II. OBJECTIVE:

- Objectivity refers to the ability of research instruments to give conclusion that is free from observer's personal biases.
- A good research design should be able to select those instruments only that provide objective conclusion.

III. RELIABILITY:

- The instruments used in research should be able to provide similar responses to a questions asked respondent.
- If the response varied the instrument is unreliable.

IV. SUFFICIENT INFORMATION:

- Any research is conducting to gain insight of the hidden facts figures and information.
- The research design should be able to provide sufficient information to the researcher so that he can analyses the problem in a broad perspective.

V. OTHERS:

- Along with these other features of research design are adaptability flexibility efficient etc.
- A good design should be able to maximize accuracy and minimize errors.

7.3. TYPES OF RESEARCH DESIGN**I. EXPLORATORY RESEARCH DESIGN:**

- Exploratory research is carried out **to explore a subject.**
- The major objective is to help in defining a research problem and generate a set of hypothesis or research questions.
- It is carried out by using survey of existing literature survey of experienced individuals and analysis of selected case studies.
- It **focus on why questions.**
- It helps determine the best research design data collection method and selection of subjects.
- It is also possible to have an idea about a relation between variables but to lack knowledge of the direction and strength of the relation.
- The use of this research is that it is easier to make new discoveries due to less stringent methodological restrictions.
- Exploration means to explore the hidden things which are not clearly visible.
- These studies **also called formulation research studies.**

OBJECTIVES OF EXPLORATORY RESEARCH DESIGN

The objectives include,

- a) Precise formulation of the problem
- b) To establish priorities for further research
- c) To design appropriate information collection procedure for given situation.
- d) To gather information on the problem association while doing conclusion research

METHODS OF EXPLORATORY RESEARCH**I. SECONDARY DATA ANALYSIS:**

- Secondary data analysis includes collecting and evaluating facts and information already available about the selected problem
- Generally journal is useful in providing required information.

II. PILOT SURVEYS:

- When a survey is conducted on a relatively small sample which is randomly drawn from target population is called pilot survey or pilot study.
- They are of short duration involving a small fraction of individual's organizations or places from the larger target population.

III. EXPERT SURVEYS:

- It includes collection and implementation of information gathered from experts from concerned area of research
- Since experts know survey is dependent on their experience they are motivated to provide their own ideas and experiences about problem.

IV. QUALITATIVE RESEARCH:

- Qualitative research is a technique in which main focus is on collecting reliable data from its natural environment rather than the numbers figures or statistical techniques.
- The unique features of this method are collection of data from multiple sources rather than single one.

SIGNIFICANCE OF EXPLORATORY RESEARCH DESIGN:

- i. It discovers new ideas to understand the problem at hand.
- ii. The principle use of this is to increase researchers into a new direction.
- iii. It should not be used to draw definite conclusions but it can help a researcher to determine why and how things happen.

- iv. It is also useful in determining the best approach to achieve a researcher's objectives.
- v. It can be very advantages in directing subsequent research approaches.
- vi. In some cases it can save great deal of time and money by flagging dead ends early.

II. DESCRIPTIVE RESEARCH DESIGN:

- In descriptive research design, the researcher must be able **to define clearly what he wants to measure** and must find adequate methods for measuring it along with a clear definition of population he wants to study.
- The recommendations/ findings in descriptive research are definite.
- It has got very specific objective clear cut data requirements and uses a large sample which is drawn through a probability sampling design.
- Most of the social research comes under this.
- The **aim of this is to obtain complete and accurate information** in the said studies the procedures to be used must be carefully planned.
- It must focus attestation like,
 - Formulating the objectives of the study
 - Designing the methods of data collection
 - Processing and analyzing the data
 - Reporting and findings
 - Selecting the sample.

OBJECTIVES:

- a. To describe something like market functions or characteristics
- b. To determines the perceptions of product characteristics
- c. To make specific predictions
- d. To describe the characteristics of relevant groups like consumers sales people organization/market areas.

METHODS OF DESCRIPTIVE RESEARCH:

I. PANELS:

- Panels are mostly used progressively for syndicated research projects.
- In this method, a panel of study units such as organizations, households retail stores etc, from which data is collected periodically.
- This kind of methods provides data that show the changes in behavior, attitudes, and perceptions etc, over time.

II. OBSERVATION:

- This is used to collect data to observe the situation or phenomenon.
- It is important to note that; observation does not only mean to see things but to monitor and understand them deeply to interpret about them.

III. EVALUATING SECONDARY DATA:

- Sometimes to collect primary data it is essential to collect and analyse secondary data first.
- These secondary data are already available in form of magazines, journals previous researchers which saves the time from conducting a survey.

IV. CROSS-SECTIONAL RESEARCH:

- Cross-sectional research is a snapshot of situation that represents the data at one point in time.
- It shows how those variables would be point out in a section of a population.
- This kind of research uses survey method for data collection.

SIGNIFICANCE:

- a. It is important in estimating the proportion of people in a specified population who behave in a certain way.
- b. It can provide a number of answers to various aspects.
- c. It helps to generate hypothesis which can further be tested by analytical studies.
- d. It enables a wider view of an issue as opposed to strict number and figures which can only account on facts rather than experiences.
- e. It helps to describe and give an answer to certain life experiences.
- f. In this people are able to accumulate findings from all forms of data like personnel accounts case studies or observation.

III. EXPERIMENTAL RESEARCH DESIGN:

- It is effective in measuring the cause and effect relationships.
- It is a strategy to gather explore knowledge i.e. knowledge based on the analysis of experimental data and not on theoretical models.
- It is now use in all most all the areas of scientific study like experiment and control group.
- Attempts are made to examine test group and control under the same situation.

- The experimental group is exposed to predesigned procedures while the control group is kept constant.
- The difference between two groups is considered to have been produced by causative factors.
- At the end of the experiment the two groups are compared to find out the resultant effect of the experiment.

SIGNIFICANCE:

- i) Other designs either explain the event or describe the population but do not determine the cause being an effect.
- ii) Experimental research design explains cause of a particular event that can be identified here.
- iii) Outcomes of this design are highly reliable as the procedure is conducted in a controlled environment.
- iv) In this design the researcher can control different variables in the environment.

8. CASE STUDY:

8.1. MEANING:

- Case study is an in-depth study of a particular research problem rather than statistical survey.
- It is a useful design when not much is known about a phenomenon.
- It is often used to narrow down a very broad field of research into one/ a few easily researchable examples.
- Case study is also useful for testing whether a specific theory and model actually applies to phenomenon in real world.
- It can provide detailed descriptions of specific and rare cases.
- A researcher using a case study design can apply a variety of methodology and depend on a variety of sources to investigation a problem.
- It may generate new understandings hypothesis and explanations.
- The principles and methods followed should be made clear.

The University of Texas suggests the following six steps for case studies to ensure the best possible outcome:

1. Determine the research question and carefully define it. The research question for case studies generally starts with a “How” or “Why.”

2. Choose the cases and state how data is to be gathered and which techniques for analysis you'll be using. Well designed studies consider all available options for cases and for ways to analyze those cases. Multiple sources and data analysis methods are recommended.
3. Prepare to collect the data. Consider how you will deal with large sets of data in order to avoid becoming overwhelmed once the study is underway. You should formulate good questions and anticipate how you will interpret answers. Multiple collection methods will strengthen the study. See: Data Collection Methods.
4. Collect the data in the field (or, less frequently, in the lab). Collect and organize the data, keep good field notes and maintain an organized database.
5. Analyze the data.
6. Prepare your report.

9. MEASUREMENT OF VARIABLES:-

9.1. MEANING AND DEFINITION:-

- In theoretical framework, measurement of variable is an internal part of research and an important aspect of research design.
- **Measurement is the process of determining the value of level**, either qualitative or quantitative, of a particular attribute for a particular unit of analysis.
- The number of variables in an experiment is constrained by the project budget the time allotted.
- Objectives that can be physically measured by some elaborated instruments pose no measurement problems.

For example: - the length and width of rectangular office table can easily measure with a ruler, a measuring tape.

- Even such objective data might, in some cases, call for careful interpretation while making managerial decisions.
- Data representing several demographic features of the office personnel are also easily obtained by asking employees.

DEFINITION:

“Measurement is the assignment of numerals to objects or events according to rules”.

- **KERLINGER**

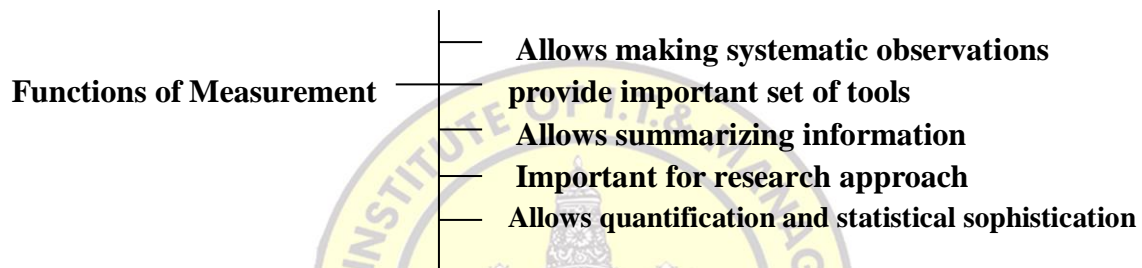
-

“Measurement is the mapping of the values on a set of numbers”.

-**JOHAN GALTUNG.**

9.2. FUNCTIONS OF MEASUREMENT:-

Measurement performs functions like;

**i) ALLOWS MAKING SYSTEMATIC OBSERVATIONS:-**

- Measurement allows making systematic observations of what is happening in a situation, and likely to understand the situation for better.
- A good example of the power of this statement is illustrated in area of finance.
- Individuals experience difficulty in managing their money because they don't know where it is being spent.
- When an accurate accounting of all expenses is made, many people may be able to find their spending habits.

ii) PROVIDE IMPORTANT SET OF TOOLS:

- Measurement procedures and instruments provide important set of tools for improving the information available for making decisions.
- However, measurement instruments only give some of the facts.
- Researchers must use these facts within their real-world, political context to decide upon their interpretation and use.

iii) ALLOWS TO SUMMARIZE INFORMATION:-

- Information measured in a systematic fashion allows summarizing the information more efficiently and particularly helpful in understanding and interpreting collected data.
- In addition, researcher is able to communicate this information to others in more effective way in form of tables, charts, and graphs.

iv) IMPORTANT FOR RESEARCH APPROACH:-

- Decision regarding measurement influence the way researcher will approach and solve all other problems that arise in completing research.
- If researcher carefully select good measures early in the planning phase, he will be more likely to conduct a better research project.

v) ALLOWS QUANTIFICATION AND STATISTICAL SOPHISTICATION:-

- Measurement is important in research-design in two critical areas.
- Measurement allows researchers to quantify abstract constructs and variables.
- The level of statistical sophistication used to analyze data delivered from a study is directly dependent on the scale of measurement used to quantify the variable of interest.

10. OPERATIONAL DEFINITION AND SCALES:-

- Operational definition is a concept solely in terms of the operations/ methods used to produce and measure it.
- With these operational definitions, we might test the hypothesis that social embeddedness reduces contracting.
- Once we decide on a particular operational definition of the concept of our study.
- It helps researchers to communicate about their concepts.
- An important question should ask as you read research is. How did the researcher operationally define his/her concepts?
- We identify this by reading researcher articles that examine the same concepts we intend to investigate.

- It also involves defining, what measures have other researchers used? What are the strengths and weaknesses of these measures?
- Measurement requires operationalising two aspects in research;
 - i) Variables
 - ii) Constructs

i. VARIABLES:-

- A Variable is a property that takes on different values as circumstances and situation change.
- The value is a number that represents either magnitude of variable (e.g., individual's height) or a category of variable (e.g., male or female).

For example:- Height can be measured in inches, and the larger the number, the greater the height.

ii. CONSTRUCTS:

- Constructs are mental abstractions that we use to express the ideas, people, organizations, events and / or objects that we are interested in.
- Constructs are a way of bringing theory down to earth, helping to explain different components of theories, as well as measure their behavior.

10.1. SCALE OF MEASUREMENT:-

- *A scale may be defined as a continuous spectrum or series of categories* and has been defined as any series of items that are arranged progressively according to value or magnitude.
- Scaling may be considered as an extension of measurement.
- The purpose of scaling is to represent quantitatively, an item, people, or an event's place in the spectrum.
- Scaling can be done towards making the judgment about some characteristics of an individual and then placing him directly on a scale.
- It refers to the procedure by which numbers are assigned to the various degrees of opinion, attitudes and other concepts.
- Scales are of 4 types:-

i. NOMINAL SCALE:-

- Nominal Scale **assigns a value to an object** for identification or classification purposes.
- It is a qualitative scale because no quantities are being represented.

ii. ORDINAL SCALE:-

- Ordinal Scale has normal properties, but they also allow things to be arranged based on how much of some concept they possess.
- It is a ranking scale and indicates the relative position of two or more objects or some characteristic.

iii. INTERVAL SCALE:

- It has all characteristics of ordinal scale and in addition, the units of measures or intervals between successive positions are equal.

iv. RATIO SCALE:-

- Ratio Scales provide iconic measurement.
- They have all the properties of interval scales with additional attribute of representing absolute quantities.
- Interval Scales represent only relative meaning, whereas **ratio scale represents absolute meaning.**

10.2. NOMINAL SCALE:-

- A Nominal Scale represents the most elementary level of measurement.
- It assigns a value to an object for identification or classification purposes.
- The value can be, but does not have to be, a number because the quantities are not represented in nominal scale.
- Nominal scale is truly a qualitative scale.
- Marketing researchers use nominal scale quite often.
- Nominal scale is arbitrary in the sense that each label can be assigned to any of the categories without introducing error.
- For nominally scaled data, statistical analysis such as mode, percentages, the binomial test and chi-square test can be used.
- A mean or median cannot be calculated.

FOR EXAMPLE:

- Defining social adjustment in terms of whether a person is receiving social services (yes or no) is at the nominal level of measurement.

- So, in defined in it in terms of whether a person is deemed ready for a sheltered workshop (again yes or no).

10.3. ORDINAL SCALE:-

- The ordinal scale indicates the relative position of two or more objects or some characteristics.
- An ordinal scale is a ranking scale.
- There is no objective distance b/w any two points on subjective scale.
- Ordinal scale variables have the property of identify and magnitude.
- Values or observations can be ranked (put in order) or have a rating scale attached.
- Research participants often are asked to rank order things based on preference.
- Five objects can be ranked from 1-5 (least preferred to most preferred) or 1-5 (most preferred to least preferred) with no loss of meaning.

For example:-

- The consumers are asked to rank preferences for several brands, favors or package designs. The measures of such preferences are ordinal in nature.
- In ordinal scale, no absolute values more, precise compressions are not possible.

10.4. RATING SCALES:-

- Rating Scales provide the data required for perceptual mapping.
- It uses to judge properties of objects without reference to other similar objects.
- These may be in such forms as “like-dislike”, “approve-disapprove”, or other classifications.
- Rating scale may be in different forms like;
 - i. Graphic rating scale.
 - ii. Semantic Differential Scale.
 - iii. Multi-dimensional Scaling.
 - Iv. Stapes is scale.

i. GRAPHIC RATING SCALE:-

- Here, the respondents rate the objects by placing a mark at the appropriate position on a line that runs from one extreme of the criterion variable to another.

- This line can be vertical or horizontal and scale points may be provided.

ii) **SEMANTIC DIFFERENTIAL SCALE:-**

- This is a 7-point rating scale with end points associated with bipolar labels that have semantic meaning.
- In a typical application, respondents rate objects on a number of itemized, 7-points rating scales bound at each end by one of two bipolar adjectives 'cold' and 'warm'.
- It establishes a connection between brand and company images studies.

iii) **MULTI-DIMENSIONAL SCALE:-**

- It consists of a group of analytical techniques which are used to study consumer attitudes related to perceptions and preferences.
- It is a computer based technique.
- The respondents are asked to place various brands into different groups like similar, very similar, and not similar and so on.
- A goodness of fit is traded off on a large number of attributes. Then lack of fit index is calculated on computer program.

iv) **STAPES SCALE:**

- The staple scale was developed in 1950's to measure simultaneously the direction and intensity of an attitude.
- Staple scale is easier to administer, especially over the telephone.

10.5. RANKING SCALES:-

- In this type of scales, the subject directly compares two or more objects and makes choices among them.
- Frequently, the respondent is asked to select one as the 'best' or the most preferred'.
- When there are two choices, this approach is satisfactory but it often results in 'ties' when more than two choices are found.

FOR EXAMPLE:-

Respondents are asked to select the most preferred among three or more models of a product. Assume that 40% choose model A, 30% choose model B, and 30% choose model C. "which is the preferred model"?

Techniques of Ranking Scales:-

- A. Q-Sort Scaling
- B. Rank Order Scaling
- C. Paired Comparison Scaling
- D. Constant Sum Scaling

A) Q-SORT SCALING:-

- Q-Sort Scaling is a rank order procedure where respondents are asked to sort a given number of items or statements and classify them into a predetermined number sets (usually) according to criteria such as preference, attitude, or behavioral intents.

B) RANK ORDER SCALING:-

- Rank order scaling are comparative scales, where the respondents is asked to rate an item in comparison with another item or group.

Eg:- Respondent ask to rank three motorcycle brands on attributes such as cost, mileage, style and pick-up etc; the importance of rank order analysis is;

- a) It is easy to develop rank among objects.
- b) It becomes easy to analysis objects after ranking.

C) PAIRED COMPARISION SCALING:-

- In this method, the items are presented in pairs to one or more judges, for each pair the judge selects the item that best satisfies the specified judgments criterion.

D) CONSTANT SUM SCALING:-

- With this ordinal level technique respondents are given a constant sum of units such as points, money or credits and then asked to allocate them to various items.

11. VALIDITY AND RELIABILITY:-**11.1. VALIDITY:**

- **It refers to the soundness of interpretation of the test** the most important consideration in measurement.
- It indicates the degree to which the test or instrument and it measures what it is supposed to measure.
- It is the ability of a scale or measuring instrument to measure what it is intended to measure.
- **EXAMPLE** is absenteeism from work a valid measure of job satisfaction.
- The researchers are always concerned about the validity of their measuring instrument.

- It can also be through of as utility. It is the extent to which the differences found with measuring instrument reflex true differences among those being tested.

11.2. CONTENT VALIDITY:

- Accuracy of the topic under study.
- Instrument should contain a representative sample of the universe.
- No numerical expression possible
- It relies on panel of experts
- It is claimed when the measure obviously involves the performance being measured.
- It is equally important that the items and questions cover the full range of the issue or attitude being measured
- Assessment of the items of an instrument in this respect is called content validity.
- It is easy to present logical arguments to establish validity there are certain problems.
- It is estimate of how much a measure represents every single element of a construct.

11.3. CRITERION RELATED VALIDITY:

- Ability to predict outcome estimate the existence of some concurrent condition.
- The criterion must be relevant free from bias reliable and information specified must be available
- It may include demographic any psychographic characteristic attitudinal and behavioral measures or sources obtained from the scales.
- It can take two forms like.

I. CONCURRENT VALIDITY:

- It is assessed when the data on the scale being evaluated and on the criterion variable are collected at the same time.
- To assert this a researcher may develop short forms of standard personally instruments.

II. PREDICTIVE VALIDITY:

- The researcher collects data on the scale at one point in time and data on the criterion variable at a time future.

III. CONSTRUCT VALIDITY:

- The researcher attempts to answer theoretical questions about why the scale works and what deductions can be made concerning the underlying theory.
- It is the most sophisticated and difficult type of validity to establish.
- When assessing this researcher attempts to answer theoretical questions about why the scale works and what deductions can be made concerning the underlying theory.

IV. CONVERGET VALIDITY:

- It is the extent to which the scale correlates positively with other measure of the same construct.
- Not necessary that all these measures be obtained by using conventional scaling techniques.

V. DISCRIMINANT VALIDITY:

- It involves demonstrating a lack of correlation among differing constructs.

11.4. RELIABILITY:

- **It is the degree to which measurements are devoid of error** and therefore in the position to yield consistent rules also over repeated attempts over time.
- Factors that influence the reliability like.
 - a. **CLARITY**: clarity of your operation definition
 - b. **FOLLOW THROUGH**: the extent to which your operational definition is followed.
 - c. **OBSERVATION**: the no. of observation the overall score is based on.
- (Factor) ways to measure how reliable your study is
 - A. **INTER-RATER**: the degree of agreement between two independent raters.
 - B. **TEST-RETEST**: The degree of consistency over time

C. INTERNAL CONSISTENCY: This is often measured using the split half reliability test.

The scores had taken from a random sample of questions match the scores taken from another sample of questions.

11.5. METHODS OF ESTIMATING RELIABILITY

i. TEST-RETEST METHOD

- A measuring instrument is administered to the same group of person at different times.
- The co-efficient of co-relation between the two sets of scores is computed.
- The obtained co-efficient is a measure of reliability.

ii. SPLIT OF RELIABILITY

- It is design to split the instrument into two sets involves like odd no items as a one half and the even number items as 2nd half.
- Each half is used as separate instrument and the scores of both half are co-related.
- The reliability is an instrument can be improved by
 - a. Minimizing the external sources of variations
 - b. Improving internal consistency of the instrument
 - c. Producing the sample of items.

12. SAMPLING IN RESEARCH:

In research terms, **a sample is a group of people, objects, or items that are taken from a larger population for measurement.** The sample should be representative of the population to ensure that we can generalize the findings from the research sample to the population as a whole.

What is the purpose of sampling?

- To draw conclusions about populations from samples, we must use inferential statistics, to enable us to determine a population's characteristics by directly observing only a portion (or sample) of the population. We obtain a sample of the population for many reasons as it is usually not practical and almost never economical

There would also be difficulties measuring whole populations because: -

- **The large size of many populations**
- **Inaccessibility of some of the population** - Some populations are so difficult to get access to that only a sample can be used. E.g. prisoners, people with severe mental illness, disaster survivors etc. The inaccessibility may be associated with cost or time or just access.
- **Destructiveness of the observation**- Sometimes the very act of observing the desired characteristic of the product destroys it for the intended use. Good examples of this occur in quality control. E.g. to determine the quality of a fuse and whether it is defective, it must be destroyed. Therefore if you tested all the fuses, all would be destroyed.
- **Accuracy and sampling** - A sample may be more accurate than the total study population. A badly identified population can provide less reliable information than a carefully obtained sample.

13. METHODS OF SAMPLING:

There are several different sampling techniques available, and they can be subdivided into two groups:

- i. Probability sampling and
- ii. Non-probability sampling.

i. Probability sampling methods:

- In probability (random) sampling, you start with a complete sampling frame of all eligible individuals from which you select your sample.
- In this way, all eligible individuals have a chance of being chosen for the sample, and you will be more able to generalize the results from your study.
- Probability sampling methods tend to be more time-consuming and expensive than non-probability sampling

ii. Non-probability methods:

- In non-probability (non-random) sampling, you do not start with a complete sampling frame, so some individuals have no chance of being selected.
- Consequently, you cannot estimate the effect of sampling error and there is a significant risk of ending up with a non-representative sample which produces non-generalizable results.

- However, non-probability sampling methods tend to be cheaper and more convenient, and they are useful for exploratory research and hypothesis generation.

13.1. PROBABILITY SAMPLING METHODS

I. SIMPLE RANDOM SAMPLING:

- In this case each individual is chosen entirely by chance and each member of the population has an equal chance, or probability, of being selected.
- One way of obtaining a random sample is to give each individual in a population a number, and then use a table of random numbers to decide which individuals to include.
- For example, if you have a sampling frame of 1000 individuals, labelled 0 to 999, use groups of three digits from the random number table to pick your sample. So, if the first three numbers from the random number table were 094, select the individual labeled “94”, and so on.
- As with all probability sampling methods, simple random sampling allows the sampling error to be calculated and reduces selection bias.
- A specific advantage is that it is the most straightforward method of probability sampling.
- A disadvantage of simple random sampling is that you may not select enough individuals with your characteristic of interest, especially if that characteristic is uncommon.
- It may also be difficult to define a complete sampling frame and inconvenient to contact them, especially if different forms of contact are required (email, phone, post) and your sample units are scattered over a wide geographical area.

ii. SYSTEMATIC SAMPLING:

- Individuals are selected at regular intervals from the sampling frame.
- The intervals are chosen to ensure an adequate sample size.
- If you need a sample size n from a population of size x , you should select every x/n^{th} individual for the sample.
- For example, if you wanted a sample size of 100 from a population of 1000, select every $1000/100 = 10^{\text{th}}$ member of the sampling frame.
- Systematic sampling is often more convenient than simple random sampling, and it is easy to administer.

- However, it may also lead to bias, for example if there are underlying patterns in the order of the individuals in the sampling frame, such that the sampling technique coincides with the periodicity of the underlying pattern.
- As a hypothetical example, if a group of students were being sampled to gain their opinions on college facilities, but the Student Record Department's central list of all students was arranged such that the sex of students alternated between male and female, choosing an even interval (e.g. every 20th student) would result in a sample of all males or all females.
- Whilst in this example the bias is obvious and should be easily corrected, this may not always be the case.

iii. **STRATIFIED SAMPLING:**

- In this method, the population is first divided into subgroups (or strata) who all share a similar characteristic.
- It is used when we might reasonably expect the measurement of interest to vary between the different subgroups, and we want to ensure representation from all the subgroups.
- For example, in a study of stroke outcomes, we may stratify the population by sex, to ensure equal representation of men and women.
- Stratified sampling improves the accuracy and representativeness of the results by reducing sampling bias.
- However, it requires knowledge of the appropriate characteristics of the sampling frame (the details of which are not always available), and it can be difficult to decide which characteristic(s) to stratify by.

iv. **CLUSTERED SAMPLING:**

- In a clustered sample, subgroups of the population are used as the sampling unit, rather than individuals.
- The population is divided into subgroups, known as clusters, which are randomly selected to be included in the study.
- Clusters are usually already defined, for example individual GP practices or towns could be identified as clusters.
- In single-stage cluster sampling, all members of the chosen clusters are then included in the study.
- In two-stage cluster sampling, a selection of individuals from each cluster is then randomly selected for inclusion.

- Cluster sampling can be more efficient than simple random sampling, especially where a study takes place over a wide geographical region.
- For instance, it is easier to contact lots of individuals in a few GP practices than a few individuals in many different GP practices.
- Disadvantages include an increased risk of bias, if the chosen clusters are not representative of the population, resulting in an increased sampling error.

13.2. NON-PROBABILITY SAMPLING METHODS:

I. CONVENIENCE SAMPLING:

- Convenience sampling is perhaps the easiest method of sampling, because participants are selected based on availability and willingness to take part.
- Useful results can be obtained, but the results are prone to significant bias, because those who volunteer to take part may be different from those who choose not to (volunteer bias), and the sample may not be representative of other characteristics, such as age or sex.
- Note: volunteer bias is a risk of all non-probability sampling methods.

ii. QUOTA SAMPLING:

- This method of sampling is often used by market researchers.
- Interviewers are given a quota of subjects of a specified type to attempt to recruit. For example, an interviewer might be told to go out and select 20 adult men, 20 adult women, 10 teenage girls and 10 teenage boys so that they could interview them about their television viewing.
- Ideally the quotas chosen would proportionally represent the characteristics of the underlying population.
- Whilst this has the advantage of being relatively straightforward and potentially representative, the chosen sample may not be representative of other characteristics that weren't considered (a consequence of the non-random nature of sampling).

iii. JUDGEMENT (OR PURPOSIVE) SAMPLING:

- Also known as selective, or subjective, sampling, this technique relies on the judgment of the researcher when choosing who to ask to participate.
- Researchers may implicitly thus choose a “representative” sample to suit their needs, or specifically approach individuals with certain characteristics.
- This approach is often used by the media when canvassing the public for opinions and in qualitative research.
- Judgment sampling has the advantage of being time-and cost-effective to perform whilst resulting in a range of responses (particularly useful in qualitative research).
- However, in addition to volunteer bias, it is also prone to errors of judgment by the researcher and the findings, whilst being potentially broad, will not necessarily be representative.

IV. SNOWBALL SAMPLING:

- This method is commonly used in social sciences when investigating hard-to-reach groups.
- Existing subjects are asked to nominate further subjects known to them, so the sample increases in size like a rolling snowball.
- For example, when carrying out a survey of risk behaviors amongst intravenous drug users, participants may be asked to nominate other users to be interviewed.
- Snowball sampling can be effective when a sampling frame is difficult to identify.
- However, by selecting friends and acquaintances of subjects already investigated, there is a significant risk of selection bias (choosing a large number of people with similar characteristics or views to the initial individual identified).

13.3. BIAS IN SAMPLING:

- There are five important potential sources of bias that should be considered when selecting a sample, irrespective of the method used.
- Sampling bias may be introduced when:
 - Any pre-agreed sampling rules are deviated from.
 - People in hard-to-reach groups are omitted.

- Selected individuals are replaced with others, for example if they are difficult to contact.
- There are low response rates.
- An out-of-date list is used as the sample frame (for example, if it excludes people who have recently moved to an area).

13.4. ADVANTAGES OF SAMPLING:

Sampling ensures convenience, collection of intensive and exhaustive data, suitability in limited resources and better rapport. In addition to this, sampling has the following advantages also.

i. LOW COST OF SAMPLING:

- If data were to be collected for the entire population, the cost will be quite high.
- A sample is a small proportion of a population.
- So, the cost will be lower if data is collected for a sample of population which is a big advantage.

ii. LESS TIME CONSUMING IN SAMPLING:

- Use of sampling takes less time also.
- It consumes less time than census technique. Tabulation, analysis etc., take much less time in the case of a sample than in the case of a population.

iii. SCOPE OF SAMPLING IS HIGH:

- The investigator is concerned with the generalization of data.
- To study a whole population in order to arrive at generalizations would be impractical.
- Some populations are so large that their characteristics could not be measured.
- Before the measurement has been completed, the population would have changed.
- But the process of sampling makes it possible to arrive at generalizations by studying the variables within a relatively small proportion of the population.

iv. ACCURACY OF DATA IS HIGH:

- Having drawn a sample and computed the desired descriptive statistics, it is possible to determine the stability of the obtained sample value.
- A sample represents the population from which it is drawn.
- It permits a high degree of accuracy due to a limited area of operations.
- Moreover, careful execution of field work is possible. Ultimately, the results of sampling studies turn out to be sufficiently accurate.

v. ORGANIZATION OF CONVENIENCE:

- Organizational problems involved in sampling are very few.
- Since sample is of a small size, vast facilities are not required.
- Sampling is therefore economical in respect of resources. Study of samples involves less space and equipment.

vi. INTENSIVE AND EXHAUSTIVE DATA:

- In sample studies, measurements or observations are made of a limited number.
- So, intensive and exhaustive data are collected.

vii. SUITABLE IN LIMITED RESOURCES:

- The resources available within an organization may be limited.
- Studying the entire universe is not viable. The population can be satisfactorily covered through sampling.
- Where limited resources exist, use of sampling is an appropriate strategy while conducting marketing research.

ix. BETTER RAPPORT:

- An effective research study requires a good rapport between the researcher and the respondents.
- When the population of the study is large, the problem of rapport arises.
- But manageable samples permit the researcher to establish adequate rapport with the respondents.

13.5. DISADVANTAGES OF SAMPLING:

The reliability of the sample depends upon the appropriateness of the sampling method used. The purpose of sampling theory is to make sampling

more efficient. But the real difficulties lie in selection, estimation and administration of samples.

Disadvantages of sampling may be discussed under the heads:

- i. Chances of bias
- ii. Difficulties in selecting truly a representative sample
- iii. Need for subject specific knowledge
- iv. changeability of sampling units
- v. Impossibility of sampling.

i. CHANCES OF BIAS:

- The serious limitation of the sampling method is that it involves biased selection and thereby leads us to draw erroneous conclusions.
- Bias arises when the method of selection of sample employed is faulty. Relative small samples properly selected may be much more reliable than large samples poorly selected.

ii. DIFFICULTIES IN SELECTING A TRULY REPRESENTATIVE SAMPLE:

- Difficulties in selecting a truly representative sample produce reliable and accurate results only when they are representative of the whole group.
- Selection of a truly representative sample is difficult when the phenomena under study are of a complex nature. Selecting good samples is difficult.

iii. INADEQUATE KNOWLEDGE IN THE SUBJECT:

- Use of sampling method requires adequate subject specific knowledge in **sampling technique**. Sampling involves statistical analysis and calculation of probable error.
- When the researcher lacks specialized knowledge in sampling, he may commit serious mistakes. Consequently, the results of the study will be misleading.

iv. CHANGEABILITY OF UNITS:

- When the units of the population are not in homogeneous, the sampling technique will be unscientific. In sampling, though the number of cases is small, it is not always easy to stick to the, selected cases.
- The units of sample may be widely dispersed.

- Some of the cases of sample may not cooperate with the researcher and some others may be inaccessible.
- Because of these problems, all the cases may not be taken up. The selected cases may have to be replaced by other cases.
- Changeability of units stands in the way of results of the study.

v. IMPOSSIBILITY OF SAMPLING:

- Deriving a representative sample is difficult, when the universe is too small or too heterogeneous.
- In this case, census study is the only alternative.
- Moreover, in studies requiring a very high standard of accuracy, the sampling method may be unsuitable.
- There will be chances of errors even if samples are drawn most carefully.

IMPORTANT QUESTIONS:

UNIT-2:

1. Explain about any two sampling methods.
2. Briefly explain the different steps involved in research process.
3. Explain various rating and ranking scales with examples.
4. What differences does it make whether we measure in terms of a nominal and ordinal scale? Explain with example.
5. Describe the basic scales for any research with examples.
6. What is research design? Explain types of research design.

CASESTUDY:

UNIT-2

LEVI'S FADING JEANS AND MARKET SHARE

As of 2006 Levi's is a leading global apparel company with sales in more than 110 countries. It has been a long standing company with over 150 years of being in the clothing business. While one may think this long history can only result in good things Levi's heritage has been its worst enemy. Philip marinara the president and chief executive officer for Levi Strauss and co., had to work to revamp Levi's antique image and make the brand appealing to younger generations in efforts to best its declining sales. In the last five years, Martineau saw worldwide sales drop 40% losing market share to competitors like the gap, and trendier ones such as Calvin Klein, Tommy Hilfiger and diesel.

Another problem for Martineau came from store brand jeans such as JCPenny's Arizona brand jeans or the gap's in house brand which have changed their image and launched an assault on big brand names line Levi's. These store brand jeans along with other store label jeans now target the teenage market with cutting edge advertising. American trade publication brand strategy estimated that the brand has lost about 50% of the younger consumer market share worldwide between 1999 and 2005.

Philip Martineau wonders how powerful is a national brand like Levi's compared to an in house brand like gap or store brand like JCPenny's Arizona jeans?

QUESTIONS

A. If you were philip marineau, what type of research would you want to conduct to help to arrive at an answer?

B. please explain how you would implement the type of research you have recommended.

A) ONE POSSIBLE SOLUTION

IN THE PRESENT CASE THE EXPLORATORY RESEARCH IS SUITABLE:

- When the purpose of research is to gain familiarity with a phenomenon or acquire new insights into it in order to formulate a more precise problem or develop hypothesis, the exploratory studies come in handy.
- *Exploratory research focuses on why questions.*
 - For example, it is one thing to describe the crime rate in a country to examine trends over time or to compare the rates in different counties. Techniques of exploratory research studies to conduct the research are as follows.

1. LITERATURE RESEARCH/STUDY OF SECONDARY DATA: The quickest and most economical way is to find possible hypothesis from the available literature.

2. DEPTH INTERVIEW/SURVEY OF KNOWLEDGEABLE PERSONS OR EXPERIENCE SURVEY: Experience survey means the survey of people who have had practical experience with the problem to be studied. These

individuals can be to executive's sales managers/executives, wholesalers and retailers possessing valuable knowledge and information about the problem environment.

3. CASE STUDY: It involves the comprehensive study of one or a few specific situations and lends itself of one or a few specific situations and lends itself particularly to the study of complex situations in which the interrelations of several individuals are important.

4. FOCUS GROUPS: Focus group studies are generally conducted to evaluate the potential of a new product idea or concept.

5. PROJECTIVE TECHNIQUES: In projective techniques, respondents are asked to interpret the behavior of others rather than describe their own behavior.

6. TWO STAGE DESIGN: In this method, the exploration is conducted in two stages. The first stage consists of clearly defining the research problem while the second stage comprises developing the research design.

B. PLEASE EXPLAIN HOW YOU WOULD IMPLEMENT THE TYPE OF RESEARCH YOU HAVE RECOMMENDED.

ONE POSSIBLE SOLUTION

IMPLEMENTING THE TYPE OF RESEARCH

1. DETERMINING PRESENT STATUS: The first step is to gather descriptive information which will determine as precisely as possible the present status of the unit under investigation. Here the investigation after knowing the problem tries to find out nature and extent of the problem.

2. GATHERING BACKGROUND INFORMATION: Once the research is able to achieve an accurate description of the present situation he collects background data.

3. TESTING SUGGESTED HYPOTHESIS: At this step the researcher gathers specific evidences in relation to each of the hypothesis suggested from the background information just gathered. The individual's behavior is usually determined by several factors.

4. INSTITUTING REMEDIAL ACTION: The case studies are generally carried on to make an intensive examination of problem cases. Therefore the

researcher tries to find out how one or more of the hypothesized difficulties actually contributed to the original difficulties. This is accomplished by instituting some remedial or corrective program and then by examining as to what effort the change has brought about.

PREPARED BY:

HIMMAT T

ASSOCIATE PROFESSOR, MBA

BALAJI INSTITUTE OF IT & MANAGEMENT

KADAPA.



(17E00204) BUSINESS RESEARCH METHODS

Course Code	BUSINESS RESEARCH METHODS	L	T	P	C
21E00204		4	0	0	4
Semester		II			
Course Objectives:					
<ul style="list-style-type: none">To introduce business research, types and technology used in business research.To explain in detail on research process involved in business research.To discuss sources of data and instruments to collect dataTo provide knowledge on analysis and interpretation of outcome of the data in a scientific way.To provide knowledge on descriptive and inferential statistical analysis.To impart competence skills to undertake business research problem and carryout scientific research.					
*Standard Statistical tables shall be allowed in the examination					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none">Learn types of business research, technology used in business research in technological era.Identify research problem, appropriate research design and sample design for the problem, formulate hypothesis, testing process of hypothesis.Understand sources of data, instruments to collect data, analyse and interpretation of data.Prepare and present the research report effectively and efficiently.					
UNIT - I		Lecture Hrs:08			
Introduction to Business Research: Definition-Types of Business Research. Scientific Investigation, Technology and Business Research: Information needs of Business - Technologies used in Business Research: The Internet, E-mail, Browsers and Websites. Role of Business Research in Managerial Decisions.					
UNIT - II		Lecture Hrs:12			
The Research Process: Problem Identification: Broad Problem Area-Preliminary Data Gathering. Literature Survey - Hypothesis Development - Statement of Hypothesis- Procedure for Testing of Hypothesis. The Research Design: Types of Research Designs: Exploratory, Descriptive, Experimental Designs and Case Study -Measurement of Variables- Operational Definitions and Scales-Nominal and Ordinal Scales- Rating Scales- Ranking Scales- Reliability and Validity - Sampling and Methods of sampling					
UNIT - III		Lecture Hrs:12			
Collection and Analysis of Data Sources of Data-Primary and Secondary Sources of Data - Data Collection Methods- Interviews: Structured Interviews and Unstructured Interviews- Observational Surveys: Questionnaire Construction: Organizing Questions- Structured and Unstructured Questionnaires – Guidelines for Construction of Questionnaires.					
UNIT - IV		Lecture Hrs:12			
Data Preparation and Analysis: Data preparation process, problems in preparation process - An overview of Descriptive, Associational and Inferential- Statistical Measures.					
UNIT - V		Lecture Hrs:12			
The Research Report: Research Reports-Components-The Title Page-Table of Contents-The Executive Summary-The Introductory Section-The Body of the Report-The Final Part of the Report-Acknowledgements – References-Appendix - Guidelines for Preparing a Good Research report - Oral Presentation.					
Textbooks:					
<ol style="list-style-type: none">Research Methodology – methods & Techniques, C.R. Kothari, Vishwa prakashan.Research Methods for Business–A Skill Building Approach, Uma Sekaran, John Wiley & Sons (Asia) Pvt. Ltd, Singapore.					

UNIT-3

COLLECTION AND ANALYSIS OF DATA

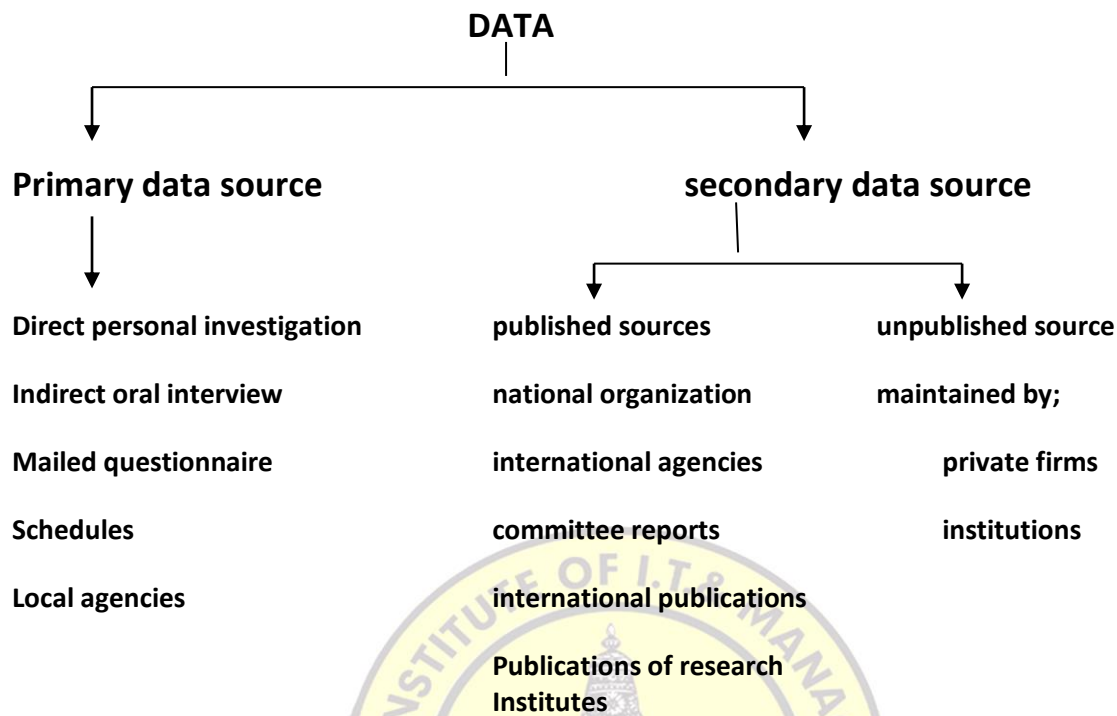
INTRODUCTION:

Data collection is a **process of collecting information** from all the relevant sources to find answers to the research problem, test the hypothesis and evaluate the outcomes.

Data Analysis. In qualitative researches using interviews, focus groups, experiments etc. **data analysis** is going to involve identifying common patterns within the responses and critically analyzing them in order to achieve **research** aims and objectives.

1. SOURCES OF DATA:

- For the study purpose, both primary and secondary data are used.
- The **primary data** is collected from sales men of the companies, customers and dealers who are dealing in the products of the company. The primary data are related to behavior and response of employees, dealers and customers.
- The **secondary data** is collected from records of the company, retailers and dealers. The data of past sales are also been collected. The secondary data shows the sales of the company product wise. These data used in combination as per need of the study.
- The primary and secondary data will be collected to cover every aspect of the study.



PRIMARY DATA:

Primary data is information collected by a researcher specifically for a research assignment. In other words, primary data is information that a company must gather because no one has compiled and published the information in a form accessible to the public.

Primary data are original in nature and directly related to the issue or problem and current data. Primary data are the data which the researcher collects through various methods like interviews, surveys, questionnaires etc.

Example: Interviewing a candidate for getting details

THE PRIMARY DATA ADVANTAGES AND DISADVANTAGES:

a. ADVANTAGES OF PRIMARY DATA:

Advantages of primary data are as follows:

1. The primary data are original and relevant to the topic of the research study so the degree of accuracy is very high.
2. Primary data can be collected from a number of ways like interviews, telephone surveys, focus groups etc. It can be also collected across the

national borders through emails and posts. It can include a large population and wide geographical coverage.

3. Moreover, primary data is current and it can better give a realistic view to the researcher about the topic under consideration.
4. Reliability of primary data is very high because these are collected by the concerned and reliable party.

b. DISADVANTAGES OF PRIMARY DATA:

Following are the disadvantages of primary data:

1. For collection of primary data where interview is to be conducted the coverage is limited and for wider coverage a more number of researchers are required.
2. A lot of time and efforts are required for data collection.
3. It has design problems like how to design the surveys. The questions must be simple to understand and respond.
4. Some respondents do not give timely responses. Sometimes, the respondents may give fake, socially acceptable and sweet answers and try to cover up the realities.
5. With more people, time and efforts involvement the cost of the data collection goes high. The importance of the research may go down.

SOURCES OF PRIMARY DATA:

PRIMARY DATA – METHODS OF COLLECTION OF DATA

Discussed below are 5 broad classifications of the methods of collecting primary data.

I. DIRECT PERSONAL INVESTIGATION:

- Consists of the collection of data by the investigator in a direct manner.
- The investigator (or researcher) is responsible for personally approaching a respondent and investigating the research and gather appropriate information.
- In other words, the researcher himself enters the field and solicits data that he requires to take the research forward.
- This data is all the more reliable for an intensive research.
- But in an extensive research, this data is inadequate and proves to be unreliable.
- This method of collection of data is time-consuming. Hence, it tends to get handicapped when there is lack of time resource.

- However, the greatest demerit is that this method is very subjective in nature and is not suitable for objective based extensive researches.

ii. INDIRECT ORAL INTERVIEW:

- Consists of the collection of data by the investigator in an indirect manner.
- The investigator (or enumerator) approaches (either by telephonic interviews) an indirect respondent who possesses the appropriate information for the research.
- Thus, this method of data collection ensures first-hand information because the interviewers can cross-question for the right and appropriate information.

iii. MAILED QUESTIONNAIRE:

- Consists of mailing a set or series of questions related to the research.
- The respondent answers the questionnaire and forwards it back to the investigator after marking his/her responses.
- This method of collection of data has proven to be time-saving.
- It is also a very cost-efficient manner of collecting the required data.
- An investigator who has the access to the internet and an email account can undertake this method of data collection.
- The researcher can only investigate those respondents who also have access to the internet and an email account. This remains the only major restriction of this method.

IV. SCHEDULES:

- Scheduling involves a face to face situation with the respondents.
- In this method of collecting data, the interviewer questions the respondent according to the questions mentioned in a form. This form is known as a schedule.
- This is different than a questionnaire. A questionnaire is personally filled by the respondents and the interviewer may or may not be physically present. Whereas, the schedule is filled by the enumerator or interviewer after asking the respondent his/her answer to a specific question.
- And in scheduling method of collecting data, the interviewer or enumerator is physically present.

V. LOCAL AGENCIES:

- In this method, the information is not directly or indirectly collected by either the interviewer or the enumerator.
- Instead, the interviewer hires or employs a local agency to work for him/her and help in gathering appropriate information.
- These local agents are often known as correspondents as well.
- Correspondents are only responsible for gathering accurate and reliable information. They work according to their preference and adopt different methods to do so.

2. SECONDARY DATA:

Secondary data refers to the data that the investigator collects from another source. Past investigators or agents collect data required for their study. The investigator is the first researcher or statistician to collect this data. Moreover, the investigator does not have a clear idea about the intricacies (details) of the data. There may be ambiguity in terms of the sample size and sample technique. There may also be unreliability with respect to the accuracy of the data.

2.1. SECONDARY DATA – SOURCES OF DATA:

Discussed below are 2 broad classifications of the sources of secondary data.

i. PUBLISHED SOURCES:

- There are many national organizations, international agencies and official publications that collect various statistical data.
- They collect data related to business, commerce, trade, prices, economy, productions, services, industries, currency and foreign affairs.
- They also collect information related to various (internal and external) socio-economic phenomena and publishes them.
- These publications contain statistical reports of various kinds.
- Central Government Official Publication, Publications of Research Institutions, Committee Reports and International Publications are some published sources of secondary data.

ii. UNPUBLISHED SOURCES:

- Some statistical data are not always a part of publications.
- Such data are stored by institutions, private firms.

- Researchers often make use of these unpublished data in order to make their researches all the more original.

2.2. ADVANTAGES OF SECONDARY DATA:

- It is *economical*. It saves efforts and expenses.
- It is *time saving*.
- It *helps to make primary data collection more specific* since with the help of secondary data, we are able to make out what are the gaps and deficiencies and what additional information needs to be collected.
- It *helps to improve the understanding of the problem*.
- It *provides a basis for comparison for the data* that is collected by the researcher.

2.3. DISADVANTAGES OF SECONDARY DATA:

i. Secondary data is something that seldom fits in the framework of the marketing research factors. Reasons for its non-fitting are:-

- Unit of secondary data collection-Suppose you want information on disposable income, but the data is available on gross income. The information may not be same as we require.
- Class Boundaries may be different when units are same.

Before 5 Years	After 5 Years
2500-5000	5000-6000
5001-7500	6001-7000
7500-10000	7001-10000

- Thus the data collected earlier is of no use to you.

ii. Accuracy of secondary data is not known.

iii. Data may be outdated.

3. INTERVIEWS:

Interview is a conversation where questions are asked and answers are given. In common parlance, the word "interview" refers to a one-on-one conversation between an interviewer and an interviewee. Interviewer asks questions to which the interviewee responds, usually so information may be transferred from interviewee to interviewer (and any other audience of the interview).

Interviews usually take place *face to face* and in person, although modern communications technologies such as the internet have enabled conversations to happen in which parties are separated geographically, such as with *video conferencing* software, and interviews can happen without visual contact. Interviews can range from *unstructured* or free-wheeling and open-ended conversations in which there is no predetermined plan with prearranged questions to *highly structured conversations* in which specific questions occur in a specified order.

3.1. IMPORTANCE OF INTERVIEW FOR EMPLOYERS:

a) INFORMATION ABOUT JOB-SEEKING CANDIDATE:

- In an interview, the employer can collect complete information about the job-seeking candidate.
- Interview collects information about the candidate's cultural and educational background, work experience, intelligence quotient, communication skills, personality type, interests, social behavior, etc.

b) SUPPLEMENTS THE APPLICATION BLANK:

- Due to some limitations, the job-seeking candidate cannot give his full information or details in the **Application Blank** for employment.
- However, an interviewer can collect additional relevant information of the candidate by scheduling a personal meeting with him.
- During meeting, interview process helps an interviewer to collect that information which is currently not available in the Application Blank.
- Thus, an interview supplements the Application Blank by collecting and verifying some missing information of the candidate.

C. INTERVIEW HELPS TO SELECT A RIGHT PERSON:

- In an interview, the interviewer can see and talk to the candidates.
- So he can make a correct decision, whether to select or reject the candidate.
- Personal interview is the best method of selecting the right person for the right post.

d. INTERVIEW COLLECTS USEFUL INFORMATION:

- In an interview, the candidates discuss about their past work experiences, achievements, research works, etc.

- Interview helps an employer to collect a lot of useful information from different candidates.
- The employer can use this collected information to solve problems of his firm and improve efficiency.

e. GOOD INTERVIEW INCREASES GOODWILL:

- An interview is a public-relation tool.
- So, it should be conducted properly in a friendly and fearless environment.
- The candidates being interviewed should be treated with dignity and respect.
- Whether the candidate is selected or rejected, he / she should feel happy about the employer. This will boost the image of the employer.
- So, a good interview session always increases the goodwill of the employer.

f. HELPS IN PROMOTIONS AND TRANSFERS:

- A personal interview also helps an employer to evaluate his staff for promotions, transfers, etc.

3.2. IMPORTANCE OF INTERVIEW FOR JOB SEEKERS:

i. PROVIDES EMPLOYMENT OPPORTUNITY:

- An interview provides an employment opportunity to the job-seeking candidate.
- It helps an applicant to present and communicate his views, opinions and ideas to the employer.
- If a candidate performs well at the interview and meets employer's expectations, then he has a good chance of getting selected for a desired post.

ii. DEVELOP CONFIDENCE IN CANDIDATES:

- Fresh job-seeking candidates (young college graduates), generally get nervous during their first few job interviews.
- However, after attending (facing) multiple interviews, they automatically develop a confidence in themselves.
- As experience builds up, they subconsciously develop skills to tackle a variety of interviews.

- Thus, routine interviews develop a confidence in the job-seeking candidates and boost their morale.

iii. HELPS CANDIDATES TO ACCEPT OR REJECT THE JOB:

- The job-seeking candidate is provided with information about the job and employer.
- He is well-informed about the compensation (salary), perks and allowances, working condition, job security, chances of promotions and transfers, other employment benefits, if any, etc.
- All the doubts of the candidate are cleared by the interviewer.
- This helps the candidate to make a wiser career decision, whether to accept or reject the job, if offered.

iv. HELPS JOB SEEKERS TO INCREASE CONTACTS:

- When a job-seeking candidate attends an interview, he develops contacts with the interviewer and the other candidates.
- So, if a candidate is not selected at first job searching attempt, then these contacts sometimes help him to succeed at next job hunting attempts.

4. STRUCTURED INTERVIEW:

A structured interview (also known as a standardized interview or a researcher-administered survey) is a quantitative research method commonly employed in survey research. The aim of this approach is to ensure that each interview is presented with exactly the same questions in the same order. This ensures that answers can be reliably aggregated and that comparisons can be made with confidence between sample subgroups or between different survey periods.

Structured interviews are a means of collecting data for a statistical survey. In this case, the data is collected by an interviewer rather than through a self-administered questionnaire. Interviewers read the questions exactly as they appear on the survey questionnaire. The choice of answers to the questions is often fixed (close-ended) in advance, though open-ended questions can also be included within a structured interview.

4.1. CHARACTERISTICS OF THE STRUCTURED INTERVIEW:

- i. The interviewer asks each respondent the same series of questions.
- ii. The questions are created prior to the interview, and often have a limited set of response categories.
- iii. There is generally little room for variation in responses and there are few open-ended questions included in the interview guide.
- iv. Questioning is standardized and the ordering and phrasing of the questions are kept consistent from interview to interview.
- v. The interviewer plays a neutral role and acts casual and friendly, but does not insert his or her opinion in the interview.
- vi. Self-administered questionnaires are a type of structured interview.

4.2. TYPES OF STRUCTURED INTERVIEWS:**i. CLOSE-ENDED QUESTIONS:**

- Structured interview questions could be open as well as close-ended.
- The close-ended questions will ask all respondents for the right piece of information and could also require the respondent to maybe choose the right list of alternatives.
- If we are considering a close-ended question, it could be something like “are you taking drugs recently? They could be prescribed or not” and here the person who is responding shall say YES or NO. Literally, there shall not be any room for further elaboration.

ii. OPEN-ENDED QUESTIONS:

- Open-ended questions happen to those which can be answered in several ways.
- The respondent will have to elaborate and give you thoughtful answers.
- An open minded question that interviewers may also ask you includes “can you talk about the symptoms that you have been experiencing in the last few weeks”.
- The respondent will also list the symptoms they want to talk about and will not limit themselves to a couple of responses.

4.3. ADVANTAGES AND DISADVANTAGES OF STRUCTURED INTERVIEWS:

Advantages of Structured Interview	Disadvantages of Structured Interview
Make the process easy	Very little rapport
Can be checked upon	Limited assessments as well as tensions
Expands the line of questioning	Intimidating
Gives you a better idea of the issue	Internal disconnect
Questions can be rephrased	Cannot alter questions
Reliable	Complex questions
Examine understanding level	Limited scope
Powerful form of assessment	Lack to test communication
Can get to know details	Intense process
Training not required	Experts required

a) PROS OR ADVANTAGES OF STRUCTURED INTERVIEW:

Here are some of the biggest advantages that come with structured interviews.

i. MAKE THE PROCESS EASY:

- Since structured interviews mostly come with standardized questions, it makes the process much simpler and efficient.
- All people who respond will answer the same kind of questions so that they can be compared with others easily along with the trends.

II. CAN BE CHECKED UPON:

- The second benefit of structured interview is that it can be repeated all the time so that the reliability can be checked

- Often the data is not great or reliable. But since the structured interview lets you repeat and check the data constantly, the problem will be solved.

iii. EXPANDS THE LINE OF QUESTIONING:

- The best thing about this interview is that it can expand the line of questioning.
- The respondent can give you much better and detailed responses.
- This is one of the biggest and most wonderful benefits that come with structured interviews.

IV. GIVES YOU A BETTER IDEA OF THE ISSUE:

- Structured interviews always manage to give you a better and much more comprehensive view of the whole issue.
- It is beneficial for those who have difficulty while trying to understand the subject and an eye-opener as well.
- With other types, you can't read such situations well. But with structured interviews, that is very much possible.

V. QUESTIONS CAN BE REPHRASED:

- The trained interviewer may also rephrase the question if he wants in order to alter the manner or the tone so that he can sue the ones who are interviewing.

B) CONS OR DISADVANTAGES OF STRUCTURED INTERVIEW:

I. VERY LITTLE RAPPORT:

- The thing with structured interviews is that both the hiring managers as well as the candidates of the job tend to get disappointed when they see the rigidity that comes with formal interviews.
- Hiring new managers will mean that you will have to understand the prospect of the person personality as well as a good idea of their interpersonal skill as well as general demeanor.
- The candidates want to be able to develop the rapport with their hiring manager as well.
- Because of the emphasis and structure of keeping their interview well focused, there will be very little room to **build up a proper relationship**.

II. LIMITED ASSESSMENTS AS WELL AS TENSIONS:

- The thing with structured interviews is that it makes far more sense in the lower level. The same applies to technical positions.
- Whether it is sales, service or other positions that need regular communication as well as personal interaction, a structured interview is something that will reduce your ability to see and check a person's personality and their qualifications.
- They don't just have any formal interviews which leave out basic elements that include rapport and small talk as per the **formal interview definition**; the process will cause all candidates to feel tense.

iii. INTIMIDATING (FRIGHTEN, SCARE, ALARM, TERRORIZE, DISCOURAGE):

- Another thing with structured interviews is that they tend to become very intimidating to even those who are experienced or do qualify as job candidates.
- When the interview is being processed, the ability of the candidate to give away the right depiction of skills, confidence, and personal may also diminish with time.
- The goal of all interviews is to hire the best type of candidate which makes the process of the interview a problem and inhibits the person's ability to do their best.

IV. INTERNAL DISCONNECT:

- A final problem and major concern we get to see in structured interviews is that the questions are usually prepared by the staff but the managers, as well as the committees, are the ones who will handle the interview and conduct them.
- This also could mean that the managers are not feeling all that supportive or comfortable when it comes to a few questions.
- Choosing collaboration between the HR as well as hiring managers could become a disadvantage.

V. CANNOT ALTER QUESTIONS:

- The quality of the questions plays a major role which assists in the use and quality of information.
- The main disadvantage here is that the interviewer cannot add or delete questions as they like as it may affect quality.

VI. COMPLEX QUESTIONS:

- It is quite complex when a deep look is taken about the format of questions when issues and opinions are to be evaluated.
- **Open-ended questions** are another aspect where the answers are also limited when compared to any other method.

5. UNSTRUCTURED INTERVIEWS:

An unstructured interview is an interview in which there is no specific set of predetermined questions, although the interviewers usually have certain topics in mind that they wish to cover during the interview. Unstructured interviews flow like an everyday conversation and tend to be more informal and open-ended.

This is in contrast to a structured interview, when a list of predetermined questions is used. Despite not having a list of predetermined questions, unstructured interviews are still purposeful and somewhat directive.

5.1. ADVANTAGES AND DISADVANTAGES OF UNSTRUCTURED INTERVIEW:

Advantages of Unstructured Interview	Disadvantages of Unstructured Interview
Better understanding of the candidate than in a structured interview	Time consuming
It is very flexible and more comfortable	There are chances to get diverted from the entire interview
It is very valid and interactive way	It might also create a negative opinion about the organization
It breaks the communication gap between the interviewer and the candidate	There are risks of speaking about confidential matters during the interview
It creates a good hope to the candidate about the organization's work atmosphere	

A) PROS OR ADVANTAGES OF UN STRUCTURED INTERVIEWS:**I. THE BETTER UNDERSTANDING OF THE CANDIDATE THAN IN A STRUCTURED INTERVIEW:**

- In an unstructured interview, the interviewer gets to know the person better as he tries to know from his perspective.
- For example, in an interview, the interviewer asks the candidate about how to market a mobile phone and expects a different answer. The candidate explains it with various techniques involved which the interviewer might not really know.
- Hence, the next question is based on his/her answer which is a perfect example of an unstructured interview as the interviewer is able to guess the **depth of the knowledge**.
- Hence, an unstructured interview gives a better understanding of the candidate.

II. IT IS VERY FLEXIBLE AND MORE COMFORTABLE:

- A structured interview might move based on the pre-determined questions which the interviewer puts up in the interview.
- When it proceeds in the same way, the interview might move in a formal way and strictly stuck to the same area.
- In case of an unstructured interview, the candidate might be very comfortable as it proceeds like a conversation than one on one type.
- And moreover, an unstructured interview has flexibility in explaining the concept in a very informal way which exhibits the pure knowledge rather than a bookish explanation.
- Hence, an **unstructured interview is very flexible and comfortable** to both the interviewer and the candidate.

III. VERY PRACTICAL METHOD TO ANALYZE THE CANDIDATE:

- Most of the unstructured interviews happen to be very realistic and practical as it analyses and the interview happens in a very spontaneous way.
- The interview questions or answers happen to be very spontaneous and it shows the real intentions and knowledge of the candidate to the interviewer.

- Hence, unstructured interviews are a very **practical method to analyze the candidates.**

IV. IT IS A VERY VALID AND INTERACTIVE WAY:

- Unstructured interviews are very valid comparison to structured interviews because of the thorough understanding of the concept as well as the interviewer will be able to clarify the doubts of concept told by the candidate.
- Hence, the unstructured interview is something which has clarity and it is very interactive too.

V. IT BREAKS THE COMMUNICATION GAP BETWEEN THE INTERVIEWER AND THE CANDIDATE:

- In most of the formal interviews like structured interviews, the question asked is very direct and it sticks to simple bookish replies.
- Hence there is no opportunity to communicate or discuss neither interview questions nor the answer.
- Whereas, in unstructured interviews, as the interview questions are very informal and spontaneous there is good communication between the interviewer and the candidate.

B) DISADVANTAGES OF UNSTRUCTURED INTERVIEW:

Here are the few disadvantages which are said to be common in an unstructured interview. They are,

I. TIME-CONSUMING:

- In an unstructured interview, as the interview process does not have any proper direction it might be time-consuming.
- As sometimes the interview questions do not have a specific format and not pre-determined, the interviewer might not know where to stop and how to decide about the answer.
- And also sometimes it also will raise branch questions from the uncertainty of the answer. Hence, there is a lot of time consumed in an unstructured interview.

ii. THERE ARE CHANCES TO GET DIVERTED FROM THE ENTIRE INTERVIEW:

- Mostly all the interview questions in an unstructured interview have no judgment about the answer, the interviewer or the candidate tend to

divert from the topic and deviate totally out of the purpose of the interview.

- Hence, the only proper experienced person in unstructured interviews has to have opted else the real purpose of the method of the interview might go waste.

III. NOT SUITABLE FOR CERTAIN CANDIDATES:

- We cannot hope all candidates, to be decent enough take the right intention of the unstructured interview.
- There are chances that the candidate might totally take advantage of the informal way by getting into informal arguments or irrelevant topics and losing the real intention of the interview process.
- Hence, sometimes unstructured interview process might not suit all candidates.

IV. IT MIGHT ALSO CREATE A NEGATIVE OPINION ABOUT THE ORGANIZATION:

- The real intention of the unstructured interview is to make the candidate feel comfortable and interactive.
- But, there are lots of chances that the candidate might develop a misconception about the professionalism of the organization.
- They might also feel that the organization does not function in a very formal way.
- Hence, unstructured interviews have to be conducted in a correct way to avoid creating a negative opinion about the organization.

V. THERE ARE RISKS OF SPEAKING ABOUT CONFIDENTIAL MATTERS DURING THE INTERVIEW:

- In an unstructured interview, there are a lot of chances of talking about many official topics.
- Sometimes in a flow, it might also lead to the discussion about the confidential issues about the organization.

6. QUESTIONNAIRE:

A questionnaire is a research instrument consisting of a series of questions (or other types of prompts) for the purpose of gathering information from respondents. The questionnaire was invented by the Statistical Society of London in 1838.

Although questionnaires are often designed for statistical analysis of the responses, this is not always the case. Questionnaires have advantages over some other types of surveys in that they are cheap, do not require as much effort from the questioner as verbal or telephone surveys, and often have standardized answers that make it simple to compile data. However, such standardized answers may frustrate users.

Questionnaires are also sharply limited by the fact that respondents must be able to read the questions and respond to them. Thus, for some demographic groups conducting a survey by questionnaire may not be concrete.

6.1. TYPES OF QUESTIONNAIRES:

Based on the type of questions used, questionnaires are as follows:

I. STRUCTURED QUESTIONNAIRE:

- Comes under quantitative research.
- It includes the low number of researchers and the high number of respondents.
- They are also called as closed questionnaires.
- They usually include answers such as very bad, bad, good, very good and so on.
- They have a definite and concrete questions
- They have to be prepared well in advance so as to ask as much questions and receive info from the respondent.
- A formal inquiry is initiated.
- Supplements and checks the previously accumulated data.
- Commonly used in for social and economic problems, to study about the changes caused due to change in policies, laws etc.

II. UNSTRUCTURED QUESTIONNAIRE:

- A version of qualitative survey.
- They are usually based around more open questions.
- Open questions also means recording more data as the respondents can point out what is important for them, in their own words and methods.
- But it is more difficult from the researcher's side, since it does not give the correct idea of the topic and moreover proper understanding of the data is needed.
- Usually used at the time of an interview.
- Doesn't require much planning and time.
- More flexible for applying in many areas.
- Usually used to collect data about people and their personal info such as family, debates, beliefs etc.

III. SCALED QUESTIONNAIRES:

- The respondents are asked to scale the answers based on a given rating prescribed by the question.

Depending on the type of format used in questionnaires, they are divided into the following.

A. OPEN FORMAT QUESTIONS:

- These are the type of questions that are used to allow the respondents to express their views in a free flowing manner.
- By using such questions, the respondents do not have to follow the criteria for answering questions and he/she can truly express their beliefs and suggestions.

B. CLOSED FORMAT QUESTIONS:

- Multiple choice questions come under this category.
- The user is restricted to answer their opinions through the options that are set by the surveyor. Hence, these are also called as close ended questions.

IV. HAND DELIVERED QUESTIONNAIRE:

- This type of questionnaire is also called as direct questionnaire where the researcher directly goes to the respondent and shares the questions.
- The respondent needs to tick the right answers in front of the researcher.

ADVANTAGES:

- In this type the researcher will have close relationship with the respondents.
- Tough questions are explained by the researcher if the respondent wants.
- The reason to study is also described

DISADVANTAGES:

- Expensive
- Time consuming.

V. MAILED QUESTIONNAIRE:

- This type of questionnaire is mainly used by most of the researchers.
- Here the respondents would be living somewhere far and the questionnaire is sent to him by post.
- Along with the questions, a set of instruction list is also sent to him.
- The respondent needs to write the answers and send it back to the respective person or agency.

ADVANTAGES:

- Most commonly used
- Very helpful for the researcher.
- Time saving
- Easy and simple.
- Not at all expensive

DISADVANTAGES:

- Lack of returns.
- Time taking if respondents are careless and lazy.
- Scarcity of skilled respondents.
- Chances of Errors due to misunderstanding by respondents.

VI. MIXED QUESTIONNAIRE:

- Comprises of both close and open type of questions.
- Most used in social research sector.

VII. PICTORIAL QUESTIONNAIRE:

- It is not used regularly.
- Usage of pictures impacts the respondents in answering the questions

- Mostly used for the studies based on social attitudes and prejudices in children.

6.2. ADVANTAGES OF QUESTIONNAIRES:

- i. Questionnaires are really inexpensive when they are handled properly. They can be cheaper than taking surveys which requires a lot of time and money.
- ii. Questionnaires can be of different types, written, postal, telephone and many other methods.
- iii. A single question or a topic can be asked to many at the same time without any kind of delay. Unlike surveys they don't have to go to each and everyone to get an opinion.
- iv. It is an effective method to get an opinion from a large number of people.
- v. Large number of respondents can be possible varying in age, sex, occupation etc.
- vi. Question responses can be highly defined and specific, depending upon the type of questions asked in the questionnaire.
- vii. These results can also be included as statistical survey, the deciding factor is the nature of the questionnaire and on what topic was the questionnaire based on.
- viii. Unlike face to face surveys where the respondent has to answer within that moment itself, questionnaires gives time to the respondents to think carefully, before giving the answers.

6.3. DISADVANTAGES OF QUESTIONNAIRES:

- i. The results for questionnaires are based only on the type of question being asked. If the questions are poorly worded or are biased in nature, then the result analyzed will also be of the same nature.
- ii. Questionnaires can pose difficulties to the analyst if he/she is not familiar with the system based on which the questions are being asked. That is, the analyst may not be able to produce the required questions, and hence the required results cannot be achieved.
- iii. Questionnaires tend to give an alien feeling to many respondents and hence they are very impersonal irrespective of the situation. Thus, many

people do prefer face to face conversations than answering questionnaires.

- iv. The response rate may be poor in questionnaires, if people do not have time or they don't feel any importance in answering them. This is one of the main disadvantages of questionnaires.
- v. If any doubts in the answers, the analyst cannot trace back to the respondents since most of the questionnaires are usually anonymous in nature.
- vi. Some participants may forget about the whole issue and tend to forget why such questionnaire was present in the first place.
- vii. Open ended questions may take a long time and will produce a large amount of data that will take time to analyze.
- viii. Respondents may answer the questionnaire superficially, if it takes time to answer such questions. This might lead to inadequate and maybe unwanted data to analyze the final result.
- ix. Do not try to ask too many question since it might bore the respondent and ultimately it will lead to incorrect answers.
- x. Try to make the questionnaire as anonymous as possible as it will be more beneficial for the respondent to explain their opinions in detail.

6.4: SIGNIFICANCE OF QUESTIONNAIRE:

1. QUICK AND EASY TO CREATE AND INTERPRET:

Questionnaires are relatively quick and easy to create code and interpret (especially if closed questions are used). A questionnaire is easy to standardize. For example, every respondent is asked the same question in the same way. The researcher therefore can be sure that everyone in the sample answers exactly the same questions which make this a very reliable method of research.

2. ACCESSIBILITY:

The researcher is able to contact large number of people quickly easily and efficiently using a postal questionnaire (since all he/she has to do is identify the group that will be targeted and post them the list of questions).

3. POTENTIAL REDUCTION IN BIAS:

With a well designed questionnaire there is little opportunity to introduce bias into the results as may be the cases with interviews.

4. STRUCTURED DATA:

Questionnaires tend to provide highly structured quantitative data that is easily comparable either between subject groups or between the same groups studied over an extended time period. Such data is generally straightforward to convert into tables and charts and to analyze statistically.

5. INCREASED TIME FOR RESPONDENTS:

Respondents completed questionnaires allow the respondents to fill in the questionnaire at a convenient time if necessary or to be able to go back to the questionnaire at a later time if they recall anything further.

7. OBSERVATIONAL SURVEYS:

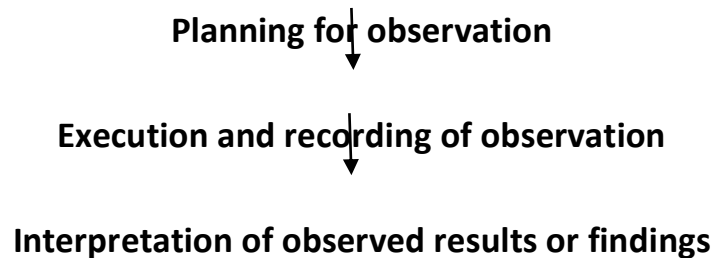
Observation is an activity of a person which senses and assimilates the knowledge of the phenomenon or the recording of data using instrument. The observation method is the most commonly used method especially in studies relating to behavioral sciences. Observational forms should specify who, what, when, where, why and way of behavior to be observed.

Under observation method, the information is sought by way of investigator's own direct observation without asking from the respondent.

Eg; in a study relating to consumer behavior, the investigator instead of asking the brand of shirt used by the respondent, may himself look at the shirt.

7.1. CONDUCTING AN OBSERVATIONAL SURVEY:

For conducting an observational survey, following steps are needed;



i. PLANNING FOR OBSERVATION:

- Observation task should be carefully planned and thoroughly analyzed before putting it to execution.
- For carrying out the task at his planning in a proper way, a researcher should be in a proper position to reply about the why, what, who, where, when and how of his observation task.
- Planning should be done relating to factors like;
 - a. Definition of specific activities
 - b. An appropriate group of subjects to observe.
 - c. Scope of observation- individual or group.
 - d. Determination of length of each observation period.
 - e. Deciding about instruments, form of recording and physical position of observer.
 - f. Determining the specific conditions required
 - g. Preparation of proper tools for recording observations.

ii. EXECUTION AND RECORDING OF OBSERVATION:

- In this step, what is planned at first stage needs to be executed in a proper way.
- The success of observation task depends much on its proper execution and recording on the part of observers.

iii. INTERPRETATION OF OBSERVED RESULTS OR FINDINGS:

- In this step, the recorded and categorized observation data is subjected to interpretation for answering the research questions raised.
- The researcher should be cautious in deriving valid conclusions from his recorded observations.

- It should reflect reasonable objectivity, reliability and validity on the part of the researcher. He should free from any biases, prejudice and rigidity of any sort for providing appropriate interpretation of observation record.

8. QUESTIONNAIRE CONSTRUCTION:

The following steps are involved in the questionnaire design process:

I. SPECIFY THE INFORMATION NEEDED:

- The first and the foremost step in designing the questionnaire is to specify the information needed from the respondents such that the objective of the survey is fulfilled.
- The researcher must completely review the components of the problem, particularly the hypothesis, research questions, and the information needed.

II. DEFINE THE TARGET RESPONDENT:

- At the very outset, the researcher must identify the target respondent from whom the information is to be collected.
- The questions must be designed keeping in mind the type of respondents under study.
- Such as, the questions that are appropriate for serviceman might not be appropriate for a businessman.
- The less diversified respondent group shall be selected because the more diversified the group is, the more difficult it will be to design a single questionnaire that is appropriate for the entire group.

III. SPECIFY THE TYPE OF INTERVIEWING METHOD:

- The next step is to identify the **way in which the respondents are reached**.
- In personal interviews, the respondent is presented with a questionnaire and interacts face-to-face with the interviewer. Thus, lengthy, complex and varied questions can be asked using the personal interview method.
- In telephone interviews, the respondent is required to give answers to the questions over the telephone. Here the respondent cannot see the questionnaire and hence this method restricts the use of small, simple and precise questions.

- The questionnaire can be sent through mail or post.
- It should be self-explanatory and contain all the important information such that the respondent is able to understand every question and gives a complete response.
- The electronic questionnaires are sent directly to the mail ids of the respondents and are required to give answers online.

IV. DETERMINE THE CONTENT OF INDIVIDUAL QUESTIONS:

- Once the information needed is specified and the interviewing methods are determined, the next step is to decide the content of the question.
- The researcher must decide on what should be included in the question such that it contributes to the information needed or serve some specific purpose.
- In some situations, the indirect questions which are not directly related to the information needed may be asked.
- It is useful to ask neutral questions at the beginning of a questionnaire with intent to establish respondent's involvement and rapport. This is mainly done when the subject of a questionnaire is sensitive or controversial.
- The researcher must try to avoid the use of **double-barreled questions**. A question that talks about two issues simultaneously, such as Is the Real juice tasty and a refreshing health drink?

V. OVERCOME RESPONDENT'S INABILITY AND UNWILLINGNESS TO ANSWER:

- The researcher should not presume that the respondent can provide accurate responses to all the questions.
- He must attempt to overcome the respondent's inability to answer.
- The questions must be designed in a simple and easy language such that it is easily understood by each respondent.
- In situations, where the respondent is not at all informed about the topic of interest, then the researcher may ask the **filter questions**, an initial question asked in the questionnaire to identify the prospective respondents to ensure that they fulfill the requirements of the sample.

VI. DECIDE ON THE QUESTION STRUCTURE:

- The researcher must decide on the structure of questions to be included in the questionnaire.

- The question can be structured or unstructured.
- The unstructured questions are the open-ended questions which are answered by the respondents in their own words. These questions are also called as a free-response or free-answer questions.
- While, the structured questions are called as closed-ended questions that pre-specify the response alternatives. These questions could be a multiple choice question, dichotomous (yes or no) or a scale.

VII. DETERMINE THE QUESTION WORDING:

- The desired question content and structure must be translated into **words which are easily understood** by the respondents.
- At this step, the researcher must translate the questions in easy words such that the information received from the respondents is similar to what was intended.

VIII. DETERMINE THE ORDER OF QUESTIONS:

- At this step, the researcher must decide the **sequence in which the questions are to be asked**.
- The opening questions are crucial in establishing respondent's involvement and rapport, and therefore, these questions must be interesting, non-threatening and easy.
- Usually, the **open-ended questions** which ask respondents for their opinions are considered as good opening questions, because people like to express their opinions.

IX. IDENTIFY THE FORM AND LAYOUT:

- The **format, positioning and spacing** of questions has a significant effect on the results.
- The layout of a questionnaire is specifically important for the self-administered questionnaires.
- The questionnaires must be divided into several parts, and each part shall be numbered accurately to clearly define the branches of a question.

X. REPRODUCTION OF QUESTIONNAIRE:

- Here, we talk about the **appearance of the questionnaire**, i.e. the quality of paper on which the questionnaire is either written or printed.

- In case, the questionnaire is reproduced on a poor-quality paper; then the respondent might feel the research is unimportant due to which the quality of response gets adversely affected.
- Thus, it is recommended to reproduce the questionnaire on a good-quality paper having a professional appearance.
- In case, the questionnaire has several pages, then it should be presented in the form of a booklet rather than the sheets clipped or stapled together.

XI. PRETESTING:

- Pretesting means **testing the questionnaires on a few selected respondents** or a small sample of actual respondents with a purpose of improving the questionnaire by identifying and eliminating the potential problems.
- All the aspects of the questionnaire must be tested such as question content, structure, wording, sequence, form and layout, instructions, and question difficulty.
- The researcher must ensure that the respondents in the pretest should be similar to those who are to be finally surveyed.

Thus, the questionnaire design is a multistage process that requires the researcher's attention to many details.

9. ORGANISING QUESTIONS:

- Organizing of questions in questionnaire is an important aspect of questionnaire structure.
- Researchers initially start with general questions and move to specific areas of interest.
- Generally, before starting the questionnaire, the interviewer introduces the research purpose to the respondent.
- The sequencing of questions should be in the following order;
 - ✚ Lead-in-questions
 - ✚ Qualifying questions
 - ✚ Warm-up questions
 - ✚ Specific questions
 - ✚ Demographic questions

i. LEAD IN QUESTIONS:

- First of all, the lead-in questions are asked in a questionnaire.
- These questions are designed to get the respondents attention in the first stage itself so that he is engaged for the entire duration of the research.
- These are simple questions, which bind the respondent to the questionnaire.

II. QUALIFYING QUESTIONS:

- After lead-in questions, which encourage the respondents. Some relevant questions are asked which can lead to the main purpose of the study.
- Qualifying questions gradually bring the respondents to the objective of the study.
- Depending upon the answers, respondents qualify for further objective questions.

iii. WARM-UP QUESTIONS:

- Warm-up questions are asked only after the lead-in and qualifying questions.
- Clearly, the interview cannot start with this type of questions, as many respondents may consider it personal.

iv. SPECIFIC QUESTIONS:

- Specific questions are directly based on research objectives.
- Here, direct questions are asked about the research problem to those participants who respond favorably.
- These questions help in deriving most important information related to the research issue.

v. DEMOGRAPHIC QUESTIONS:

- The demographic variables such as age, income, gender etc., are useful in classifying the customers and in analyzing how respondents belonging to different demographic classes differ in terms of opinions.
- Demographic questions are developed in order to collect the information related to these demographic variables.

10. STRUCTURED QUESTIONNAIRE:

Structured questionnaire consist of closed questions with predefined answers. The researcher has to anticipate all possible answers with pre-coded responses. They are used in large interview programmes and may be carried out over the telephone, face-to-face or self-completion depending on respondent's type, the content of questionnaire and budget.

Structured questionnaire comes under quantitative research. It includes a low number of researchers and the high number of respondents. They are also called as **closed questionnaires**. They usually include answers such as very bad, bad, good, very good and so on.

- They have a definite and concrete questions
- They have to be prepared well in advance so as to ask as many questions and receive info from the respondent.
- A formal inquiry is initiated.
- Supplements and checks the previously accumulated data.
- Commonly used in for social and economic problems, to study about the changes caused due to change in policies, laws etc.

10.1. TYPES OF STRUCTURED QUESTIONNAIRE:

- i. Structured disguised questionnaire
- ii. Structured non-disguised questionnaire

I. STRUCTURED DISGUISED QUESTIONNAIRE:

- Disguised questionnaire is one, in which questions are not pre-arranged and the purpose of interview is not revealed to the respondent.
- The idea here is that respondents would show their abilities without hesitation which would not be reflected when the purpose is known.
- Here, the interviews take the form of story-telling, sentence-completion tests, word association tests etc.,

ii. STRUCTURED NON-DISGUISED QUESTIONNAIRE:

- This type of questionnaire contains pre-arranged sets of questions which are asked strictly in a fixed format.

- The objective or the purpose of this questionnaire is already explained to the respondents because by doing so that they can realize the importance and provide desired response.
- This type of questionnaire is very popular among market researchers.
- This method is used in personal interviews, mailing and telephone.

LIMITATIONS:

- Inability of respondents in providing desired information.
- Unwillingness of respondents
- Ineffectiveness of questions in deriving correct responses.

11. UNSTRUCTURED QUESTIONNAIRE:

- Unstructured questionnaires are made up of questions that elicit free responses.
- These are guided conversations rather than structured interviews and would often be referred to as a topic guide.
- The topic guide is made up of a list of questions with an apparent order but is not so rigid that the interviewer has to follow it in detail.
- A version of the qualitative survey.
- They are usually based around more open questions. Open questions also mean recording more data as the respondents can point out what is important for them, in their own words and methods. But it is more difficult from the researcher's side since it does not give the correct idea of the topic and moreover, a proper understanding of the data is needed.
- Usually used at the time of an interview.
- It doesn't require much planning and time.
- More flexible for applying in many areas.
- Usually used to collect data about people and their personal info such as family, debates, beliefs etc

TYPES OF UNSTRUCTURED QUESTIONNAIRE:

- Unstructured disguised questionnaire
- Unstructured non disguised questionnaire.

i. UNSTRUCTURED DISGUISED QUESTIONNAIRE:

- In this type of questionnaire the researcher doesn't reveal the purpose of the study but still retains a structured manner of research.
- Here the research tries to expose the latent perception of respondents through use of psychology scales.
- This questionnaire is used in case of inability of non disguised questionnaire.
- Through this method the information known by the respondent is explored rather than their feelings about an object or an issue.

ii. UNSTRUCTURED NON DISGUISED QUESTIONNAIRE:

- A non structured non dig guised questionnaire contains open ended questions which are not like structured non disguised questionnaires.
- Here the objectives of the study is made clear at the beginning of the study so made clear at the beginning itself so that the respondent is aware of the purpose of his answers to be used is research.
- Since these are unstructured in nature deciding the sequence of asking questions depends upon the researcher
- This is called depth interview.

BENEFITS:

- I. Large amount of information may be collected.
- II. Flexibility in the sequence of questions
- III. Only desired information is gathered

LIMITATIONS:

- I. Time consuming to administer
- II. Non co-operating from the respondents
- III. Quantification of open ended responses becomes difficult.

12. GUIDELINES FOR QUESTIONNAIRE CONSTRUCTION:

The researcher must pay attention to the following points in constructing an appropriate and effective questionnaire;

- i. The researcher must keep in view the problem he is study for it provides the starting point for developing the questionnaire.
- ii. Researcher must be clear about various aspects of his research problem to be dealt with in the course of his research project.
- iii. Appropriate form of questions depends on the nature of information sought. The researcher must decide whether to use closed or open ended question.
- iv. Questions should be simple and must be constructed with a view to their forming a logical part of a well thought out tabulation plan.
- v. The units of enumeration should be defined precisely so that they can ensure accurate and full information.
- vi. Rough draft of the questionnaire is prepared, giving due thought to the appropriate sequence of putting questions.
- vii. Researcher must invariably re-examine, and in case of need may revise the rough draft for a better one. Technical defects must be minutely scrutinized and removed.
- viii. Pilot study should be undertaken for pretesting the questionnaire. The questionnaire may be entitled in the light of the results of the pilot study.
- ix. Questionnaire must contain simple but straight forward directions for the respondents so that they may not feel any difficulty in answering the questions.

PREVIOUS QUESTIONS

OBSERVATION:

- Observation is the *active acquisition of information* from a primary source. In living beings, observation employs the senses.
- In science, observation can also involve the recording of data via the use of scientific instruments.

- The term may also refer to any data collected during the scientific activity.
- Observations can be *qualitative*, that is, only the absence or presence of a property is noted, or *quantitative* if a numerical value is attached to the observed phenomenon by counting or measuring.
- Observation as a data collection method can be *structured or unstructured*.
- In structured or systematic observation, data collection is conducted using specific variables and according to a pre-defined schedule.
- Unstructured observation, on the other hand, is conducted in an open and free manner in a sense that there would be no pre-determined variables or objectives.

TYPES OF OBSERVATION:

I. PARTICIPANT OBSERVATION:

- Participant observation was first introduced by Prof. Edward Winder Man.
- It means the activities of a group in which an observer himself participates and note the situation.
- He willingly mixes with the group and performs his activities as an observer not merely a participator who criticizes the situation. In other words he takes place and shares the activities with his group.
- For example when we study the rural and urban conditions of Asian people, we have to go there and watched what is going on.
- The best philosophy of participant observation is that we watch the phenomena not to ask. The actual behavior of the group can be observed only by participant observation not by any other method.

Merits

1. The observer is personally involved in group activities and shares their feelings and prejudices.
2. He participates himself and get insight into the behavior of the group.
3. It motivates and stimulates mutual relationship b/w the observer and observe.
4. He can get more information's with accuracy and precision.
5. The information's are recorded in front of the group people.

Demerits

1. The observer may develop emotional attachment to his group which will lose the objectivity of the study.
2. Cannot observe a certain phenomenon in a short time available to him.
3. Cannot cover a wide area through this method.

II. NON-PARTICIPANT OBSERVATION:

- The non-participant observation has a lack of participation of the observer in his group activities.
- He either watches the phenomena from a distance or participate in the group but never in its activities. He only sit in the group but do not interest in the process.
- The difference between participant & non-participant observation is that, in the former the observer himself take part in a group and become the member of that group also participate in their activities with full fledge while the latter refers to the less or no participation of the observer in his group, their membership and activities.
- He watches from a distance but do not have active eye sight that what is going on in the field of research.

Merits

1. Although observer himself never attach to the group but the objectivity maintained.
2. Less emotional involvement of the observer leads to accuracy and greater objectivity.
3. Having secondary relationship with his group, so the information's are collected entirely.
4. Through non-participant observation the research remains very smooth.

Demerits

1. Do not have full knowledge about the group activities.
2. Cannot understand the whole phenomena.
3. Cannot get real and deep insight into the phenomena.

III. CONTROLLED OBSERVATION:

- Here observer and observe or subject both are controlled.
- For systematic data collection control is imposed on both for accuracy and precision.
- When observation is pre-planned and definite, then it is termed as controlled observation.

- In control observation, mechanical devices are used for precision and standardized.
- So, control increase accuracy, reduce bias, and ensure reliability and standardization.
- Some of the devices are as under.

1. Observational plan.
2. Observational schedule.
3. Mechanical appliances like, camera, maps, films, video, tape recorder etc.
4. Team of observers.
5. Socio Metric Scale.

Controlled observation	
Advantages	Disadvantages
<ul style="list-style-type: none"> • more control • more accurate observations • easier to replicate • usually avoid ethical problems of consent 	<ul style="list-style-type: none"> • awareness of being observed might affect participants behavior • low ecological validity • demand characteristics • cause and effect

IV. UNCONTROLLED OBSERVATION:

- Uncontrolled observation takes place in a natural setting without the influence of external or outside control.
- The observer does not plan in advance but this is related to day to day problems and socio-cultural problems.
- It studies some of our life situations.

V. STRUCTURED AND UN-STRUCTURED OBSERVATION:

- It is this type careful information's are recorded in a standardized way.
- It is a planned observation of a phenomena and to follow certain patterns, rules and designs for the purpose what, how and when to observe, .
- Unstructured observation is opposite to structured. This is not systematic and un-planned observation.
- A researcher does not set a plan in advance but he get the information's freely. There is no rule to follow by the researcher.

Structured Observation	
Advantages	Disadvantages
<ul style="list-style-type: none"> • simple to carry out • easy to replicate • provides quantitative data • easily analyzed statistically 	<ul style="list-style-type: none"> • data is not in depth so important information may be missed • behaviors may be missed if they is no coding scheme • gives restricted views of what is actually happening

Unstructured Observation	
Advantages	Disadvantages
<ul style="list-style-type: none"> • provides rich/detailed data • unexpected behaviors are still included • Provides qualitative data 	<ul style="list-style-type: none"> • can be difficult to miss behavior without recording equipment • difficult to analyze • hard to replicate • Observers have a tendency to record most eye catching or noticeable behavior that might not be important or relevant.

QUESTIONNAIRE VERSUS SCHEDULE:

BASIS FOR COMPARISON	QUESTIONNAIRE	SCHEDULE
Meaning	Questionnaire refers to a technique of data collection which consists of a series of written questions along with alternative answers.	Schedule is a formalized set of questions, statements and spaces for answers, provided to the enumerators who ask questions to the respondents and note down the answers.
Filled by	Respondents	Enumerators
Response Rate	Low	High
Coverage	Large	Comparatively small
Cost	Economical	Expensive
Respondent's identity	Not known	Known
Success relies on	Quality of the questionnaire	Honesty and competence of the enumerator.
Usage	Only when the people are literate and cooperative.	Used on both literate and illiterate people.

TYPES OF QUESTIONS:

1. Open-ended questions
2. Closed-ended questions
3. Rating questions
4. Likert scale questions
5. Multiple choice questions
6. Picture choice questions
7. Demographic questions

1. OPEN-ENDED QUESTIONS:

- Open up a conversation with this question.
- With an open-ended question, you can (hopefully) get more meaningful answers from the people filling out your survey.
- If you're looking for a yes/no answer—you need to use a closed-end question.

Open-ended question examples

- i. What are you wearing today?
- ii. How did you meet your best friend?
- iii. What is it like to live in Barcelona

2. CLOSED-ENDED QUESTIONS:

- Some questions just need a one-word answer. Like yes. Or no.
- You can use them for finding out some quick tit-bits of information—then go on to segment your survey-filler-inners accordingly.

Closed-ended questions examples

- i. Did you order the chicken?
- ii. Do you like learning German?
- iii. Are you living in Australia?

3. RATING QUESTIONS:

It's a super useful question to ask, as you can gauge peoples' opinions across the board.

Rating questions examples

- i. How would you rate our service out of 5?
- ii. How many stars would you give our film?
- iii. Please, rate how valuable our training was today.

4. LIKERT SCALE QUESTIONS:

- Likert scale questions are great for finding out what people think about certain things.
- Generally, they come in 5, 7, or 9-point scales and you've probably filled one out before.
- Use them to find out your Net Promoter Score and boost your business.

Likert scale questions examples

- i. Do you agree that channel 5 offers more comedy than channel 6?
- ii. How satisfied are you today with our customer service?
- iii. Do you feel affected by the recent changes in the office?

5. MULTIPLE CHOICE QUESTIONS:

- Sending out a test or quiz? Multiple choice questions are your friend, friend.
- You can give a few answers and hide the real answer.
- Also, if you want to find out time periods, or dates for an event—multiple choice questions are the one.

Multiple choice questions examples

- i. Face book was launched in... 2003 | 2004 | 2005 | 2006
- ii. How many of our restaurants have you visited? 1 | 2 | 3 | 4
- iii. What is the capital of Scotland? Perth | Glasgow | Aberdeen | Edinburgh

6. DEMOGRAPHIC QUESTIONS

- Demographic survey questions are a mix of different forms of questions.
- It's up to you whether you want to use a drop-response or an open-ended question with them.
- They all talk about things which can be seen as a bit touchy, so take heed.

Multiple choice questions examples

- i. How old are you?
- ii. What's your gender?
- iii. Which industry do you work in?

QUESTIONNAIRE DESIGN PROCESS

DEFINITION:

Questionnaire is a systematic, data collection technique consists of a series of questions required to be answered by the respondents to identify their attitude, experience, and behavior towards the subject of research.

The following steps are involved in the questionnaire design process:

I. Specify the Information Needed:

- The first and the foremost step in designing the questionnaire is to specify the information needed from the respondents such that the objective of the survey is fulfilled.
- The researcher must completely review the components of the problem, particularly the hypothesis, research questions, and the information needed.

II. Define the Target Respondent:

- At the very outset, the researcher must identify the target respondent from whom the information is to be collected.
- The questions must be designed keeping in mind the type of respondents under study.
- Such as, the questions that are appropriate for serviceman might not be appropriate for a businessman.

III. Specify the type of Interviewing Method:

- The next step is to identify the **way in which the respondents are reached**.
- In personal interviews, the respondent is presented with a questionnaire and interacts face-to-face with the interviewer. Thus, lengthy, complex and varied questions can be asked using the personal interview method.
- In telephone interviews, the respondent is required to give answers to the questions over the telephone. Here the respondent cannot see the questionnaire and hence this method restricts the use of small, simple and precise questions.

IV. Determine the Content of Individual Questions:

- The researcher must decide on what should be included in the question such that it contributes to the information needed or serve some specific purpose.

V. Overcome Respondent's Inability and Unwillingness to Answer:

- The researcher should not presume that the respondent can provide accurate responses to all the questions.
- He must attempt to overcome the respondent's inability to answer.
- The questions must be designed in a simple and easy language such that it is easily understood by each respondent.

VI. Decide on the Question Structure:

- The researcher must decide on the structure of questions to be included in the questionnaire. The question can be structured or unstructured.
- The **unstructured questions are the open-ended questions** which are answered by the respondents in their own words. These questions are also called as a **free-response** or **free-answer questions**.
- While, the **structured questions are called as closed-ended questions** that pre-specify the response alternatives. These questions could be a multiple choice question, dichotomous (yes or no) or a scale.

VII. Determine the Question Wording:

- At this step, the researcher must translate the questions in easy words such that the information received from the respondents is similar to what was intended.
- In case the question is written poorly, then the respondent might refuse to answer it or might give a wrong answer.
- In case, the respondent is reluctant to give answers, then "**non response**" arises which increases the complexity of data analysis.
- On the other hand, if the wrong information is given, then "**response error**" arises due to which the result is biased.

VIII. Determine the Order of Questions:

- At this step, the researcher must decide the sequence in which the questions are to be asked.
- The opening questions are crucial in establishing respondent's involvement and rapport, and therefore, these questions must be interesting, non-threatening and easy.
- Usually, the open-ended questions which ask respondents for their opinions are considered as good opening questions, because people like to express their opinions.

IX. Identify the Form and Layout:

- The format, positioning and spacing of questions has a significant effect on the results.
- The layout of a questionnaire is specifically important for the self-administered questionnaires.
- The questionnaires must be divided into several parts, and each part shall be numbered accurately to clearly define the branches of a question.

X. Reproduction of Questionnaire:

- It is recommended to reproduce the questionnaire on a good-quality paper having a professional appearance.
- In case, the questionnaire has several pages, then it should be presented in the form of a booklet rather than the sheets clipped or stapled together.

XI. Pretesting:

- Pretesting means testing the questionnaires on a few selected respondents or a small sample of actual respondents with a purpose of improving the questionnaire by identifying and eliminating the potential problems.
- All the aspects of the questionnaire must be tested such as question content, structure, wording, sequence, form and layout, instructions, and question difficulty.

Thus, the questionnaire design is a multistage process that requires the researcher's attention to many details.

CASE STUDY:

JOB SATISFACTION LEVEL

You are asked to conduct a study on the job satisfaction level of employees of a company.

QUESTION

Which type of data, primary or secondary will you use and why? for collection of primary data which method do you think is the best and why?

ONE POSSIBLE SOLUTION

As mentioned in the question a study on the job satisfaction level of employees of a company will have to be conducted. ***In this study, primary data should be used.*** Reasons to use primary data are as follows,

1. **RELIABILITY**: The information collected for primary data is more reliable than those collected from the secondary data because this information is collected directly from the respondents.
2. **AVAILABILITY OF A WIDE RANGE OF TECHNIQUES**: There are lot of techniques that can be employed which means that all information necessary can be obtained by using the appropriate techniques enabling all areas of the research topic to be answered and investing thoroughly and effectively.
3. **ADDRESSES SPECIFIC RESEARCH ISSUE**: The organization asking for the research has the complete as far as its objectives and scope is concerned. Researching company can be asked to concentrate their efforts to find data regarding specific market rather than concentration on mass market. Primary research is designed to collect the information the marketer wants to know and report it in ways that benefit the marketer.
4. **GREATER CONTROL**: Not only does primary research enable the marketer to focus on specific issues it also ***enables the marketers to have a higher level of control over how the information is collected.*** In this way the marketer can decide on such issues as size, project location of research and timeframe for completing the project.
5. **EFFICIENT SPENDING FOR INFORMATION**: Unlike secondary research where the marketer may spend for information that is not needed primary data

collection focuses on issues specific to the researcher and improves the changes that research funds will be spent efficiently.

6. PROPRIETARY INFORMATION: Information collected by the marketer using primary research is their own and is generally not shared with other. Thus information can be kept hidden from competitors and potentially offer an information advantage to the company that under look the primary research.

PRIMARY DATA COLLECTION METHOD

- In this case, the most suitable method for data collection would be questionnaire.
- Questionnaire is a data collection instrument. It is a list of questions to be asked from respondents. It also contains a suitable space where the answers can be recorded.
- The term questionnaire usually refers to a self administered process whereby the respondents himself reads the question and records his answers without the assistance of an interviewer.
- This is a narrow definition of a questionnaire.

SIGNIFICANCE OF QUESTIONNAIRE

1. QUICK AND EASY TO CREATE AND INTERPRET: Questionnaires are relatively quick and easy to create code and interpret (especially if closed questions are used). A questionnaire is easy to standardize. For example, every respondent is asked the same question in the same way. The researcher therefore can be sure that everyone in the sample answers exactly the same questions which make this a very reliable method of research.

2. ACCESSIBILITY: The researcher is able to contact large number of people quickly, easily and efficiently using a postal questionnaire (since all he/she has to do is identify the group that will be targeted and post them the list of questions).

3. POTENTIAL REDUCTION IN BIAS: With a well designed questionnaire, there is little opportunity to introduce bias into the results as may be the cases with interviews.

4. STRUCTURED DATA: Questionnaires tend to provide highly structured quantitative data that is easily comparable either between subject groups or between the same groups studied over an extended time period. Such data is generally straightforward to convert into tables and charts and to analyze statistically.

5. INCREASED TIME FOR RESPONDENTS: Respondents completed questionnaires allow the respondents to fill in the questionnaire at a convenient time if necessary or to be able to go back to the questionnaire at a later time if they recall anything further.

IMPORTANT QUESTIONS:

UNIT-3

1. What are the types and sources of data? Explain.
2. Write short notes on:
 - a) Primary and secondary data.
 - b) Types of interview.
3. Discuss the types of interviews with their merits and demerits.
4. What are the guidelines for the construction of questionnaire?
5. What is observation? What are its types? Discuss their merits and demerits.
6. What is questionnaire? Explain the process and guidelines for construction of questionnaire.
7. Write a short note on;
 - a) Questionnaire versus schedule
 - b) Types of questions

PREPARED BY:

HIMMAT T

ASSOCIATE PROFESSOR,

BALAJI INSTITUTE OF IT & MANAGEMENT

KADAPA.

(17E00204) BUSINESS RESEARCH METHODS

Course Code	BUSINESS RESEARCH METHODS		L	T	P	C
21E00204			4	0	0	4
Semester			II			
Course Objectives:						
<ul style="list-style-type: none">To introduce business research, types and technology used in business research.To explain in detail on research process involved in business research.To discuss sources of data and instruments to collect dataTo provide knowledge on analysis and interpretation of outcome of the data in a scientific way.To provide knowledge on descriptive and inferential statistical analysis.To impart competence skills to undertake business research problem and carryout scientific research.						
*Standard Statistical tables shall be allowed in the examination						
Course Outcomes (CO): Student will be able to						
<ul style="list-style-type: none">Learn types of business research, technology used in business research in technological era.Identify research problem, appropriate research design and sample design for the problem, formulate hypothesis, testing process of hypothesis.Understand sources of data, instruments to collect data, analyse and interpretation of data.Prepare and present the research report effectively and efficiently.						
UNIT - I					Lecture Hrs:08	
Introduction to Business Research: Definition-Types of Business Research. Scientific Investigation, Technology and Business Research: Information needs of Business - Technologies used in Business Research: The Internet, E-mail, Browsers and Websites. Role of Business Research in Managerial Decisions.						
UNIT - II					Lecture Hrs:12	
The Research Process: Problem Identification: Broad Problem Area-Preliminary Data Gathering. Literature Survey - Hypothesis Development - Statement of Hypothesis- Procedure for Testing of Hypothesis. The Research Design: Types of Research Designs: Exploratory, Descriptive, Experimental Designs and Case Study -Measurement of Variables- Operational Definitions and Scales-Nominal and Ordinal Scales- Rating Scales- Ranking Scales- Reliability and Validity - Sampling and Methods of sampling						
UNIT - III					Lecture Hrs:12	
Collection and Analysis of Data Sources of Data-Primary and Secondary Sources of Data - Data Collection Methods- Interviews: Structured Interviews and Unstructured Interviews- Observational Surveys: Questionnaire Construction: Organizing Questions- Structured and Unstructured Questionnaires – Guidelines for Construction of Questionnaires.						
UNIT - IV					Lecture Hrs:12	
Data Preparation and Analysis: Data preparation process, problems in preparation process - An overview of Descriptive, Associational and Inferential- Statistical Measures.						
UNIT - V					Lecture Hrs:12	
The Research Report: Research Reports-Components-The Title Page-Table of Contents-The Executive Summary-The Introductory Section-The Body of the Report-The Final Part of the Report-Acknowledgements – References-Appendix - Guidelines for Preparing a Good Research report - Oral Presentation.						
Textbooks:						
<ol style="list-style-type: none">Research Methodology – methods & Techniques, C.R. Kothari, Vishwa prakashan.Research Methods for Business–A Skill Building Approach, Uma Sekaran, John Wiley & Sons (Asia) Pvt. Ltd, Singapore.						

UNIT-4

DATA PREPARATION AND ANALYSIS

1. Data Preparation Process:

A researcher collects huge amount of data with the help of different methods and tools. Data collection is an important stage in the research process. But mere collection of data does not help the researcher in any manner. It is necessary to process the data, to derive the desired results from it. Hence, data processing is an important or even more important stage in the research work. The processing of data includes different stages like editing, Coding, classification and tabulation of data. Data processing is a connecting link between the data collection stage and the stage of analysis and interpretation.

STAGES OF PROCESSING OF DATA-

The data processing is done in following four stages:

- (1) Editing.
- (2) Coding.
- (3) Classification.
- (4) Tabulation.

1) **Editing of Data:** It is the basic stage in the data processing task.

Definition

- (a) Editing refers to, “A process of checking to detect and correct errors and omissions.”
- (b) Editing is a process of examining the collected raw data to detect errors, inconsistencies and omissions if any, and to correct these wherever possible.

Types/Levels of Data Editing

- a. **Field Editing:** It includes reviewing the reporting forms by the investigator for completing or translating what the other has written in abbreviated form at the time of interviewing of respondents. This form of editing deals with handling the errors or complexities made by the enumerator while collecting the data from respondent. It might be difficult to understand the data for researcher. It is necessary to avoid guess work or recording by fluke, which may affect the reliability of the research work.

- b. Central Editing:** This type of editing is done at central place when all the questionnaires or forms are returned by the enumerators to the researcher. The editing should be done according to the size of the research work. It means an individual can take care of editing in case of small study or a small group of persons can be appointed to edit a large study.

The success of the Editing of data is based upon following 3 Cs.

- Correctness.
- Completeness.
- Commonness.

2) **Coding:** In the stage of data collection huge data is collected by the researcher through questionnaire and schedule. It is necessary to assign certain numbers, signs to such data.

“The process of assigning some symbols, either alphabetical or numerals or both to the answers is known as coding.”

The recording of data is done on the basis of this coding scheme. The responses collected in a data sheet varies, sometimes the response could be the choice among a multiple response, sometimes the response could be in terms of values or it may be in alphanumeric form coding helps to bring uniformity which serves towards data analysis. When codification is done, it is necessary to keep a log of the codes allotted to the observations.

Types of Coding

(a) **Numeric Coding:** It includes use of different numbers to indicate different data. For example ‘0’ can be used for teenagers ‘1’ can be used for adults ‘2’ can be used for senior-citizens. This will give a concise form to the vast data and it can be exhibited in a concise and convenient manner.

(b) **Alphabetic Coding:** A mere tabulation or frequency count or graphical representation if the variables may be given an alphabetic coding.

(c) **Zero Coding:** This method should be assigned with proper care. In many cases, the zero coding is used to record “no response” from the respondents. But while utilizing it care should be taken for non allotment of “Zero” as a code for any other response. The coding sheet needs to be prepared carefully if the data recording is done by someone else other than the researcher.

3) **Classification of Data:** After the stage of editing and coding of data the next stage in the data processing is classification of data.

Definition “The process of arranging the data in groups and classes according to resemblance and similarities which is technically called as classification.” In classification, units having common characteristics are placed in a class and in this fashion the whole data is deviled into a number of classes. Unless and until the data is classified, it is unable to express or derive any conclusion. Classification gives the value of certainty to the data. It is a process of arranging the data according to the points of similarities or dissimilarities.

Types or Bases of Classification

(1) **Qualitative Classification:** When the data is classified according to some attributes which are not capable of measurement. Such classification is known as qualitative classification. For e.g. – Classification such as (i) literate-illiterate, (ii) Primary, secondary, higher secondary education, (iii) Rich class, middle class, poor class etc.

(2) **Quantitative Classification:** When the data is classified according to some characteristics that can be measured, it is called as quantitative classification. For e.g. – Age, height, income, production, etc. Quantitative data may be further classified into one or two types namely, discrete or continuous. (i) Discrete data refers to quantitative data that is limited to certain numerical values of a variable. For e.g. – Number of students in a college. (ii) Continuous data considers all values of the variable. If considers integers. For e.g. – Data relating to temperature, height, distance, etc.

(3) **Geographical Classification:** When the data is classification according to area or region, it is called as geographical classification. For e.g. – Country, state, district, taluka, village, etc.

(4) **Chronological classification** when the data is classified according to the time of its occurrence for e.g. – Days, weeks, months, years, etc.

4) **Tabulation of Data:** After the classification of data, they are presented in the form of tables so that the qualifies and characteristics implicit in them may be explicit. Classification and tabulation are interrelated and interdependent. The data which is classified must be presented in the form of tables, and then only it can be used in the research work.

(a) Tabulation simply means presenting a data through tables. It is after the stage of classification in the process of statistical investigation.

(b) “Tabulation is an orderly arrangement of data in columns and rows.”

(c) Tabulation means exhibiting or presenting the data in vertical and horizontal columns and rows. It includes preparing a chart or table of the data according to the attributes.

Tabulation can be done manually or through the computer. The decision depends upon different factors like, type of study, cost considerations, time pressures and the availability of software packages. Manual tabulation is useful for small and simple studies.

Tabulation is used for summarization and condensation of data. It helps in analysis of relationships, trends and other summarization of the given data. Tabulation may be simple or complex in nature. Simple tabulation focuses on one-way tables. Whereas complex tabulation usually results in two way tables or three way tables.

In tabulation, every row and column is assigned a suitable title, to present the data according to the convenience of research study.

Types of Tabulation/Statistical Table

(1) Simple and Complex Tabulation When a single attribute is taken into account while exhibiting the data, it is called as simple tabulation. It is always in small size. For example: (i) Tabulation which shows the division of data into two or more categories and gives information about one or more sets of inter related questions it is called as complex tabulation. (ii) Simple tabulation- If a table exhibits rainfall in the Mumbai city in different years, it will be known as simple tabulation. Example of complex tabulation – Preparation of census report.

(2) General Tabulation and Particular Tabulation This tabulation does not aim at any particular single objective. General tabulation focuses to present or to show all available information in a systematic manner. It is a broad-based type of tabulation. It is useful for comparative study of the available attributes. For example: Statistical tables published by government, Reserve Bank of India Bulletins, etc. They only focus or show the facts but are not useful for any specific situation. They are mainly used by researchers to draw their own conclusions related to the research work. Particular tabulation focuses on some particular objective. These tables are small in size serving mainly to the statically analysis or comparison of particular issues. They are also known as summary tables. They are mainly used in research reports.

(3) One - Way Table It considers only one quantity or characteristic. For example - Distribution of students on the basis of subjects of their study. Construction of one way table is easy and simple. An example of one way Table.

One Way Table

Education Level of Residents in a City

S.No	Levels of Education	Number of Citizen
1	Primary	
2	Secondary	
3	Higher Secondary	
4	Graduate	
	Total	

2. Problems in Preparation Process

Some problems in processing of data are as follows.

We can take up the following two problems of processing the data for analytical purposes

- a. **The problem concerning “Don’t know” (or DK) responses:** While processing the data, the researcher often comes across some responses that are difficult to handle. One category of such responses may be ‘Don’t Know Response’ or simply DK response.

When the DK response group is small, it is of little significance. But when it is relatively big, it becomes a matter of major concern in which case the question arises: Is the question which elicited DK response useless? The answer depends on two points viz., the respondent actually may not know the answer or the researcher may fail in obtaining the appropriate information.

In the first case the concerned question is said to be alright and DK response is taken as legitimate DK response. But in the second case, DK response is more likely to be a failure of the questioning process.

How DK responses are to be dealt with by researchers? The best way is to design better type of questions. Good rapport of interviewers with respondents will result in minimising DK responses. But what about the DK responses that have already taken place? One way to tackle this issue is to estimate the allocation of DK answers from other data in the questionnaire.

The other way is to keep DK responses as a separate category in tabulation where we can consider it as a separate reply category if DK responses happen to be legitimate, otherwise we should let the reader make his own decision.

Yet another way is to assume that DK responses occur more or less randomly and as such we may distribute them among the other answers in the ratio in which the latter have occurred. Similar results will be achieved if all DK replies are excluded from tabulation and that too without inflating the actual number of other responses.

b Use or percentages: Percentages are often used in data presentation for they simplify numbers, reducing all of them to a 0 to 100 range. Through the use of percentages, the data are reduced in the standard form with base equal to 100 which fact facilitates relative comparisons. While using percentages, the following rules should be kept in view by researchers:

1. Two or more percentages must not be averaged unless each is weighted by the group size from which it has been derived.
2. Use of too large percentages should be avoided, since a large percentage is difficult to understand and tends to confuse, defeating the very purpose for which percentages are used.
3. Percentages hide the base from which they have been computed. If this is not kept in view, the real differences may not be correctly read.
4. Percentage decreases can never exceed 100 per cent and as such for calculating the percentage of decrease, the higher figure should invariably be taken as the base.
5. Percentages should generally be worked out in the direction of the causal-factor in case of two-dimension tables and for this purpose we must select the more significant factor out of the two given factors as the causal factor.

DATA ANALYSIS:

Data analysis is a process of inspecting, cleansing, transforming, and modeling data with the goal of discovering useful information, informing conclusions, and supporting decision-making. Data analysis has multiple facets and approaches, encompassing diverse techniques under a variety of names, while being used in different business, science, and social science domains.

In today's business, *data analysis is playing a role in making decisions more scientific and helping the business achieve effective operation.* Analysis refers to breaking a whole into its separate components for individual examination.

Data analysis is a process for obtaining raw data and converting it into information useful for decision-making by users. Data are collected and analyzed to answer questions, test hypotheses or disprove theories. It eventually helps in arriving at conclusions and proving the hypothesis.

Data analysis is a process used to inspect, clean, transform and remodel data with a view to reach to a certain **conclusion** for a given situation.

DEFINITION:

Statistician **JOHN TUKEY** defined data analysis in 1961 as: "Procedures for analyzing data, techniques for interpreting the results of such procedures, ways of planning the gathering of data to make its analysis easier, more precise or more

accurate, and all the machinery and results of (mathematical) statistics which apply to analyzing data."

TYPES OF DATA ANALYSIS:

- There are many **types** of data **analysis**.
- Some of them are more basic in nature, such as descriptive, exploratory, inferential, predictive, and causal.
- Some, however, are more specific, such as qualitative **analysis**, which looks for things like patterns and colors, and quantitative **analysis**, which focuses on numbers.
- Types of data analysis include;
 - a. Descriptive statistics
 - b. Associational statistics
 - c. Inferential statistics

a. DESCRIPTIVE STATISTICS:

- Descriptive analysis of data limits generalization to a particular group of individuals observed.
- No conclusions extend beyond this group and any similarity to those outside the group cannot be assumed.
- The data describe one group and that group only.
- Much simple action research involves descriptive analysis and provides valuable information about the nature of the particular group of individuals
- Descriptive analysis is used to describe the basic features of the data in the study.
- They provide simple summaries about the sample and the measures.
- The descriptive analysis of data provides the following:
 - i. The first estimates and summaries, arranged in tables and graphs, to meet the objectives.
 - ii. Information about the variability or uncertainty in the data
 - iii. Indications of unexpected patterns and observations that need to be considered when doing formal analysis.

b. ASSOCIATIONAL STATISTICS:

- The **measures of association** refer to a wide variety of coefficients (including vicariate correlation and regression coefficients) that measure the strength and direction of the relationship between variables; these measures of strength, or association, can be described in several ways, depending on the analysis.
- For measures of association, a value of zero signifies that no relationship exists.
- In a correlation analysis, if the coefficient (r) has a value of one, it signifies a perfect relationship on the variables of interest.
- In regression analyses, if the standardized beta weight (β) has a value of one, it also signifies a perfect relationship on the variables of interest.
- The researcher should note that vicariate measures of association (e.g., Pearson correlations) are inappropriate for curvilinear relationships or discontinuous relationships.

NOTE:

- A **Curvilinear Relationship** is a type of **relationship** between two variables where as one variable increases, so does the other variable, but only up to a certain point, after which, as one variable continues to increase, the other decreases.
- When a **function** is not continuous at a point, then we **can** say it is **discontinuous** at that point. There are several types of behaviors that lead to discontinuities. A removable **discontinuity** exists when the **limit** of the **function** exists, but one or both of the other two conditions is not met.

c. INFERENCE STATISTICS:

- **Statistical inference** is the process of using data analysis to deduce properties of an underlying probability distribution.
- ***Inferential statistical analysis infers properties of a population, for example by testing hypotheses and deriving estimates.***
- It is assumed that the observed data set is sampled from a larger population.
- Inferential statistics can be contrasted with descriptive statistics. Descriptive statistics is solely concerned with properties of the observed

data, and it does not rest on the assumption that the data come from a larger population.

- Statistical inference makes propositions about a population, using data drawn from the population with some form of sampling.

Given a hypothesis about a population, for which we wish to draw inferences, statistical inference consists of (first) selecting a statistical model

- Statistical model of the process that generates the data and (second) deducing propositions from the model.

NOTE:

A **statistical model** is a set of assumptions concerning the generation of the observed data and similar data.

AN OVERVIEW OF DESCRIPTIVE, ASSOCIATIONAL AND INFERENTIAL-STATISTICAL MEASURES:

1. DESCRIPTIVE STATISTICS:

- Descriptive analysis of data limits generalization to a particular group of individuals observed.
- No conclusions extend beyond this group and any similarity to those outside the group cannot be assumed.
- The data describe one group and that group only.
- Much simple action research involves descriptive analysis and provides valuable information about the nature of the particular group of individuals
- Descriptive analysis is used to describe the basic features of the data in the study.
- They provide simple summaries about the sample and the measures.
- Descriptive statistics include;
 - i. Measures of tendency
 - ii. Measures of dispersion

I. MEASURES OF CENTRAL TENDENCY:

- A measure of central tendency is a single value that attempts to describe a set of data by identifying the central position within that set of data.
- As such, measures of central tendency are sometimes called measures of central location.

- They are also classed as summary statistics.
- The mean (often called the average) is most likely the measure of central tendency that you are most familiar with, but there are others, such as the median and the mode.
- The mean, median and mode are all valid measures of central tendency, but under different conditions, some measures of central tendency become more appropriate to use than others.

MEAN:

- The mean (or average) is the most popular and well known measure of central tendency.
- It can be used with both discrete and continuous data, although its use is most often with continuous data.
- The mean is equal to the sum of all the values in the data set divided by the number of values in the data set.
- So, if we have n values in a data set and they have values x_1, x_2, \dots, x_n , the sample mean, usually denoted by \bar{x} (pronounced x bar), is:

$$\bar{x} = \frac{(x_1 + x_2 + \dots + x_n)}{n}$$

- This formula is usually written in a slightly different manner using the Greek capital letter, Σ pronounced "sigma", which means "sum of...":

$$\bar{x} = \frac{\sum x}{n}$$

- The above formula refers to the sample mean.
- So, why have we called it a sample mean? This is because, in statistics, samples and populations have very different meanings and these differences are very important, even if, in the case of the mean, they are calculated in the same way.
- To acknowledge that we are calculating the population mean and not the sample mean, we use the Greek lower case letter "mu", denoted as μ :

$$\mu = \frac{\sum x}{n}$$

PRACTICE PROBLEM:

Calculate the mean of the following data set:

{1, 2, 3, 4, 5, 7, 10, 15, 21, 22, 23, 24, 25, 26}

SOLUTION:

Simply use the formula for the mean μ as given above. The result is the same regardless of whether the data corresponds to a population or a sample. Note that this data set contains 14 data values.

$$\mu = \frac{1+2+3+4+5+7+10+15+21+22+23+24+25+26}{14}$$

$$\mu = \frac{188}{14} = \frac{94}{7} \approx 13.4$$

Thus, the mean of the data set is about 13.4.

MEDIAN

- The median is the middle score for a set of data that has been arranged in order of magnitude.
- The median is less affected by outliers and skewed data. In order to calculate the median, suppose we have the data below:

65	55	89	56	35	14	56	55	87	45	92
----	----	----	----	----	----	----	----	----	----	----

- We first need to rearrange that data into order of magnitude (smallest first):

14	35	45	55	55	56	56	65	87	89	92
----	----	----	----	----	-----------	----	----	----	----	----

- Our median mark is the middle mark - in this case, 56 (highlighted in bold).
- It is the middle mark because there are 5 scores before it and 5 scores after it.
- This works fine when you have an odd number of scores, but what happens when you have an even number of scores? What if you had only 10 scores? Well, you simply have to take the middle two scores and average the result. So, if we look at the example below:

65	55	89	56	35	14	56	55	87	45
----	----	----	----	----	----	----	----	----	----

- We again rearrange that data into order of magnitude (smallest first):

14	35	45	55	55	56	56	65	87	89
----	----	----	----	----	----	----	----	----	----

- Only now we have to take the 5th and 6th score in our data set and average them to get a median of 55.5.

PROCEDURE:

MEDIAN FOR AN ODD SET OF NUMBERS;

SAMPLE QUESTION:

Find the median for the following data set;

102, 56, 34, 99, 89, 101, 10.

Step 1:

Place the data in ascending order. In other words, sort your data from the smallest number to the highest number. For this sample data set, the order is: 10,34,56,89,99,101,102.

Step 2:

Find the number in the middle (where there are an equal number of data points above *and* below the number):

10, 34, 56, **89**, 99, 101, and 102. The median is 89.

Tip:

If you have a large data set, divide the number in the set by two. That tells you how many numbers should be above and how many numbers should be below. For example, $101/2 = 55.5$. Ignore the decimal: 55 numbers should be above and 55 below.

MEDIAN FOR AN EVEN SET OF NUMBERS

SAMPLE QUESTION:

Find the median for the following data set:
102,56,34,99,89,101,10,54.

Step 1: Place the data in ascending order (smallest to highest).
10,34,54,56,89,99,101,102.

Step 2: Find the TWO numbers in the middle (where there are an equal number of data points above *and* below the two middle numbers).
10, 34, 54, **56, 89**, 99, 101, 102

Step 3: Add the two middle numbers and then divide by two, to get the average:

$$56+89=145$$

$$145/2=72.5.$$

The median is 72.5.

TIP:

For large data sets, divide the number of items by 2, and then subtract 1 to find the number that should be above and the number that should be below.

For example, $100/2 = 50$. $50 - 1 = 49$. The middle two numbers will have 49 items above and 49 below.

MODE:

- The mode is the most commonly occurring data point in a dataset.
- The mode is useful when there are a lot of repeated values in a dataset.
- There can be no mode, one mode, or multiple modes in a dataset.

I. FIND THE MODE OF THE DATA:

0,0,0,1,1,1,1,2,2,2,3,4

Ans: the mode is 1 because '1' repeated for four times compared to others.

II. FIND THE MODE OF THE DATA:

5,5,5,4,7,9,8,8,5,7,8,8

Look for the value that occurs the most:

5,5,5,4,7,9,8,8,5,7,8,8

There is a tie for the value that occurs the most often.

The modes are 5 and 8.

II. MEASURES OF DISPERSION:

- The measures of central tendency are not adequate to describe data.
- Two data sets can have the same mean but they can be entirely different.
- Thus to describe data, one needs to know the extent of variability. This is given by the measures of dispersion.
- Range, inter quartile range, and standard deviation are the three commonly used measures of dispersion.
- Measures of dispersion measure how spread out a set of data is.
- Measures of dispersion include.

- A. Range
- B. Quartile deviation
- C. Standard deviation

A.RANGE:

- *In statistics, the range of a set of data is the difference between the largest and smallest values.*
- However, in descriptive statistics, this concept of range has a more complex meaning.
- The range is the size of the smallest interval which contains all the data and provides an indication of statistical dispersion.
- It is measured in the same units as the data.
- Since it only depends on two of the observations, it is most useful in representing the dispersion of small data sets.

FORMULA:

Range = Maximum Value – Minimum Value.

EXAMPLE:

i. The data set 4,6,10, 15, 18

Data set has a maximum of 18, a minimum of 4 and a range of $18-4 = 14$.

ii. We consider the data set 1, 1, 2, 3, 4, 5, 5, 6, 7, 8, 8, 10

Max value is 10

Min value is 1

The range for this data set is $10-1 = 9$.

B. STANDARD DEVIATION:**VARIANCE AND STANDARD DEVIATION:**

- The formulae for the variance and standard deviation are given below. μ means the mean of the data.

$$\text{Variance} = \frac{\sum (x_r - \mu)^2}{N}$$

The standard deviation, s , is the square root of the variance.

What the formula means;

(1) $x_r - \mu$ means take each value in turn and subtract the mean from each value.

(2) $(x_r - \mu)^2$ means square each of the results obtained from step (1)

This is to get rid of any minus signs.

(3) $\sum (x_r - \mu)^2$ means add up all of the results obtained from step (2).

(4) Divide step (3) by n , which is the number of numbers

(5) for the standard deviation, square root the answer to step (4).

Example:

Find the variance and standard deviation of the following numbers:

1, 3, 5, 5, 6, 7, 9, 10.

The mean = $46 / 8 = 5.75$

(Step 1):

$(1 - 5.75), (3 - 5.75), (5 - 5.75), (5 - 5.75), (6 - 5.75), (7 - 5.75), (9 - 5.75), (10 - 5.75)$
 $= -4.75, -2.75, -0.75, -0.75, 0.25, 1.25, 3.25, 4.25$

(Step 2):

22.563, 7.563, 0.563, 0.563, 0.063, 1.563, 10.563, 18.063

(Step 3):

$22.563 + 7.563 + 0.563 + 0.563 + 0.063 + 1.563 + 10.563 + 18.063$
 $= 61.504$

(Step 4):

$n = 8$, therefore variance = $61.504 / 8 = 7.69$

(Step 5):

Standard deviation = 2.77

GROUPED DATA:

There are many ways of writing the formula for the standard deviation. The one above is for a basic list of numbers. The formula for the variance when the data is grouped is as follows. The standard deviation can be found by taking the square root of this value.

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Variance, } \sigma^2 = \frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f} \right)^2$$

EXAMPLE:

The table shows marks (out of 10) obtained by 20 people in a test

**Marks (x) Frequency
 (f)**

1	0
2	1
3	1
4	3
5	2
6	5
7	5
8	2
9	0
10	1

Work out the variance of this data.

In such questions, it is often easiest to set your working out in a table:

fx	fx ²
0	0
2	4
3	9
12	48
10	50
30	180
35	245
16	128
0	0

10 100

$$\Sigma f = 20$$

$$\Sigma fx = 118$$

$$\Sigma fx^2 = 764$$

$$\text{Variance} = \frac{\Sigma fx^2 - \frac{(\Sigma fx)^2}{\Sigma f}}{(\Sigma f)^2}$$

$$= \frac{764 - \frac{(118)^2}{20}}{(20)^2}$$

$$= 38.2 - 34.81$$

$$= \underline{3.39}$$

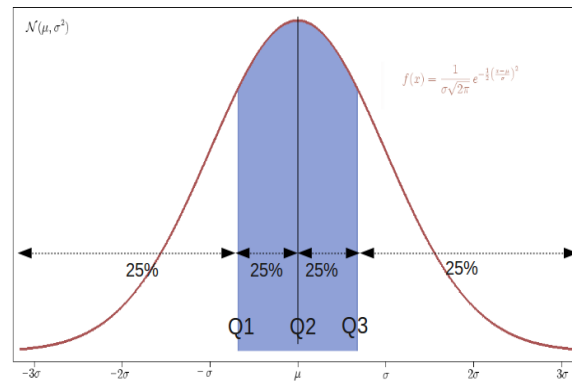
C. QUARTILE DEVIATION:

- The Quartile Deviation is a simple way to estimate the spread of a distribution about a measure of its central tendency (usually the mean).
- So, it gives you an idea about the range within which the central 50% of your sample data lies.
- Consequently, based on the quartile deviation, the Coefficient of Quartile Deviation can be defined, which makes it easy to compare the spread of two or more different distributions.
- Since both of these topics are based on the concept of quartiles.

QUARTILES:

- A median divides a given dataset (which is already sorted) into two equal halves similarly; the quartiles are used to divide a given dataset into four equal halves.
- Therefore, logically there should be three quartiles for a given distribution, but if you think about it, the second quartile is equal to the median itself!
- The first quartile or the lower quartile or the 25th percentile, also denoted by Q_1 , corresponds to the value that lies halfway between the median and the lowest value in the distribution (when it is already sorted in the ascending order). Hence, it marks the region which encloses 25% of the initial data.

- Similarly, the third quartile or the upper quartile or 75th percentile, also denoted by **Q3**, corresponds to the value that lies halfway between the median and the highest value in the distribution (when it is already sorted in the ascending order). It, therefore, marks the region which encloses the 75% of the initial data or the 25% of the end data.



The Quartile Deviation

Formally, the Quartile Deviation is equal to the half of the Inter-Quartile Range and thus we can write it as

$$QD = \frac{Q3 - Q1}{2}$$

Therefore, we also call it the Semi Inter-Quartile Range.

THE COEFFICIENT OF QUARTILE DEVIATION:

Based on the quartiles, a relative measure of dispersion, known as the Coefficient of Quartile Deviation, can be defined for any distribution. It is formally defined as

$$\text{Coefficient of Quartile Deviation} = \frac{Q3 - Q1}{Q3 + Q1}$$

Quartile Deviation and its Coeffi: x

https://www.emathzone.com/tutorials/basic-statistics/quartile-deviation-and-its-coefficient.html

Solution:

After arranging the observations in ascending order, we get

1040, 1080, 1120, 1200, 1240, 1320, 1342, 1360, 1440, 1470, 1600, 1680, 1720, 1730, 1750, 1755, 1785, 1880, 1885, 1960.

$Q_1 = \text{Value of } \left(\frac{n+1}{4}\right) \text{th item}$
 $= \text{Value of } \left(\frac{20+1}{4}\right) \text{th item}$
 $= \text{Value of } (5.25) \text{th item}$
 $= 5 \text{th item} + 0.25(6 \text{th item} - 5 \text{th item}) = 1240 + 0.25(1320 - 1240)$
 $Q_1 = 1240 + 20 = 1260$

$Q_3 = \text{Value of } \frac{3(n+1)}{4} \text{th item}$
 $= \text{Value of } \frac{3(20+1)}{4} \text{th item}$
 $= \text{Value of } (15.75) \text{th item}$
 $= 15 \text{th item} + 0.75(16 \text{th item} - 15 \text{th item}) = 1750 + 0.75(1755 - 1750)$
 $Q_3 = 1750 + 3.75 = 1753.75$

$Q.D = \frac{Q_3 - Q_1}{2} = \frac{1753.75 - 1260}{2} = \frac{492.75}{2} = 246.875$

$\text{Coefficient of Quartile Deviation} = \frac{Q_3 - Q_1}{Q_3 + Q_1} = \frac{1753.75 - 1260}{1753.75 + 1260} = 0.164$

Ad closed by Google

Stop seeing this ad

Why this ad? ⓘ

We, along with carefully selected 3rd parties, use cookies on this site to improve performance, to analyze traffic, and to serve content and ads that may interest you (personalized advertising). By using this site you agree to this. For more information see our Privacy Policy

I agree

2:19 PM
12/24/2018

2. ASSOCIATIONAL STATISTICS:

- Measures of association provide a means of summarizing the size of the association between two variables.
- Most measures of association are scaled so that they reach a maximum numerical value of 1 when the two variables have a perfect relationship with each other.
- They are also scaled so that they have a value of 0 when there is no relationship between two variables.
- While there are exceptions to these rules, most measures of association are of this sort.
- Some measures of association are constructed to have a range of only 0 to 1, other measures have a range from -1 to +1. The latter provide a means of determining whether the two variables have a positive or negative association with each other.

- Associational statistics include;
 - I. Correlation
 - II. Regression

I. CORRELATION:

- **Correlation** is a **statistical** technique that can show whether and how strongly pairs of variables are related.
- For example, height and weight are related; taller people tend to be heavier than shorter people. The relationship isn't perfect.
- A correlation is simply defined as a relationship between two variables.
- The whole purpose of using correlations in **research** is to figure out which variables are connected.
- In statistics, the **correlation** coefficient r measures the strength and direction of a linear relationship between two variables on a scatter plot.
- The value of r is always between $+1$ and -1 . To interpret its value, see which of the following values your **correlation** r is closest to:
- **Exactly -1** . A perfect downhill (negative) linear relationship
- **-0.70** . A strong downhill (negative) linear relationship
- **-0.50** . A moderate downhill (negative) relationship
- **-0.30** . A weak downhill (negative) linear relationship
- **0** . No linear relationship
- **$+0.30$** . A weak uphill (positive) linear relationship
- **$+0.50$** . A moderate uphill (positive) relationship
- **$+0.70$** . A strong uphill (positive) linear relationship
- **Exactly $+1$** . A perfect uphill (positive) linear relationship

TYPES OF CORRELATION

1. Positive Correlation

- A positive correlation is a correlation in the same direction.

2. Negative Correlation

- A negative correlation is a correlation in the opposite direction.

3. Partial Correlation

- The correlation is partial if we study the relationship between two variables keeping all other variables constant.

Example:

The Relationship between yield and rainfall at a constant temperature is partial correlation.

4. LINEAR CORRELATION

- When the change in one variable results in the constant change in the other variable, we say the correlation is linear.
- When there is a linear correlation, the points plotted will be in a straight line

Example:

Consider the variables with the following values.

X:	10	20	30	40	50
Y:	20	40	60	80	100

Here, there is a linear relationship between the variables. There is a ratio 1:2 at all points. Also, if we plot them they will be in a straight line.

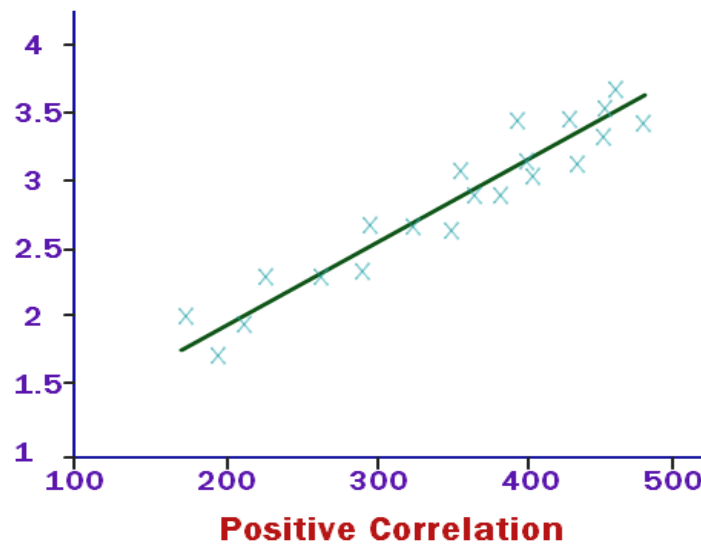
5. ZERO ORDER CORRELATION

- One of the most common and basic techniques for analyzing the relationships between variables is zero-order correlation.
- The value of a correlation coefficient can vary from -1 to +1. A -1 indicates a perfect negative correlation, while a +1 indicates a perfect positive correlation.
- A correlation of zero means there is no relationship between the two variables.

6. SCATTER PLOT CORRELATION

- A scatter plot is a type of mathematical diagram using Cartesian coordinates to display values for two variables for a set of data.
- Scatter plots will often show at a glance whether a relationship exists between two sets of data.
- The data displayed on the graph resembles a line rising from left to right.

- Since the slope of the line is positive, there is a positive correlation between the two sets of data.

Scatter plot**Positive Correlation**

7. SPEARMAN'S CORRELATION

- Spearman's rank correlation coefficient allows us to identify easily the strength of correlation within a data set of two variables, and whether the correlation is positive or negative.
- The Spearman coefficient is denoted with the Greek letter rho (ρ).

8. NON LINEAR CORRELATION

- When the amount of change in one variable is not in a constant ratio to the change in the other variable, we say that the correlation is non linear.
Example:
- **Consider the variables with the following values**

X:	10	20	30	40	50
Y:	10	30	70	90	120

Here there is a non linear relationship between the variables. The ratio between them is not fixed for all points. Also if we plot them on the graph, the points will not be in a straight line. It will be a curve.

- Non linear correlation is also known as curvilinear correlation.

9. SIMPLE CORRELATION

- If there are only two variable under study, the correlation is said to be simple.

Example:

The correlation between price and demand is simple.

10. MULTIPLE CORRELATIONS

- When one variable is related to a number of other variables, the correlation is not simple.
- It is multiple if there is one variable on one side and a set of variables on the other side.

Example:

Relationship between yield with both rainfall and fertilizer together is multiple correlations.

11. WEAK CORRELATION

- The range of the correlation coefficient between -1 to +1.
- If the linear correlation coefficient takes values close to 0, the correlation is weak.

PROBLEMS:**Question:**

To determine the correlation value for the given set of X and Y values:

X Values	Y Values
21	2.5
23	3.1
37	4.2
19	5.6
24	6.4
33	8.4

Solution:

Let us count the number of values.

N=6

Determine the values for XY, X², Y²

X Value	Y Value	X*Y	X*X	Y*Y
---------	---------	-----	-----	-----

21	2.5	52.5	441	6.25
23	3.1	71.3	529	9.61
37	4.2	155.4	1369	17.64
19	5.6	106.4	361	31.36
24	6.4	153.6	576	40.96
33	8.4	277.2	1089	70.56

Determine the following values $\sum X$, $\sum Y$, $\sum XY$, $\sum X^2$, $\sum Y^2$.

$$\sum X = 157$$

$$\sum Y = 30.2$$

$$\sum XY = 816.4$$

$$\sum X^2 = 4365$$

$$\sum Y^2 = 176.38$$

The screenshot shows a web browser window with the URL <https://math.tutorvista.com/statistics/correlation.html>. The page displays a table with 5 columns: X Value, Y Value, X*Y, X*X, and Y*Y. The data rows are identical to the table provided in the question. Below the table, the page asks to determine the following values: $\sum X$, $\sum Y$, $\sum XY$, $\sum X^2$, and $\sum Y^2$. The calculated values are listed as follows:

- $\sum X = 157$
- $\sum Y = 30.2$
- $\sum XY = 816.4$
- $\sum X^2 = 4365$
- $\sum Y^2 = 176.38$

The correlation coefficient (r) is calculated using the formula:

$$\text{Correlation (r)} = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{[N \sum X^2 - (\sum X)^2][N \sum Y^2 - (\sum Y)^2]}}$$

The calculation is shown as:

$$= \frac{157}{\sqrt{(1541)(146.24)}}$$

The final result is:

$$(r) = 0.33$$

ii. REGRESSION ANALYSIS:

- In **statistical** modeling, **regression analysis** is a set of **statistical** processes for estimating the relationships among variables.
- **Regression analysis** is also used to understand which among the independent variables are related to the dependent variable, and to explore the forms of these relationships.

- Regression analysis is also used to understand which among the independent variables are related to the dependent variable, and to **explore** the forms of these relationships.
- In restricted circumstances, regression analysis can be used to infer causal relationships between the independent and dependent variables.
- **Regression** describes how an independent variable is numerically related to the dependent variable.
- **Correlation** is used to represent the linear **relationship between** two variables. ... In **correlation**, there is no **difference between** dependent and independent variables i.e. **correlation between** x and y is similar to y and x.

TYPES OF REGRESSION:

1. LINEAR REGRESSION:

- It is one of the most widely known modeling techniques.
- Linear regression is usually among the first few topics which people pick while learning predictive modeling.
- In this technique, the dependent variable is continuous, independent variable(s) can be continuous or discrete, and nature of regression line is linear.
- Linear Regression establishes a relationship between **dependent variable (Y)** and one or more **independent variables (X)** using a **best fit straight line** (also known as regression line).
- It is represented by an equation $Y = a + b \cdot X + e$, where a is intercept, b is slope of the line and e is error term. This equation can be used to predict the value of target variable based on given predictor variable(s).

2. LOGISTIC REGRESSION:

- Logistic regression is used to find the probability of event=Success and event=Failure.
- We should use logistic regression when the dependent variable is binary (0/1, True/ False, Yes/ No) in nature. Here the value of Y ranges from 0 to 1

IMPORTANT POINTS:

- It is widely used for **classification problems**

- Logistic regression doesn't require linear relationship between dependent and independent variables. It can handle various types of relationships because it applies a non-linear log transformation to the predicted odds ratio

To avoid over fitting and under fitting, we should include all significant variables. A good approach to ensure this practice is to use a step wise method to estimate the logistic regression

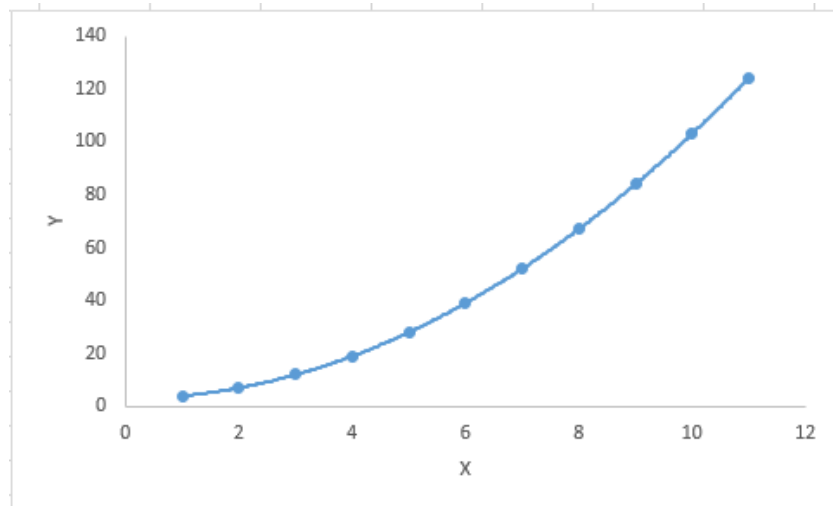
- It requires **large sample sizes** because maximum likelihood estimates are less powerful at low sample sizes than ordinary least square
- The independent variables should not be correlated with each other i.e. **no multi co linearity**. However, we have the options to include interaction effects of categorical variables in the analysis and in the model.
- If the values of dependent variable is ordinal, then it is called as **Ordinal logistic regression**
- If dependent variable is multi class then it is known as **Multinomial Logistic regression**.

3. POLYNOMIAL REGRESSION:

- A regression equation is a polynomial regression equation if the power of independent variable is more than 1.
- The equation below represents a polynomial equation:

$$y=a+b*x^2$$

- In this regression technique, the best fit line is not a straight line. It is rather a curve that fits into the data points.



4. STEPWISE REGRESSION:

- This form of regression is used when we deal with multiple independent variables.
- In this technique, the selection of independent variables is done with the help of an automatic process, which involves *no* human intervention.
- The aim of this modeling technique is to maximize the prediction power with minimum number of predictor variables.
- It is one of the methods to handle higher dimensionality of data set.

5. RIDGE REGRESSION:

- Ridge Regression is a technique used when the data suffers from multi collinearity (independent variables are highly correlated). In multi collinearity, even though the least squares estimates (OLS) are unbiased, their variances are large which deviates the observed value far from the true value. By adding a degree of bias to the regression estimates, ridge regression reduces the standard errors.
- Above, we saw the equation for linear regression. Remember? It can be represented as:

$$y = a + b \cdot x$$

6. LASSO REGRESSION:

- Similar to Ridge Regression, Lasso (Least Absolute Shrinkage and Selection Operator) also penalizes the absolute size of the regression coefficients.
- In addition, it is capable of reducing the variability and improving the accuracy of linear regression models.

7. ELASTIC NET REGRESSION:

- Elastic Net is hybrid of Lasso and Ridge Regression techniques.
- It is trained with L1 and L2 prior as regularize.
- Elastic-net is useful when there are multiple features which are correlated.
- Lasso is likely to pick one of these at random, while elastic-net is likely to pick both.

3. INFERENCE STATISTICS:

- **Statistical inference** is the process of using data analysis to deduce properties of an underlying probability distribution.
- Inferential statistical analysis infers properties of a population, for example by testing hypotheses and deriving estimates.
- It is assumed that the observed data set is sampled from a larger population.
- Inferential statistics can be contrasted with descriptive statistics. Descriptive statistics is solely concerned with properties of the observed data, and it does not rest on the assumption that the data come from a larger population.
- Statistical inference makes propositions about a population, using data drawn from the population with some form of sampling.
- Given a hypothesis about a population, for which we wish to draw inferences, statistical inference consists of (first) selecting a statistical model of the process that generates the data and (second) deducing propositions from the model.

NOTE:

A **statistical model** is a set of assumptions concerning the generation of the observed data and similar data.

It includes;

HYPOTHESIS TESTING:

- **Hypothesis testing** was introduced by **Ronald Fisher, Jerzy Neyman, Karl Pearson** and Pearson's son, **Egon Pearson**.
- Hypothesis testing is a statistical method that is used in making statistical decisions using experimental data.
- Hypothesis Testing is basically an assumption that we make about the population parameter.

KEY TERMS AND CONCEPTS:

- **Null hypothesis:** Null hypothesis is a statistical hypothesis that assumes that the observation is due to a chance factor. Null hypothesis is denoted by; $H_0: \mu_1 = \mu_2$, which shows that there is no difference between the two population means.
- **Alternative hypothesis:** Contrary to the null hypothesis, the alternative hypothesis shows that observations are the result of a real effect.
- **Level of significance:** Refers to the degree of significance in which we accept or reject the null-hypothesis. 100% accuracy is not possible for accepting or rejecting a hypothesis, so we therefore select a level of significance that is usually 5%.
- **Type I error:** When we reject the null hypothesis, although that hypothesis was true. Type I error is denoted by alpha. In hypothesis testing, the normal curve that shows the critical region is called the alpha region.
- **Type II errors:** When we accept the null hypothesis but it is false. Type II errors are denoted by beta. In Hypothesis testing, the normal curve that shows the acceptance region is called the beta region.
- **Power:** Usually known as the probability of correctly accepting the null hypothesis. 1-beta is called power of the analysis.
- **One-tailed test:** When the given statistical hypothesis is one value like $H_0: \mu_1 = \mu_2$, it is called the one-tailed test.
- **Two-tailed test:** When the given statistics hypothesis assumes a less than or greater than value, it is called the two-tailed test.

PARAMETRIC TESTS:-**INTRODUCTION:-**

Parametric tests are based on models with some assumptions. If the assumptions hold well, these tests may offer a more powerful tool for analysis. It usually assumes certain properties of the parent population from which we draw samples.

The important parametric tests are:-

1. Z-test
2. T-test
3. F-test

Assumptions about parametric test:-

1. Observations come from a normal population.
2. Sample size is large.
3. Assumptions about the population parameters like mean, variance, etc., must hold good before parametric test can be used.
4. But there are situations when the researcher cannot or does not want to make such assumptions. In such situations methods for testing hypothesis which are called non-parametric tests because such test do not depend on any assumption about the parameters of the parent's population.

Besides, most non-parametric test assumes only nominal or ordinal data, whereas parametric tests require measurement equivalent to at least an

5. Internal scale. As a result, non-parametric tests to achieve the same size of type I and Type II errors.

Z-TEST:-

This method is given by prof. Fisher and is used to test the significance of the correlation coefficient in small samples

This method states that the coefficient of correlation is converted into Z and hence the name Z-transformation and it is used to test:-

- 1) How an observed value of r varies significantly from some hypothetical value.
- 2) Whether two sample values of r vary significantly.

Z Test is applicable on large as well as small samples.

Mathematically,

Z-TEST

Formula to find the value of Z (z-test) is:

$$Z = \frac{\bar{x} - \mu_0}{\sigma / \sqrt{n}}$$

\bar{x} = mean of sample

μ_0 = mean of population

σ = standard deviation of population

n = no. of observations

Example:

The mean lifetime of a sample of 100 tube lights takes produced by a company is found to be 1,600 hours with standard deviation of 95 hours. Test the hypothesis that the mean lifetime of the bulbs produced by the company is 1,620 hours.

Solution: -

The null hypothesis is that there is no significant difference between the sample mean and hypothesized population mean, i.e., $H_0: \mu = \mu_0$ and $H_1: \mu \neq \mu_0$

T-test:-

If one take a very large number of small samples from a population and calculate the mean for each sample and then plot the frequency distribution of these means the resulting sampling distribution would be the student's t-distribution. The greatest contribution to the theory of small samples was made by Sir William Gossett and R.A.Fisher. Gossett published his discovery in 1905 under the pen name "students" and it is popularly known as t-test or students'-distribution or students' distribution. When size of the sample is 30 or less and the population standard deviation is not known, we can use the t-distribution.

This formula is, t-test;

Where, sample standard deviation (S) =

If sample S.D. is given without using n-1 as denominator then.

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

Where,

\bar{x}_1 = Mean of first set of values

\bar{x}_2 = Mean of second set of values

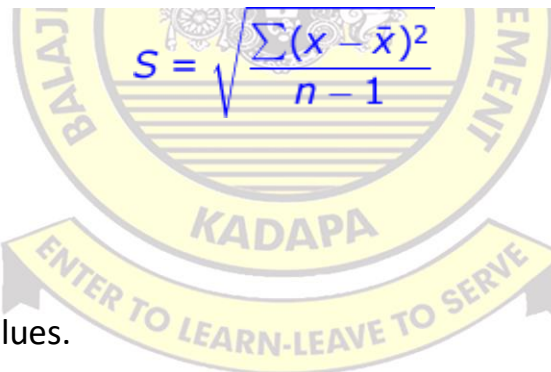
S_1 = Standard deviation of first set of values

S_2 = Standard deviation of second set of values

n_1 = Total number of values in first set

n_2 = Total number of values in second set.

The formula for standard deviation is given by:



$$S = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}}$$

Where,

x = values given

\bar{x} = Mean

n = Total number of values.

Sample question:

Calculate a paired t test by hand for the following data:

Subject #	Score 1	Score 2
1	3	20
2	3	13
3	3	13
4	12	20
5	15	29
6	16	32
7	17	23
8	19	20
9	23	25
10	24	15
11	32	30

Step 1: Subtract each Y score from each X score.

Subject #	Score 1	Score 2	X-Y
1	3	20	-17
2	3	13	-10
3	3	13	-10
4	12	20	-8
5	15	29	-14
6	16	32	-16
7	17	23	-6
8	19	20	-1
9	23	25	-2
10	24	15	9
11	32	30	2

Step 2: Add up all of the values from Step 1

Subject #	Score 1	Score 2	X-Y
1	3	20	-17
2	3	13	-10
3	3	13	-10
4	12	20	-8
5	15	29	-14
6	16	32	-16
7	17	23	-6
8	19	20	-1
9	23	25	-2
10	24	15	9
11	32	30	2
		SUM:	-73

Step 3: Square the differences from Step 1.

Subject #	Score 1	Score 2	X-Y	(X-Y) ²
1	3	20	-17	289
2	3	13	-10	100
3	3	13	-10	100
4	12	20	-8	64
5	15	29	-14	196
6	16	32	-16	256
7	17	23	-6	36
8	19	20	-1	1
9	23	25	-2	4
10	24	15	9	81
11	32	30	2	4
		SUM:	-73	

Step 4: Add up all of the squared differences from Step 3.

Subject #	Score 1	Score 2	X-Y	(X-Y) ²
1	3	20	-17	289
2	3	13	-10	100
3	3	13	-10	100
4	12	20	-8	64
5	15	29	-14	196
6	16	32	-16	256
7	17	23	-6	36
8	19	20	-1	1
9	23	25	-2	4
10	24	15	9	81
11	32	30	2	4
		SUM:	-73	1131

Step 5: Use the following formula to calculate the t-score:

$$t = \frac{(\sum D)/N}{\sqrt{\frac{\sum D^2 - \frac{(\sum D)^2}{N}}{(N-1)(N)}}$$

$\sum D$: Sum of the differences (Sum of X-Y from Step 2)

$\sum D^2$: Sum of the squared differences (from Step 4)

$(\sum D)^2$: Sum of the differences (from Step 2), squared.

$$t = \frac{(\sum D)/N}{\sqrt{\frac{\sum D^2 - \frac{(\sum D)^2}{N}}{(N-1)(N)}}$$

$$t = \frac{-73/11}{\sqrt{\frac{1131 - \frac{(-73)^2}{11}}{(11-1)(11)}}$$

$$t = \frac{-73/11}{\sqrt{\frac{1131 - \frac{5329}{11}}{110}}}$$

$$t = -2.74$$

Therefore, the value of **t** is **2.74**.

CHI-SQUARE TEST:

A chi-squared test, also written as χ^2 test, is any statistical hypothesis test where the sampling distribution of the test statistic is a chi-squared distribution when the null hypothesis is true. Without other qualification, 'chi-squared test' often is used as short for Pearson's chi-squared test. The chi-squared test is used to determine whether there is a significant difference between the expected frequencies and the observed frequencies in one or more categories.

In the standard applications of this test, the observations are classified into mutually exclusive classes, and there is some theory, or say null hypothesis, which gives the probability that any observation falls into the corresponding class. The purpose of the test is to evaluate how likely the observations that are made would be, assuming the null hypothesis is true.

Chi Square is one of the most useful non-parametric statistics. Chi Square is used in data consists of people distributed across categories, and to know whether that distribution is different from what would expect by chance.

- A very small Chi Square test statistic means that your observed data fits your expected data extremely well.
- A very large Chi Square test statistic means that the data does not fit very well. If the chi-square value is large, you reject the null hypothesis.

A Chi Square is one way to show a relationship between two categorical variables. There are two types of variables in statistics: numerical variables and non-numerical variables. The value can be calculated by using the given observed frequency and expected frequency. The Chi Square is denoted by X^2 and the formula is:

$$\chi^2 = \frac{\sum (O-E)^2}{E}$$

Where,

O =Observedfrequency

E =Expectedfrequency

Σ =Summation

X^2 = Chi Square value

SOLVED EXAMPLE:**Question 1:**

Calculate the chi-square value for the following data;

	Male	Female
Full Stop	6(observed)	6 (observed)
	6.24 (expected)	5.76 (expected)
Rolling Stop	16 (observed)	15 (observed)
	16.12 (expected)	14.88 (expected)
No Stop	4 (observed)	3 (observed)
	3.64 (expected)	3.36 (expected)

SOLUTION:

Now calculate Chi Square using the following formula:

$$X^2 = \sum \frac{(O-E)^2}{E}$$

Calculate this formula for each cell, one at a time.

For example, cell #1 (Male/Full Stop):

Observed number is: 6

Expected number is: 6.24

Therefore, $(6-6.24)^2/6.24=0.0092$

Continue doing this for the rest of the cells, and add the final numbers for each cell together for the final Chi Square number. There are 6 total cells, so at the end you should be adding six numbers together for your final Chi Square number.

ANNOVA:

ANALYSIS OF VARIANCE:

THE ANOVA TECHNIQUE:

The ANOVA technique is important in the context of all those situations where we want to compare more than two populations such as in comparing the yield of crop from several varieties of seeds, the gasoline mileage of four automobiles, the smoking habits of five groups of university students and so on.

In such circumstances one generally does not want to consider all possible combinations of two populations at a time for that would require a great number of tests before we would be able to arrive at a decision. This would also consume a lot of time and money, and even then certain relationships may be left unidentified (particularly the interaction effects)

“The essence of ANOVA is that the total amount of variation in a set of data is broken down into two types, that amount which can be attributed to chance and that amount which can be attributed to specified causes.” There may be variation between samples and also within sample items. ANOVA consists in splitting the variance for analytical purposes. Hence, it is a method of analyzing the variance to which a response is subject into its various components corresponding to various sources of variation.

If we take only one factor and investigate the differences amongst its various categories having numerous possible values, we are said to use one-way ANOVA and in case we investigate two factors at the same time, then we use two-way ANOVA. In two-way ANOVA, the interaction or inter-relationship of two factors affecting the values of a variable can as well be studied for better decisions.

THE BASIC PRINCIPLE OF ANOVA:

The basic principle of ANOVA is to test for differences among the means of the populations by examining the amount of variation within each of these samples, relative to the amount of variation between the samples.

ONE WAY ANOVA:

Under the one-way ANOVA, we consider only one factor and then observe that the reason for said factor to be important is that several possible types of samples can occur within that factor. We then determine if there are differences within that factor. The technique involves the following steps:

- (i) Obtain the mean of each sample i.e., obtain

$$\bar{X}_1, \bar{X}_2, \bar{X}_3, \dots, \bar{X}_k$$

When there are k samples.

- (ii) Work out the mean of the samples means as follows:

$$\bar{X} = \frac{\bar{X}_1 + \bar{X}_2 + \bar{X}_3 + \dots + \bar{X}_k}{\text{No. of samples (k)}}$$

(iii) Take the deviation of the sample means from the mean of the sample means and calculate the square of such deviations which may be multiplied by the number of items in the corresponding sample, and then obtain their total. This is known as the sum of squares for variance between the samples (or SS between). Symbolically, this can be written as:

$$\text{SS between} = n_1(\bar{X}_1 - \bar{X})^2 + n_2(\bar{X}_2 - \bar{X})^2 + \dots + n_k(\bar{X}_k - \bar{X})^2$$

(iv) Divide the result of the (iii) by the degrees of freedom between the samples to obtain variance or mean square (MS) between samples. Symbolically, this can be written as:

$$MS \text{ between} = \frac{SS \text{ between}}{(k - 1)}$$

Where (k-1) represents degrees of freedom (d.f.) between samples.

(v) Obtain the deviations of the values of the sample items for all the samples from corresponding means of the samples and calculate the squares of such deviations and then obtain their total. This total is known as the sum of squares for variance within samples (or SS within) Symbolically this can be written as :

$$SS \text{ within} = \sum (x_{1i} - \bar{x}_1)^2 + \sum (x_{2i} - \bar{x}_2)^2 + \dots + \sum (x_{ki} - \bar{x}_k)^2$$

$$i = 1, 2, 3, \dots$$

(vi) Divide the result of (v) by the degrees of freedom within samples to obtain the variance or mean square (Ms) within samples. Symbolically, this can be written as:

$$MS \text{ within} = \frac{SS \text{ within}}{(n - k)}$$

When (n-K) represents degrees of freedom within samples.

N= Total number of items in all the samples i.e,

K= Number of samples.

(vii) For a check, the sum of squares of deviations for total variance can also be worked out by adding the squares of deviations when the deviations for the individual items in all the samples have been taken from the mean of the sample means. Symbolically, this can be written as:

$$SS \text{ for total variance} = \sum (x_{ij} - \bar{\bar{x}})^2 \quad i = 1, 2, 3, \text{ and } j = 1, 2, 3, \dots$$

This total should be equal to the total of the result of the (iii) and (v) explained above i.e.,

SS for total variance= SS between+ SS within.

The degrees of freedom for total variance will be equal to the number of items in all samples minus one i.e., $(n-1)$. The degrees of freedom for between and within must add up to the degrees of freedom for total variance i.e.,

$$(N-1) = (k-1) + (n-K)$$

(viii) Finally, F- ratio may be worked out as under:

$$F - \text{Ratio} = \frac{\text{MS between}}{\text{MS within}}$$

This F-ratio works as the test statistic and follows snedico's

F-distribution with $(k-1)$, $(n-k)$ degree of freedom. A discussed the test is a right tailed test. Therefore we reject the null hypothesis that all the population means (or the effects of all the treatments) are the same at given level of significance when the computed value of F-ratio is greater is greater than the critical value which can be obtained from tables 4(a) and 4(b).

TWO WAY ANOVA:

Two way ANOVA techniques are used when the data are classified on the basis of two factors. For example the agricultural output may be classified on the basis of different varieties of seeds and also on the basis of different varieties of fertilizers used.

A business firm may have its sales data classified on the basis of different salesman and also on the basis of sales in different regions. In a factory the various units of a product produced during certain in different regions.

In factory the various units products produced during a certain period may be classified on the basis of different varieties of machines used and also on the basis of different grades of labor. Such a two way design may have repeated measurements of each factor or may not have repeated values. We shall now explain the two way ANOVA technique in the context of both the said designs with the help of examples.

ONE OBSERVATION PER CELL:

As we do not have repeated values we cannot directly compute the sum of squares within samples as we had done in the case of one way ANOVA. Therefore we have to calculate this residual or error variation by subtraction once we have calculated the sum of squares for total variance and for variance between varieties of one factor as also for variance between varieties of the other factor.

The varieties steps involved are as follows

- Take the total of observations in all the sample and call it T
- Work out the correction factor as under;

$$\text{Correlation factor} = \frac{T^2}{n}$$

- Find out the square of all the item values (or their coded values as the case may be) one by one and then take its total. Subtract the correction factor from this total to obtain the sum of squares of deviations for total variance. Symbolically we can write it as;
Sum of squares of deviations for total variance or total SS

$$= \sum \frac{x_{ij}^2}{n} - \frac{T^2}{n}$$

- Take the total of different rows and then obtain the square of each row total and divide such squared values of each row by the number of items in the corresponding row and take the total of the result thus obtained. Finally subtract the correction factor from this total to obtain the sum of squares of deviations for variance between rows (or SS between rows.)
- Sum of squares of deviations for residual or error variance can be obtained as SS for residual or error variance = total SS – SS between - SS between rows.
- Degrees of freedom (d.f) can be worked out as under,

d.f. for total variance $= (c \cdot r - 1)$

d.f. for variance between columns $= (c-1)$

d.f. for variance between rows $= (r-1)$

d.f. for residual variance $= (c-1)(r-1)$

Where c = number of columns

r = number of rows

MORE THAN ONE OBSERVATION PER CELL:

In case of a two-way design with repeated measurements for all of the categories we can obtain a separate independent measure of inherent or smallest variations. For this measure we can calculate the sum of squares and degrees of freedom in the same way as we had worked out the sum of squares for variance within samples in the case of one way ANOVA.

Total SS, SS between columns and SS between rows can also be worked out as stated above. We then find left over sums of squares and left over degrees of freedom which are used for what is known as interaction variation (interaction is the measure of inter relationship among the two different classifications.) after making all these computations, ANOVA table can be set up for drawing inferences.

IMPORTANT QUESTIONS:

UNIT-4

1. Explain the measures of dispersion with examples.
2. Discuss the procedure used to calculate two way ANOVA with an example
3. Write a detailed note on chi square test.
4. What is correlation? Why is correlation used? How is it different from regression?
5. What are the measures of central tendency? Explain.
6. What are the measures of dispersion? Explain
7. Explain various measures of central tendency with examples
8. Discuss the procedure used to calculate one way ANOVA with an example.
9. Give an overview of descriptive and associational statistical measures.

10. Briefly explain the following:

- Chi-square test
- Standard deviation and co-efficient of variation

CASE STUDY

TESTING OF DRUGS:

Two types of drugs were on 5 and 7 patients for reducing their weight. The decrease in the weight after using the drugs for six months was as follows,

Drug A	10	12	13	11	14	-	-
Drug B	8	9	12	14	15	10	9

Is there a significant difference in the efficacy of the two drugs at 5% level of significance? ($t_{0.05} = 2.223$ at d.f. 10).

Let us take the hypothesis that there is no significant difference in the efficacy of two drugs, i.e., $H_0: \mu_1 = \mu_2$ and $H_1: \mu_1 \neq \mu_2$ (two tailed test)

X_1	$\bar{X}_1 = 12$	$(X_1 - \bar{X}_1)^2$	X_2	$\bar{X}_2 = 11$	$(X_2 - \bar{X}_2)^2$
10	-2	4	8	-3	9
12	0	0	9	-2	4
13	+1	1	12	+1	1
11	-1	1	14	+3	9
14	+2	4	15	+4	16
			10	-1	1
			9	+2	4
$\sum X_1 = 60$ $N_1 = 5$		$\sum (X_1 - \bar{X}_1)^2 = 10$	$\sum X_2 = 77$ $N_2 = 7$		$\sum (X_2 - \bar{X}_2)^2 = 44$

$$\bar{X}_1 = \frac{\sum X_1}{n_1} = \frac{60}{5} = 12 \quad \bar{X}_2 = \frac{\sum X_2}{n_2} = \frac{77}{7} = 11$$

$$S = \sqrt{\frac{\sum (X_1 - \bar{X}_1)^2 + \sum (X_2 - \bar{X}_2)^2}{N_1 + n_2 - 2}} = \sqrt{\frac{10 + 44}{5 + 7 - 2}} = \frac{54}{10} = \sqrt{5.4} = 2.324$$

Applying t-test;

$$T = \frac{\bar{X}_1 - \bar{X}_2}{S} \sqrt{\frac{n_1 n_2}{n_1 + n_2}} = \frac{12 - 11}{2.324} \sqrt{\frac{5 \times 7}{5 + 7}} = \frac{1 \times 1.708}{2.324} = \frac{1.708}{2.324} = 0.735$$

Degrees of freedom (v) = $n_1 + n_2 - 2 = 5 + 7 - 2 = 10$

For v=10, $t_{0.05} = 2.228$

Since the calculated value of t is less than the table value we accept H_0 and conclude that there is no significant difference in the efficacy of two drugs. Since drug B is indigenous and there is no difference in the efficacy of imported and indigenous drug we should buy indigenous drug B.

PREPARED BY;

HIMMAT T

ASSOCIATE PROFESSOR

BALAJI INSTITUTE OF IT & MANAGEMENT

KADAPA.

(17E00204) BUSINESS RESEARCH METHODS

Course Code	BUSINESS RESEARCH METHODS	L	T	P	C
21E00204		4	0	0	4
Semester		II			
Course Objectives:					
<ul style="list-style-type: none">To introduce business research, types and technology used in business research.To explain in detail on research process involved in business research.To discuss sources of data and instruments to collect dataTo provide knowledge on analysis and interpretation of outcome of the data in a scientific way.To provide knowledge on descriptive and inferential statistical analysis.To impart competence skills to undertake business research problem and carryout scientific research.					
*Standard Statistical tables shall be allowed in the examination					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none">Learn types of business research, technology used in business research in technological era.Identify research problem, appropriate research design and sample design for the problem, formulate hypothesis, testing process of hypothesis.Understand sources of data, instruments to collect data, analyse and interpretation of data.Prepare and present the research report effectively and efficiently.					
UNIT - I					Lecture Hrs:08
Introduction to Business Research: Definition-Types of Business Research. Scientific Investigation, Technology and Business Research: Information needs of Business - Technologies used in Business Research: The Internet, E-mail, Browsers and Websites. Role of Business Research in ManagerialDecisions.					
UNIT - II					Lecture Hrs:12
The Research Process: Problem Identification: Broad Problem Area-Preliminary Data Gathering. Literature Survey - Hypothesis Development - Statement of Hypothesis- Procedure for Testing of Hypothesis. The Research Design: Types of Research Designs: Exploratory, Descriptive, Experimental Designs and Case Study -Measurement of Variables- Operational Definitions and Scales-Nominal and Ordinal Scales- Rating Scales- Ranking Scales- Reliability and Validity - Sampling and Methods of sampling					
UNIT - III					Lecture Hrs:12
Collection and Analysis of Data Sources of Data-Primary and Secondary Sources of Data - Data Collection Methods- Interviews: Structured Interviews and Unstructured Interviews- Observational Surveys: Questionnaire Construction: Organizing Questions- Structured and Unstructured Questionnaires – Guidelines for Construction of Questionnaires.					
UNIT - IV					Lecture Hrs:12
Data Preparation and Analysis: Data preparation process, problems in preparation process - An overview of Descriptive, Associational and Inferential- Statistical Measures.					
UNIT - V					Lecture Hrs:12
The Research Report: Research Reports-Components-The Title Page-Table of Contents-The Executive Summary-The Introductory Section-The Body of the Report-The Final Part of the Report-Acknowledgements – References-Appendix - Guidelines for Preparing a Good Research report - Oral Presentation.					
Textbooks:					
<ol style="list-style-type: none">Research Methodology – methods & Techniques, C.R. Kothari, Vishwa prakashan.Research Methods for Business–A Skill Building Approach, Uma Sekaran, John Wiley & Sons (Asia) Pvt. Ltd, Singapore.					

UNIT-V

THE RESEARCH REPORT

1. RESEARCH REPORTS:

INTRODUCTION:-

A research report is a document prepared by an analyst or strategist who is a part of the investment research team in a stock brokerage or investment bank. A research report may focus on a specific stock or industry sector, a currency, commodity or fixed-income instrument, or on a geographic region or country. Research reports generally, but not always, have actionable recommendations such as investment ideas that investors can act upon.

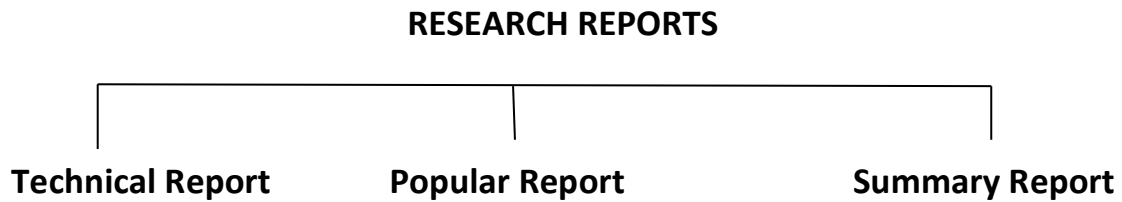
At the final & a very important step in a research study is to write its report. It is a formal statement of the research process & its results. It is a means for communicating our research experience to others & adding them to the fund of knowledge.

The purpose of this is to communicate to interested persons the methodology & to understand the research process to determine the validity of the conclusions. It represents highly specific information for a clearly designed audience. The aim of the report is not to convince the reader of the value of the result, but to convey to him what was done, why it was done, and what were its outcomes.

1.1. FUNCTIONS OF A RESEARCH REPORT:-

- It serves as a basic reference material for future use in developing research proposals in the same.
- It provides systematic knowledge on problems & issues analyzed. it serves as a means for judging the quality of the completed research project.
- It used for evaluating the researcher's ability & competences to do research.
- It provides factual base for formulating policies & strategic relating to the subject matter studied.

1.2. TYPES OF RESEARCH REPORTS:-



A) TECHNICAL REPORT:-

- It is comprehensive full report of the process & its outcome.
- It follows a specified pattern & consists of several prefatory sections with appropriate heading & paragraphs.
- It is a formal long report covering all the aspects of the research process.
- A description of the problem studied the objectives of the study, methods & techniques used a detailed account of sampling, sources of data etc.
- In the technical report the main emphasis is on (i) the methods employed (ii) assumptions made in the course of the study, (iii) the detailed presentation of the findings including their limitations and supporting data.

A general outline of a technical report can be as follows.

1. **SUMMARY OF RESULTS:** a brief review of the main findings just in two or three pages.
2. **NATURE OF THE STUDY:** description of the general objectives of study, formulations of the problem in operational terms the working hypothesis the type of analysis and data required etc.
3. **METHODS EMPLOYED:** specific methods used in the study and their limitations. For instance in sampling studies we should give details of sample design viz, sample size selection etc.
4. **DATA:** discussion of data collected their sources characteristics and limitations. If secondary data are used their suitability to the problem at hand be fully assessed. In case of a survey the manner in which data were collected should be fully described.

5. **ANALYSIS OF DATA AND PRESENTATION OF FINDINGS**: the analysis of data and presentation of the findings of the study with supporting data in the form of tables and charts be fully narrated. This in fact, happens to be the main body of the report usually extending over several chapters.

6. **CONCLUSIONS**: a detailed summary of the findings and the policy implications drawn from the result be explained.

7. **BIBLIOGRAPHY**: bibliography of various sources consulted be prepared and attached.

8. **TECHNICAL APPENDICES**: appendices are given for all technical matters relating to questionnaire mathematical derivations elaboration on particular technique of analysis and the like ones.

9. **INDEX**: index must be prepared and be given in invariably in the report at the end.

B) POPULAR REPORT:-

- It is designed for an audience of executives & other non-technical uses.
- The format of this report is differ form of a technical report.
- It should be clear, briefs & straight forward more headlines, and underling, pictures & graphs may be used.
- There can be a liberal use of margins & blank place.

Given below is a general outline of popular report.

i. **THE FINDINGS AND THEIR IMPLICATIONS**: emphasis in the report is given on the findings of most practical interest and on the implications of these findings.

ii. **RECOMMENDATIONS FOR ACTION**: recommendations for action on the basis of the findings of the study are made in this section of the report.

iii. **OBJECTIVE OF THE STUDY**: A general review of how the problem arises is presented along with the specific objectives of the project under study.

iv. **METHODS EMPLOYED**: a brief and non technical description of the methods and techniques used including a shot review of the data on which the study is based is given in this art of the report.

v. **RESULTS**: this section constitution the main body of the report wherein the result of the study are presented in clear and non technical with liberal use of all sorts of illustrations such as charts diagrams and the like ones.

vi. **TECHNICAL APPENDICES**: more detailed information on methods used forms etc is presented in the form of appendices. But the appendices are often not detailed if the report is entirely meant for general public.

C) SUMMARY REPORT:-

- It is a short report of two (or) 3 pages. Its size is limited as to be suitable for Publication in newspaper.
- It is generally prepared for the consumption of the public.
- Simple language with a liberal use of pictorial charts used.
- It just contains a brief sentence to the objective of the study & major findings & their implications.

DIFFERENT STEPS IN WRITING REPORT:

Research reports are the product of slow painstaking accurate inductive work. The usual steps involved in writing report are,

- a. logical analysis of the subject matter
- b. preparation of the final outline.
- c. preparation of the rough draft
- d. rewriting and polishing
- e. preparation of the final bibliography and
- f. writing the final draft

a. LOGICAL ANALYSIS OF THE SUBJECT MATTER:

- It is the first step which is primarily concerned with the development of a subject.
- There are two ways in which to develop a subject, (a) logically and (b) chronologically.
- The logical development is made on the basis of mental connections and association between the one thing and another by means of analysis.
- Logical treatment often consists in developing the material from the simple possible to the most complex structures.
- Chronological development is based on a connection or sequence in time or occurrence. The directions for doing or making something usually follow the chronological order.

b. PREPARATION OF THE FINAL OUTLINE:

- Outlines are the framework upon which long written works are constructed. They are an aid to the logical organization of the material and a reminder of the points to be stressed in the report.

c. PREPARATION OF THE ROUGH DRAFT:

- This follows the logical analysis of the subject and the preparation of the final outline.

- Such a step is of utmost importance for the researcher now sits to write down what he has done in the context of his research study.
- He will write down the procedure adopted by him in collecting the material for his study along with various limitations faced by him the technique of adopted by him the broad findings and generalizations and the various suggestions he wants to offer regarding the problem concerned.

d. REWRITING AND POLISHING OF THE ROUGH DRAFT:

- Usually this step requires more time than the writing of the rough draft.
- The careful revision makes the difference between a mediocre and a good piece of writing.
- While rewriting and polishing one should check the report for weaknesses in logical development or presentation.
- The researcher should also (i) see whether or not the material as it is presented has unity and cohesion. (ii) The report stands upright and firm and exhibit a definite pattern.
- In addition the researcher should give due attention to the fact that in his rough draft he has been consistent or not. He should check the mechanics of writing grammar, spelling and usage.

e. PREPARATION OF THE FINAL BIBLIOGRAPHY:

- Next in order comes the task of the preparation of the final bibliography.
- The bibliography which is generally appended to the research report is a list of books in some way pertinent to the research which has been done.
- It should contain all those works which the researcher has consulted. The bibliography should be arranged alphabetically and may be divided into two parts the first part may contain the names of books and pamphlets and the second part may contain the names of magazine and newspaper articles.
- The entire in bibliography should be made adopting the following order.

FOR BOOKS AND PAMPHLETS THE ORDER BE AS UNDER;

- Name of author last name first
- Title underlined to indicate italics
- Publisher place and date of publication
- Number of volumes

EXAMPLE,

KOTHARI, C.R., Quantitative techniques, Vikas publishing House Pvt. Ltd., Delhi, 1978.

FOR MAGAZINES AND NEWSPAPERS THE ORDER MAY BE AS UNDER,

- Name of the author last name first
- Title of article in quotation marks
- Name of periodical underlined to indicate italics
- The volume number and issue number
- The date of the issue
- The pagination

EXAMPLE,

ROBERT V. ROOSA, coping with short term international money flows, the banker London September, 1971, p. 995.

f. WRITING THE FINAL DRAFT:

- This constitutes the last step. The final draft should be written in a concise and objective style and in simple language avoiding vague expression such as it seems there may be and the like ones.
- While writing the final draft the researcher must avoid abstract terminology and technical jargon.
- Illustrations and examples based on common experiences must be incorporated in the final draft as they happen to be most effective in communicating the research findings to others.

2. COMPONENTS OF THE REPORT:-

1. title page
2. table of contents
3. executive summary (or) synopsis
4. introductory section
5. body of the report
6. final part of the report
7. acknowledgement
8. references & bibliography
9. appendix / annexure

1. TITLE PAGE:-

- It clearly explains what the study is about. It indicates the name of the Sponsored.
- Should mention about the date of the final report.
- We need to go for providing name of the researcher & their affiliations.
- Should mention about the date of the final report.

**MARKET SEGMENTATION PRACTICES
IN NEPAL BANK LIMITED**

A Project Report

Submitted by:
Karishma Manandhar
Roll No.:345
TU Regd. No.
Nepal Commerce Campus

Submitted to:
Rajesh Hamal
Marketing Department
Nepal Commerce Campus

In Partial Fulfillment for the Requirement of the Degree of
Masters of Business Administration (MBA)

New Baneshwor, Kathmandu
April 2017

2. TABLE OF CONTENTS:-

- It contains a list of the chapters & their sub-titles with page numbers.
- It facilities ready location of topics in the report.
- It should contain separate list of tables available.
- It helps the visitor to directly visit the content of his interest.
- List of charts –every charts table should be with name.

CONTENTS	
1.0	INTRODUCTION 1
2.0	PROJECT REQUIREMENTS 3
3.0	SYSTEM SPECIFICATIONS 4
4.0	SETTING UP A LINUX BASED VIDEO CAPTURE SYSTEM 5
4.1.	SELECTING AND INSTALLING THE OPERATING SYSTEM..... 5
4.2.	INSTALLING FEDORA CORE 1 6
4.3.	INSTALLING VIDEO CAPTURE DRIVERS VIA THE LINUX KERNEL..... 7
4.4.	IMPLEMENTING THE VIDEO4LINUX API 8
4.5.	INSTALLING OPENGGL AND GLUT 14
4.6.	CREATING SIMPLE GLUT PROGRAMS FOR VIDEO OUTPUT..... 16
4.7.	USING GLUI TO CREATE GUIS 17
5.0	IDENTIFYING THE TARGET IN A FRAME 19
5.1.	OBJECT RECOGNITION FROM COLOUR..... 19
5.2.	SEGMENTATION FOR NOISE REDUCTION 24
5.3.	EDGE DETECTION AND SEPARATING MULTIPLE OBJECTS..... 29
6.0	DETERMINING ATTITUDE 33
6.1.	DISTINGUISHING BETWEEN OBJECTS 33
6.2.	LOCATING THE CENTRE OF AN OBJECT..... 37
6.3.	USING CORRELATIONS TO EXTRACT 3D INFORMATION..... 39
7.0	RECOMMENDED IMPROVEMENTS 62
8.0	CONCLUSIONS 64
9.0	REFERENCES 65

3. RESEARCH REPORTS:-

- The methodology to be studied & duration, cost of study is submitted to sponsor & need to get approval.
- It consists of statement of problem, objectives of the study, research design Sample design, data collection methods, methods of data analysis.
- Time frame of the study indicating the date of submission of report.
- Budget-amount required completing research – time frames also influence the budget.

UKA TARSADIA UNIVERSITY	
Syllabus of Pre Ph.D. course work (Semester –I)	
Subject Name: Research Methodology (Feb- June 2013, Revised)	
The objective of the course is to introduce the basic methods of conducting research, explore ideas in formulating research objectives and hypotheses and sample framework for taking up research studies in a structured manner. It enable researchers in developing the most appropriate methodology for their research studies and make them familiar with the art of using different research methods and techniques. Also it is intended to facilitate for the development of an insight into different statistical tools for data analysis, interpretation and presentation of reports in different areas of research.	
1.	Introduction to Research: Meaning of research/ definition of research, importance of research, role of research, aims & objectives, research methods versus methodology, classification of research, research process (various steps in scientific research), criteria for good research, qualities of researcher.
2.	Formulating research problem: A. Review of Research Literature: Purpose and use of literature review, locating relevant information, use of library & electronic databases, preparation & presentation of literature review, research article reviews, theoretical models and framework, identification of gaps in research. B. Defining research problem What is research problem? selecting the problem, necessity of defining the problem, techniques involved in defining a problem. C. Identifying variables The definition of a variable, the difference between a concept and a variable, concepts, indicators and variable, types of variable, types of measurement scale D. Constructing hypothesis Definition of hypothesis, functions of a hypothesis, characteristics of a hypothesis, types of hypothesis, errors in testing a hypothesis
3.	Research Design: A. The research design Definition, function B. Types of study design Formal, informal
4.	Sampling: Concept of sampling, sampling terminology, principles of sampling, factors affecting the inferences drawn from a sample, aims in selecting a sample, types of sampling, calculation of sample size
5.	Writing a research proposal: Research proposal/protocol, contents of a research proposal, work schedule
6.	Data collection and data processing: Methods of data collection, ethical issues in data collection, data processing, statistical analysis
7.	Research Publication & Presentation A. Thesis, Research paper, Review Article & Technical Reports: Structure and Components of Research Report, Types of Report, Organization of thesis and research paper, formatting issues, citation methods, references.

4. EXECUTIVE SYNOPSIS (OR) SUMMARY:-

- An **executive summary**, or **management summary**, is a short document or section of a document, produced for business purposes, that summarizes a longer report or proposal or a group of related reports in such a way that readers can rapidly become acquainted with a large body of material without having to read it all.

- It usually contains a brief statement of the problem or proposal covered in the major document(s), background information, concise analysis and main conclusions. It is intended as an aid to decision-making by managers and has been described as the most important part of a business plan
- An executive summary differs from an abstract in that an abstract will usually be summary is not in common usage.
- "An abstract is a brief summarizing statement... read by parties who are trying to decide whether or not to read the main document", while "an executive summary, unlike an abstract, is a document in miniature that may be read in place of the longer document" shorter and is typically intended as an overview or orientation rather than being a condensed version of the full document.
- Abstracts are extensively used in academic research where the concept of the executive
- It is designed to be read by people who will not have time to read the whole report.
- Write a simple declarative sentence for each of the main points.
- Use bullets to improve the presentations of the executive summary.
- Check for errors of style, spelling, grammar & punctuation.
- Use a summary each important section of the report.
- Only use this format as a short summary of information.

Typically, an executive summary will:

- be approximately 5-10% of the length of the main report
- be written in language appropriate for the target audience
- consist of short, concise paragraph
- begin with a summary
- be written in the same order as the main report
- only include material present in the main report
- make recommendations
- provide a justification
- have a conclusion
- be readable separately from the main report
- sometimes summarize more than one document

Executive Summary

One-Line Pitch: A new experience in moving

Business Summary: We have invented a revolutionary piece of technology that allows things to be moved quickly and over long distances. We plan to use this technology to create products that we will sell to people who need to move anything larger than things that they can carry.

Management: My business partner and CTO Grok has a secret where he uses a hard sharp rock to shape other rocks. We have already used this technique to manufacture arrowheads. We spend our time making things for other people in exchange for food. We also made a large stone club for our CFO Buba to make sure we get paid.

Customer Problem: Zok in the next cave over tried to move a rock so his family could sit around it, but it was too heavy to drag and didn't roll well. Olf once scored so big on the hunt that he couldn't drag his prize home.

Product/Services: We are going to shape stones into disks and put a hole in the middle. In the hole we are going to put large sticks and we will connect these with other sticks to make a flat surface that will support whatever heavy object you want to move.

Target Market: Anyone who needs to move heavy objects, like Zok and Olf, would be customers. Zok wanted to move to another cave once, but changed his mind when he tried to pick up the rocks that his family sits on.

Customers: Zok and Olf so far.

Sales/Marketing Strategy: We are going to build a prototype that we can roll to the caves down the river because we think that other people will have the same problem as Zok and Olf and will therefore be customers.

Business Model: We will manufacture stone disks and build rolling platforms that we will sell. We can also sell the stone disks by themselves for other people to build things with them.

5. INTRODUCTORY SECTION:-

- An **introduction** should announce your topic, provide context and a rationale for your work, before stating your **research** questions and hypothesis.
- Well-written introductions set the tone for the **paper**, catch the reader's interest, and communicate the hypothesis or thesis statement.
- It serves to introduce the reader to the research project it should give the background of the problem.
- It may change from person to person / report to report it starts with statement of problem under investigation.
- The specific purpose of the report need to be set forth clearly. The reader must know exactly what the report covers.
- Mention clearly why the study is initiated & how the study is initiated objectives together with background of information is presented.

6. BODY OF THE PART:-

The Introduction and Conclusions act as a frame for the body of the report, which is where you present your own work. The information should be organized so that the reader can follow the development of your project. You will therefore need to put some thought into ordering the sections and choosing concise but informative headings and subheadings.

The body of the report:

- presents the information from your research, both real world and theoretical, or your design
- organizes information logically under appropriate headings
- conveys information in the most effective way for communication by means of:
 - figures and tables
 - bulleted or numbered lists
 - Formatting to break up large slabs of text.
- It is major & main part of the report. It covers the formulating of the problem studied, methodology, finding, discussions etc.

A. DESIGN OF THE STUDY / RESEARCH DESIGN:-

- It explains the descriptions of the research technical. The methodology will reveal why a particular design is used for conducting the research.
- It defines exploratory & experimental designs.

B. SOURCES OF DATA / DATA COLLECTION METHODS :-

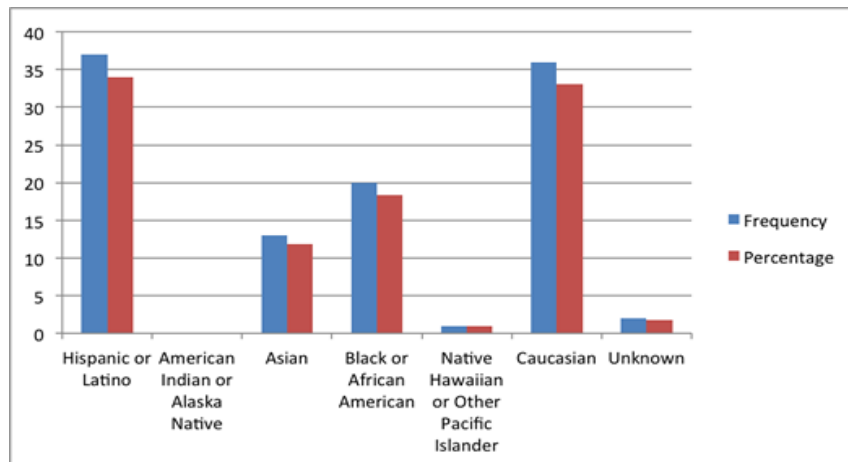
- There may be primary & secondary sources of data collection.
- A copy of questionnaire may be included to demonstrate the method & form of data collection.

C. SAMPLING :-

- The size of the universe from which the sample was drawn. The sampling methods adopted & the sample size & the process of sampling are described.

7. ANALYSIS & INTERPRETATION:-

- The findings tend to show what has been done, if any special, statistical techniques have been used they should be mentioned.
- It may be manual (or) mechanical adapted for data analysis & method used for this & testing must be justified.



8. FINAL PART OF THE REPORT:-

- It includes conclusion, recommendations & suggestions. We need to report what we have concluded from the report with appropriate proof.
- Conclusions are drawn from the findings.
- When we are assuming a problem of a company we need to provide list of recommendations to the company.
- The recommendations should be specific & should not be vaguer statements like state regulations should be liberalized.

9. ACKNOWLEDGEMENT:-

- Is a professional we need to provide it at the end of report? But in project it will be at first.
- It means we have to thank the pool who had helped you in completing the project like libraries.

ACKNOWLEDGEMENT

I would like to express my special thanks of gratitude to my Chemistry teacher "Miss.Jaishree Jadham" for their able guidance and support in completing my Project.

I would also like to extend my gratitude to the Principal Mam "Dr.Mrs.Komal Jain" and Vice Principal Sir "Mr.Swapnil Jain" for providing me with all the facility that was required.

DATE : 25/09/2017

GULSHAN SONGARA
12th "Maths" 'A'

REFERENCES OR BIBLIOGRAPHY:

- It will be given by sponsors.
- It gives a list of materials relating to the topic under study as a ready reference to the reader.
- If we have collected from e- journal or e- magazine we have to mention at websites.

BOOKS:

- Human resource management author name edition publication "Name of Journal. "
- A bibliography may contain all those that have appeared in the reference list but it may also contain additional works.
- It helps to find sources again easily to prepare documentation for your work.

PROFESSIONAL REFERENCES

Domenic Steven - Brand Manager at Diamond Technologies

Contact: 4887 Southside Lane Los Angeles, CA, 90044 - domenic_steven@diamondtechnologies.com – 213-200-8542

Zoe Denise - Content Marketing Manager at Electra Sports

Contact: 4784 John Calvin Drive Burr Ridge, IL, 60527 - zoedenise123@electrasports.com – 217-200-7697

Carla Lloyd - Vice President of Marketing at Imaginetworks

Contact: 1753 Oakwood Avenue New York, NY, 10021 lloydcarla@imaginetworks.com – 212-203-8710

10. APPENDIX:

- A Glossary of new terms used in the report may also be furnished under appendixes.
- It is a professional structure of the research.
- It is particularly important when the reader has varied expertise.
- It gives the reader additional but not essential facts and explanations.

Appendix A

Acronyms and Other Abbreviations Used in This Report

ALARA	As low as reasonably achievable
BG	Burial ground
CG	Concentration guide
CG _a	Concentration guide for air
CG _w	Concentration guide for water
CSD	Carbon-steel drum
CWDF	Central Waste Disposal Facility
D&D	Decontamination and decommissioning
DEIS	Draft environmental impact statement
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
FPDL	Fission Product Development Laboratory
FUSRAP	Formerly Used Sites Remedial Action Program
HEPA	High-efficiency particulate air (filter)
HFIR	High-Flux Irradiation Reactor
HLLW	High-level liquid waste
ICRP	International Commission on Radiological Protection
ILW	Intermediate-level waste
ISAHFD	Industrial Safety and Applied Health Physics Division
LLW	Low-level liquid waste
MED	Manhattan Engineering District
MEF	Metal Recovery Facility
MSRE	Molten Salt Reactor Experiment
NAS	National Academy of Sciences
NCRP	National Council on Radiation Protection and Measurements
NLLRMP	National Low-Level Radioactive Waste Management Program
NRC	National Research Council
ORAU	Oak Ridge Associated Universities
ORGDP	Oak Ridge Gaseous Diffusion Plant, also K-25
ORNL	Oak Ridge National Laboratory, also X-10
ORR	Oak Ridge Research Reactor
RCRA	Resource Conservation and Recovery Act
SFMP	Surplus Facilities Management Program
SSD	Stainless-steel drum
STT	Shielded transfer tank
TRU	Transuranic materials

173

11. GUIDELINES FOR PREPARING A GOOD RESEARCH REPORT

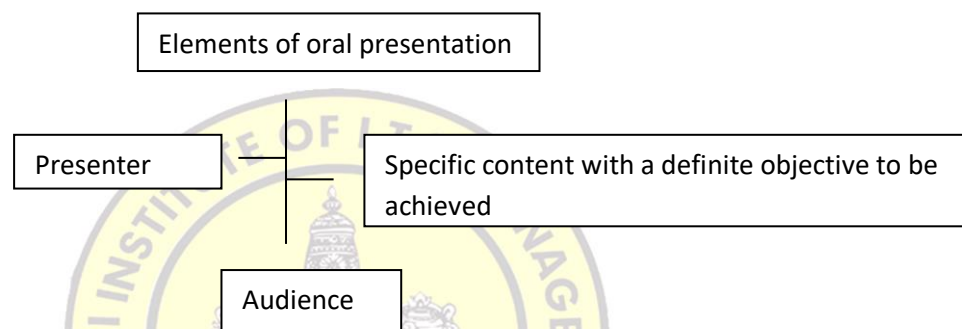
- Any project report need to meet 2 things like A) function of purpose B) type of audience.
- The audience may have to understand what you have presented in the report.
- Need to provide light emphasis an important aspect at research.
- Is objective minimizing the use of technical language?
- It should be free from grammatical mistakes it must be attractive in appearance neat to clear whether typed or printed.
- Bibliography of sources consulted in a must for a good report.
- A report should show originality the report must present the logical analysis of the subject matter.
- Other official's etc.
- All the matter should be in same font size same font type headings.
- Line spacing is important single space is not appropriate we go for double space 105 space.
- Printing should be on one side of page smooths transition from one topic to another topic
- Printing should be on one side of page smooth transition from one topic to another topic.

12. ORAL PRESENTATION:

- It is a committing by the present to help the audience do something to solve the problem.
- It is typically a demonstration lecture speech meant to inform persuade and build good will.
- It is normally built on research that finds develops substantives knowledge.
- These are ways of communication ideals and information to a group.

12.1. ELEMENTS OF ORAL PRESENTATION:

Presentations have three major elements

**I. THE PRESENTER:**

An oral presentation also allows researchers to provide a more effective description of the research methodology. This is because during an oral presentation a presenter by observing their audience can become aware of when they are encountering difficulties and can explain any confusing details more fully. In addition a presenter can more clearly explain how report recommendations are related to any research findings.

A trained presenter approaches a presentation with an awareness of all its elements and a fully planned strategy. He/she knows that just standing up and speaking to an audience for a given time to show how much he/she knows on the topic will not be delivering a presentation is a particular mode of communicating with a group of people and of conveying a message. It involves prior-preparation and planning.

As a presenter you should think and plan the following before delivering the presentation.

- Identify your purpose – achieve
- Analyze your audience

- Identify the need
- Collate your information
- Design your communication
- Time your presentation
- Decide on the visual aids to be used
- Study the location

The presenter as a self plays a key role in making the presentation a successful communication act.

II. SPECIFIC CONTENT WITH A DEFINITE OBJECTIVE:

Ask yourself why am I giving this presentation? You may be giving the presentation to

- Sell something or to persuade to follow a course of action which they may not like to do
- Inform people about an idea or describe a business opportunity to gain support for some course of action or to suggest a likely course of action in the future.
- Gather people's views on new plans or products or proposals to introduce changes.
- Put across a problem to seek a solution or to minimize reaction to it.
- Just create awareness by sharing information without requiring any action or response.
- Motivate educate or impart training to promote a more productive work culture.

Having identified objective outline it in a single sentence

SIX GREAT HELPERS	
HELPERS	DETERMINING PURPOSE
Why	Purpose – to inform to persuade, to influence, to educate, to empathize, to entertain, to sympathize
Who	Attributes of listener – personality, age, education, knowledge, anticipated response
Where	Place – formal or informal
When	Context/time
What	Subject matter – scope and need
how	Strategies to be adopted – words, slides, transparencies - which once need to be incorporated or deleted

III. AUDIENCE:

Before you made a presentation know the group you are going to address. Get an idea of the number nature needs level of knowledge and probable attitude of those who are going to receive your message. These audience factors will determine the language of delivery and selection of inputs. Understanding the audience's needs will help us focus your presentation on those issues that would be of interest to your listeners. And knowing about the probable attitude of your audience in advance would make you feel confident and not nervous when you begin. All persons in a group will not have a similar attitude and as individuals they are bound to respond to you differently.

But most importantly never consider your audience to be a hostile group. They may be opposed to your ideas/message, but they are not your enemies. Always look for some smiling faces among the listeners. They will make you feel at ease. Make eye contact with them. But do not look away from others. Finally remember the purpose for which you are addressing your audience. And try your best to meet that purpose.

Also keep in mind that different persons attending your presentation may be looking for different information related to your topic according to their own interests or needs. Therefore define the focus and scope of your presentation at the very outset.

GUIDELINES FOR ANALYSING AUDIENCE:

As a presenter find answers for the following questions

- Who is your audience?
- Why are they attending your presentation?
- What is their background and level knowledge in relation to your subject of presentation?
- How many persons will there be?
- What is their likely attitude towards the subject and you?
- What is the outcome of your presentation?

The last question is the most important question that needs to be clearly understood and answered. The answer to it will clarify and exactly define your purpose. It will help you write down your expectations from the audience.

12.2. TECHNIQUES OF ORAL PRESENTATION:

There are various methods or techniques used in presentation which are as follows,

1. AUDIO VISUAL:

- Using pictures in your presentations instead of words can double the chances of meeting your objectives.
- You should always know when presenting which slide is coming up next. It sounds very powerful when you say on the next slide you will see..... Rather than a period of confusion displays books etc.
- It works for multiple intelligences.

2. LECTURE:

- Lecturing is a one way method of communication. Lectures represent a continuation. Lectures represent a continuation of oral traditional in contact to textual communication.
- Effective presenters provide roadmaps for their speech. They design and present lectures that are well organized and easy to follow.
- It is used as a method of presentation because it conveys organized information outlines and explains concepts and also simulates people to think in new ways.

3. ROLE PLAYING:

- It generally involves a group of people acting out defined roles in a particular scenario. Role plays can be used effectively to present information and ideas an audience because they generally involve using strong visual and audio stimuli and cues which helps the audience to remember the material presented.
- They enable presenters to convey complex ideas relating to emotion or ethical decisions.

4. SENTENCE COMPLETION:

- These methods are presentation of the beginning of sentence which then requests that the subject complete the sentence any way they would like.
- This method is based on the idea on the idea that it will reveal more about thoughts emotional conflicts than testing with direct questions.

5. PROBLEM SOLVING:

- It focuses on dilemmas such as peer pressure conflicts stress.
- It includes brainstorming reverse brainstorming (technique based on finding fault by asking negative questions) Gordon methods, etc.,

6. DEMONSTRATION:

- Action and message in a communication medium is called demonstration.
- This method is mostly adopted by corporate marketing. Demonstrating is also used to educate the voters as to how to exercise his franchise.
- The demonstration is a part of the sales presentation where a salesman proves that his company's product will do all.
- The purpose of the demonstration is to maintain the interest that was aroused on the previous occasion and to build a desire in the mind of the prospect. It provides visual performance of a skill.

7. DRAMATI-SATION OR SKITS:

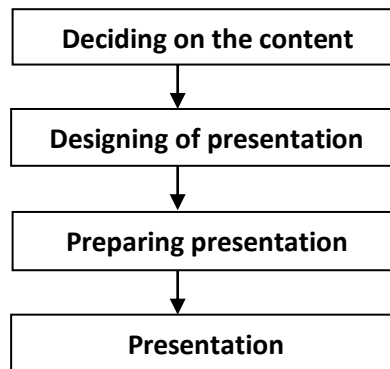
- It is a method in which doing skills may be shown explained and applied.
- Dramatization in oral communication refers to adding some visual acts, skits or short plays etc, while performing a presentation orally.
- Dramatizing could be very useful for oral presentations. A successful presentation is 75% preparation and 25% delivery.
- Hence it is very important to plan the dramatization part in an oral presentation and think about how the speaker is going to organize the content of the speech for the best effect.

8. CASE STUDIES:

The key to a good presentation is good preparation. If the case has been studied and analyzed thoroughly the content of the presentation should present no problem.

12.3. STAGES OF ORAL PRESENTATION

In order to give presentation one has to prepare for it in a sequential manner in order to avoid any haphazard. Thus presentation involves the following stages since starting till end.



A. DECIDING ON THE CONTENT

Preparing oral presentation is much like preparing any other message. We define our purpose analyze the audience and adopt our presentation and material to the audience level of understanding and develop a plan for presenting our points. However because we have to deliver the message orally under public circumstances, it requires a few special communication techniques also. Proper preparation requires the following steps,

1. **IDENTIFYING THE TOPIC**: the topic is a general statement that outlines the subject. It should be brief but precise. It may become the title of our presentation. The title is an introduction in miniature. It also should give meaningful information.

2. **DETERMINING THE PURPOSE**: the purpose of the speech guides us for preparation of introduction and conclusion of our speech. Throughout the speaking process our purpose should serve as the objective against which we can judge what we plan to say and how we organize our presentation.

3. **ANALYSE AUDIENCE**: before making a presentation know the group we are going to address. Get an idea of the number nature needs level of knowledge and probable attitude of those people who are going to receive the message. These audience factors will determine the language of delivery and selection of inputs. Understanding the audience's needs will help us focus on our presentation on those issues that would be of interest to your listeners.

4. **GATHERING INFORMATION**: by now you have the essential things to give shape to a particular presentation. After being aware of purpose and the audience needs. Their needs will guide us to gather and systematically arrange the information you want to present. Structure and design your delivery so as

to present your message effectively accept your ideas. Let the purpose and the audience needs guide your exposition and delivery.

B. DESIGNING/STRUCTURE OF PRESENTATION

1. **INTRODUCTION:** the introduction is not a formality. It is a very important multipurpose component of any presentation. Our introduction should arouse the audience interest establish rapport with them motivate them to listen on and make the body of the presentation easy to understand and accept. Once needs an imaginative introduction to capture the audience attention.

2. **BODY:** while planning the body of the presentation one should ask himself two questions. What should go into it? What order should he appear in? The first question is relatively easy to answer. The main ideas facts figures and nay supporting material that one has identified should go into the body. Here the guiding principle should be that most audiences prefer slim bodies to flabby ones. Resist the temptation to put in data just because he has worked hard to gather it.

3. **CONCLUSION:** the third major step is concluding the presentation. This is as important as the introduction. In a sense it is even more important. It is your last chance to sell our idea. It has to be planned well and delivered well. Otherwise what we have built up in the body of the presentation may be lost.

4. **QUESTIONS AND ANSWERS:** this is an important opportunity to interact with the audience. Encourage questions. Answer each question seriously and with honesty. Do not try to bluff. If you do not know be frank. Prepare a logical sequence³ of your presentation. This will make the flow of argument clear. It will also help keep to the main argument as you deliver the presentation to your audience in the form of face to face communication. While speaking to the audiences do not draft. Follow the sequence already worked out. And if you want to make your presentation effective keep it simple.

C. PREPARING AND DISPLAYING VISUAL AIDS:

For an efficient oral presentation audio visual aids supplement our message making the speech vivid interesting and stimulating. An effective speaker by judicious use of these equipments arrests the attention of the

audience. These equipments enhance the value of the oral presentation to a great extent. However too many aids cripple the speakers impact.

An efficient speaker first finds out the possibility of using audio visual aids, then generating them in the text followed by a proper planning and preparing the aids with due editing and their effectiveness and presentation he or she inserts them in the text with an intention to have a better report a better communication a better motivation and finally generating a greater interest.

There are many audio visual aids like black boards electronic boards flip charts felt boards overhead projectors slide projectors movie films projectors video CDs video tape recorders audio tape recorders audio CDs, CD ROMs display of cutouts and models etc. there are also some graphic aids like charts diagrams maps etc., also used as visual aids.

TECHNIQUES FOR USING VISUAL AIDS:

Visual aids usually carry key parts of the message. Thus they are points of emphasis in the presentation. Once blends them in with own words to communicate the message. List of do's and don'ts can help in using visual aids,

- Make certain everyone in the audience can see the visual aid. Too many or too light lines on a chart for example can be hard to see. Too small an illustration will be meaningless to those in the back of the audience..
- Explain the visual aid if there is any likelihood that it will be misunderstood.
- Organize the visual aids as a part of the presentation. Fit them into the plan.
- Emphasize the visual aids. Point to them with bodily action and with words.
- Talk to the audience not to the visual aids. Look at the visual aids only when the audience should look at them.
- Avoid blocking the listeners, view of the visual aids. Make certain that lecterns pillars charts and such do not block anyone's view. Take care not to stand in anyone line of vision. Use a pointer.

- If possible keep the chart picture or man hidden or at an inconspicuous place until you need to refer it.

D. THE PRESENTATION:

Making presentation is not simple. It is extremely important for us to realize the necessity of rehearsing to improve the quality of the presentation. Unless and until one has rehearsed adequately he should not venture forth to make a presentation. The more one rehearse the better is his performance in front of an audience. In the initial phases rehearsal is important to do away with the element of fear. In the later stages it helps in brushing up the style of presenting and reveals the self confidence.

The peak point of the preparatory stage is the rehearsal. This exercise would also entail making preparations for the OHP or slide projectors and checking whether they are in working order. Clumsy movements at the time of making a presentation such as trying to fix the plug or putting the slide/transparency in an incorrect manner can have a negative impact on the receiver. Further the projectors should be placed in a manner. So that the screen is clearly visible to all the participants even those sitting at the extreme end of the room.

The visual aids should be presented in such a manner that all the interactions are able to read what is written without having to crane their necks or adopting uncomfortable postures. All this would be part of the rehearsal procedure where attempts are made to make the presentation as immaculate and flawless as possible. One thing should be kept in mind capture the attention of the audience right at the start by making the opening spell binding. If you do not capture the attention of your audience right at the start you have lost them forever.

HOW TO PRACTICE:

Rehearse before an auditor;

- You should rehearse before a listener preferably an auditor who can evaluate his material in terms of its technical accuracy.
- The auditor should be able to provide objective criticism.

- The auditor should be willing to spare time to critically listen to the presentation.
- Use the microphone while rehearsing.
- Use the visual aids to co-ordinate delivery and visual projection
- Observe the time limit.
- Practice voice modulation proper intonation correct pronunciation of the words and proper variation in volume.

13. HANDLING QUESTIONS:

Usually questions follow the presentations. The key to handle this session effectively is preparation. It is wise to remember that each response to a question is a presentation in miniature. Spend some time before beginning our speech. Avoid postures and gestures that might seem antagonistic. Maintain a professional appearance. The attitude of the speaker is definitely the most important consideration.

Sometimes established protocol prescribes that a question and answer session follows the final presentation. If that is so consider having the question answer period before we present the summary. Sometimes we can have question answer session after we present the summary. We can start this session by simply giving a statement. I will be happy to answer any questions we may have.

13.1. GUIDELINES FOR HANDLING QUESTIONS EFFECTIVELY

Since the way in which the speaker conducts himself during a question answer session can be one of the most critical factors in the evaluation of a presentation here are some specific guidelines.

- Anticipate and plan for answering questions the listeners are likely to ask.
- Have notes on anticipated questions especially where technical data and specific information are called for.
- In some situations if one can feasibly build answers for anticipated questions into the presentation proper, this is even better.
- Control the irrelevant and embarrassing questions politely.
- If there is a large audience use buzzes groups to solicit questions in order to involve and give interrogative opportunities to all listeners.
- Control the irrelevant & embarrassing question politely.

- When someone poses a question, focus the attention on that individual.
- If speaker does not know the answer, shouldn't present.
- Do not bluff, audience normally will recognize tell an audience like "don't know, but I will try to find out".
- Plan for answering questions the listeners are likely to ask.
- Do not say more you need to he should state his response honestly, accurately & factually & then move on to the next question.

IMPORTANT PREVIOUS QUESTIONS:

UNIT-5

1. Explain the components of research report with examples.
2. What are the skills needed for the presenter to do oral presentation of research report.
3. Give a detailed note on oral presentation.
4. What are the precautions to be taken while writing a research report explain.
5. Outline the guidelines for preparing a good research report.

PREPARED BY;

HIMMAT T

ASSISTANT PROFESSOR

BALAJI INSTITUTE OF IT & ANAGEMENT

KADAPA.

