



MEASI
Institute of Management

**QUANTITATIVE TECHNIQUES AND
RESEARCH METHODS IN BUSINESS –434C1B**

STUDY MATERIAL/BATCH 2025-27

**Ist SEMESTER (FULL TIME)
NEW REGULATION SYLLABUS 2023
MASTER OF BUSINESS ADMINISTRATION
UNIVERSITY OF MADRAS**



VISION & MISSION STATEMENTS

VISION

- To be an oasis of knowledge to the seeker, to nurture one's creativity and research acumen, and to instil a unique blend of leadership, innovative spirit and empathy in response to the ever-evolving business ecosystem.

MISSION

- Provide a pedagogy that blends academic rigor and experiential learning.
- Inculcate an entrepreneurial mindset through curated activities.
- Establish a conducive environment for research.
- Foster a culture of innovation and collaboration to progress in a dynamic business landscape.
- Promote humanistic values to produce socially responsible leaders.

Program Educational Objectives (PEOs)

PEO 1 – Employability

To develop students with industry specific knowledge & skills to meet the industry requirements and also join public sector undertaking through competitive examinations.

PEO 2 - Entrepreneur

To create effective business service owners, with a growth mindset by enhancing their critical thinking, problem solving and decision-making skills.

PEO3 – Research and Development To instil and grow a mindset that focusses efforts towards inculcating and encouraging the students in the field research and development.

PEO 4 – Contribution to Business World

To produce ethical and innovative business professionals to enhance growth of the business world.

PEO 5 – Contribution to the Society:To work and contribute towards holistic development of society by producing competent MBA professionals.



PROGRAM OUTCOMES

PO1: Problem Solving Skill: Application of tools & techniques relevant to management theories and practices in analyzing & solving business problems.

PO2: Decision Making Skill: Fostering analytical and critical thinking abilities for data-based decision making.

PO3: Ethical Value: Ability to develop value-based leadership attributes.

PO4: Communication Skill: Ability to understand, analyze and effectively communicate global, economic, legal and ethical aspects of business.

PO5: Individual and Team Leadership Skill: Ability to be self-motivated in leading & driving a team towards achievement of organizational goals and contributing effectively to establish industrial harmony.

PO6: Employability Skill: Foster and enhance employability skills through relevant industry subject knowledge.

PO7: Entrepreneurial Skill: Equipped with skills and competencies to become a global entrepreneur.

PO8: Contribution to Society: Strive towards becoming a global influencer and motivating future generation towards building a legacy that contributes to overall growth of humankind.

Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
434C1B	Quantitative Techniques and Research Methods in Business	Core	3	1	-	-	4	60	25	75	100
Course Objectives											
C1	To provide the students with an introduction to probability theory and discuss how probability calculations may facilitate their decision making.										
C2	To construct a coherent research proposal that includes an abstract, literature review, research questions, ethical considerations and methodology.										
C3	To understand the basic statistical tools for analysis & interpretation of qualitative and quantitative data.										
C4	To recognize the principles and characteristics of the multivariate data analysis techniques.										
C5	To become familiar with the process of drafting a report that poses a significant problem										



UNIT	Details	No. of Hours	Course Objectives
I	Introduction: Probability - Rules of probability- Probability distribution; Binomial, Poisson and Normal Distributions, their applications in Business and Industrial Problem- Baye's Theorem and its applications - Decision Making under risk and uncertainty; Maximax, Maximin, Regret Hurwitz and Laplace Criteria in Business and Decision Making - Decision tree.	17	C1
II	Research Methods: Research - Definition - Research Process - Research Design – Definition- Types Of Research Design - Role of Theory in Research - Variables in Research – Objectives - Hypothesis - Types of Data; Preliminary Vs Secondary- Methods of Primary Data Collection; Survey, Observation, Experiments - Construction Of Questionnaire - Questionnaire Schedule- Validity and Reliability of Instruments - Types of Scales; Nominal, Ordinal, Interval - Types of Attitude Measurement Scales – Sampling Techniques; Probability And Non probability Techniques- Optimal Sample Size determination.	10	C2
III	Data Preparation and Analysis: Data Preparation - Editing –Coding- Data Entry- Data Analysis- Testing Of Hypothesis Univariate and Bivariate Analysis - Parametric And Nonparametric Tests and Interpretation of Test Results- Chi-Square Test- Correlation; Karl Pearson's Vs Correlation Coefficient and Spearman's Rank Correlation- Regression Analysis - One Way and Two Way Analysis of Variance.	15	C3
IV	Multivariate Statistical Analysis: Exploratory and Confirmatory Factor Analysis -Discriminant Analysis- Cluster Analysis -Conjoint Analysis -Multiple Regression- Multidimensional Scaling- Their Application In Marketing Problems -Application of Statistical Software For Data Analysis- SEM Analysis	09	C4
V	Report Writing and Ethics in Business Research: Research Reports- Different Types -Report Writing Format- Content of Report- Need For Executive Summary- Chapterization -Framing the Title of the Report- Different Styles Of Referencing -Academic Vs Business Research Reports - Ethics In Research.	09	C5
	Total	60	



Course Outcomes		
Course Outcomes	On completion of this course, students will;	Program Outcomes
CO1	Be able to develop problem-solving techniques needed to accurately calculate probabilities.	PO1, PO2, PO6, PO7
CO2	Be able to devise research methods, techniques and strategies in the appropriate manner for managerial decision making and conduct research for the industry.	PO4, PO6
CO3	Be able to apply and interpret the different types of quantitative and qualitative methods of data analysis.	PO4, PO6
CO4	Be able to use multivariate techniques appropriately, undertake multivariate hypothesis tests, and draw appropriate conclusions.	PO4, PO6
CO5	Be able to present orally their research or a summary of another's research in an organized, coherent, and compelling fashion.	PO4, PO6
Reading List		
1.	https://www.dartmouth.edu/~chance/teaching_aids/books_articles/probability_book/amsbook.mac.pdf	
2.	https://study.com/academy/topic/probability.html	
3.	https://onlinecourses.nptel.ac.in/noc18_ma07/preview	
4.	https://hbr.org/1964/07/decision-trees-for-decision-making	
References Books		
1.	Anderson, Sweeny, Williams, Camm and Cochran, Statistics for business and Economics, Cengage Learning, New Delhi, 13th Edition, 2017	
2.	Cooper, D.R., Schindler, P. And Business Research Methods, Tata- McGraw Hill, 12th Edition, 2012.	
3.	Cooper, D.R., Schindler, P. and Sharma, J.K., Business Research Methods, 11th Edition, Tata-McGraw Hill, 12 th Edition, 2018.	
4.	Johnson, R.A., and Wichern, D.W., Applied Multivariate Statistical Analysis, PHI Learning Pvt. Ltd., 6 th Edition, 2012.	
5.	Kumar, R., Research Methodology: A Step-by-Step guide for Beginners, Sage, South Asia, 4th Edition, 2014.	
6.	Srivastava, T.N. and Rego, S., Statistics for Management, 2nd Edition, Tata McGraw Hill, 3rd Edition, 2016.	
Methods of Evaluation		
Internal Evaluation	Continuous Internal Assessment Test	
	Assignments	
	Seminars	
	Attendance and Class Participation	
External	End Semester Examination	
		25 Marks
		75 Marks



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Evaluation		
	Total	100 Marks
Methods of Assessment		
Recall (K1)	Simple definitions, MCQ, Recall steps, Concept definitions	
Understand/Comprehend (K2)	MCQ, True/False, Short essays, Concept explanations, Short summary or overview	
Application (K3)	Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain	
Analyze (K4)	Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge	
Evaluate (K5)	Longer essay/ Evaluation essay, Critique or justify with pros and cons	
Create (K6)	Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations	

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	3	3				3	3	
CO 2				3		3		
CO 3				2		2		
CO 4				2		2		
CO 5				2		3		

S-Strong M-Medium L-Low



ONE MARKS QUESTIONS AND ANSWERS

QUANTITATIVE TECHNIQUES AND RESEARCH METHODS IN BUSINESS

ONE MARKS QUESTIONS AND ANSWERS

UNIT- 1

Probability:

- It means a chance, a possibility, likelihood or an odd.
- It refers to an event the happening and non-happening of which is uncertain.

Conditional Probability:

- The probability of a dependent event is called a conditional probability.
- Two events A and B are said to be dependent, when A can occur only when B is known to have occurred .It is said to be conditional probability.

Define the term:

- Experiment** : It is an operation which produces some result/outcome
- Trial** : Performing a random experiment is called a trial.
- Outcomes** : The result of a random experiment is called Outcomes.
- Event** : A combination of outcome of a random experiment is called an event.
- Sample space**: Each conceivable outcome of an experiment is called a sample point. The totality of all sample points is called a Sample space.

Define the term:

- Dependent Event**: The occurrence of which is affected by the occurrence of its preceding event is called a dependent event.
- Independent Event**: The occurrence of which does not depend upon the occurrence of any other event is called an independent event.
- Equally likely Events**: Two or more events are said to be equally likely, if each one of them has an equal chance of occurring.
- Mutually Exclusive Events**: Two or more events are said to be mutually exclusive, when the occurrence of anyone event excludes the occurrence of the other event.
- Exhaustive events**: Events are said to be exhaustive, when their totality includes all the possible outcomes of a random experiment.
- Complementary Events**: The event A and the and the event A^1 are complementary to each other.

Random Variable:

- A variable whose value is a number determined by the outcome of a random experiment is called a random variable.

Discrete random Variable:

- If a random variable takes only a finite number of values, it is called a discrete random variable.



Continuous random variable:

- A random Variable X which can take any value between certain intervals is called a continuous random variable.

Discrete Probability distribution function:

- For a discrete random variable X, the distribution function is given by $F(x) = P(X \leq x)$

Cumulative Probability distribution function:

- The cumulative distribution $F(X)$ of a discrete random variable X with probability distribution $p(x)$ is $F(x) = P(X \leq x) = \sum P(t)$ from $-\infty$ to ∞ .

Probability Mass function:

- The set of ordered pair $[x, P(x)]$ is a probability mass function of the discrete random variable if
 - ✓ $0 \leq P(x) \leq 1$
 - ✓ $\sum P(x) = 1$
 - ✓ $P(X = x) = p(x)$

Probability Density function:

- A function f is said to be probability density function of a continuous random variable, if it satisfies the following properties.
 - ✓ $f(x) \geq 0$
 - ✓ $\int f(x) \cdot dx = 1$ from limit ∞ to $-\infty$

Bernoulli Process:

- It is a process where in an experiment is performed repeatedly, yielding either a success or a failure in each trial and where there is absolutely no pattern in the occurrence of successes and failure.

Binomial Distribution:

- A random variable X is said to follow binomial distribution, if it assumes only non-negative values and its probability mass is given by $P(X) = nC_x P^x Q^{n-x}$
Where n = Number of trials
 x = Number of success
 P = Probability of success
 Q = Probability of failure

Poisson Distribution:

- A random variable X is said to follow Poisson distribution, if it assumes only non-negative values and its probability mass is given by $P(X) = \frac{e^{-\lambda} \cdot \lambda^x}{x!}$
Where λ is the parameter

Normal Distribution:

- A continuous random variable X is said to follow normal distribution with mean (μ) and standard deviation (σ), if its probability density function

$$P(X) = \frac{1 \cdot e^{-1/2 \left(\frac{x-\mu}{\sigma} \right)^2}}{\sigma \sqrt{2\pi}}$$



Decision tree analysis:

- It is a graphical device to show sequence of decisions to be made and the possible events that may occur.
- It shows all possible courses of action, states of nature and the probabilities associated with the state of nature.

Decision making/ taking/theory:

- It refers to a process of best selection from a set of alternative course of action.
- It can define as a choice that can be made from available alternatives.

Define the Term:

- Risk:** It refers to a situation which the probabilities of a particular outcome could be known.
- Certainty:** It refers to a situation where the future events of a particular outcome could be expressed with certainly.
- Uncertainty:** It refers to a situation in which the probability distributions are not known.

Act/ Course of Action:

- The decision making problems deals with the selection of a single act from a set of alternative acts.

Events/ State of Nature:

- The events identify the occurrences which are outside of the decision maker control and which determine the level of success for a given act.

Payoff:

- A numerical value resulting from each possible combination of alternative and state of nature is called Payoff.

Expected monetary value (EMV):

- The conditional value of each event in the payoff table is multiplied by its probability and the product is summed up. The resulting number is the EMV for the act.

Expected opportunity loss (EOL):

- The difference between the greater payoff and the actual payoff is known as opportunity loss.

Various types of decisions:

The various types of decisions can be categorized as follows:

- (i) Decision under certainty.
- (ii) Decision under risk.
- (iii) Decision under uncertainty.
- (iv) Decision making under conflict.



UNIT -2

Research:

- It refers to a search for knowledge.
- It is simply the process of finding solutions to a problem after through study and analysis of the situational factors.

Research Methodology:

- The procedure by which researchers go about their work of describing, explaining & predicting phenomenon are called research methodology.

Research problems:

- It refers to some difficulty which a researcher experiences in the content of either a theoretical or practical situation and wants to obtain a solution for same.
- There are two types of research problems.
 - (i.) Those which relates to states of nature
 - (ii.) Those which relates to relationship between variables.

Review of Literature:

- It is a survey and discussion of the **literature** in a given area of study.
- It is a preliminary step before attempting to plan the study.
- It is importance to show how his work differs with the existing literature.

Research Design \ Research Strategy:

- It is purely and simply the framework or plan for a study, that guides the collection and analysis of data.
- It constitutes the blueprint for the collection, measurement and analysis of data.

Hypothesis:

- It is a statement capable of being tested and there by verified or rejected.
- It is a proposition which can be put to test to determine validity.

Level of Significance:

- The probability used to reject null hypothesis is called level of significance.

Degree of freedom:

- It is the minimal number of values, which should be specified to determine all the data points.

Acceptance & Rejection Region:

- A region which leads acceptant of null hypothesis gives as acceptance region.
- A region which leads to the rejection of hypothesis gives as rejection region

Rating Scales:



- It is an instrument that requires the rater to assign the rated objects that have numerals assigned to them.

Type I errors:

- It means rejection of hypothesis which should have been accepted.
- It is otherwise called producers risk and it is denoted by the symbol α - error.

Type II errors:

- It means accepting of hypothesis which should have been rejected.
- It is otherwise called consumers risk and it is denoted by the symbol β - error

Reality of the state	Decision	
	To accept	To reject
H_0 is true	No Error	Type I error
H_0 is false	Type II error	No Error

Concepts:

It is a idea about a class of objects, attributes and occurrences.

Concept Mapping:

It is a method used to help any individual or group describe ideas about some topics in a pictorial form.

Proposition:

It is a statement of relationship among concepts and a statement of a universal connection between events that have certain properties.

Theory:

It is a coherent set of general propositions used to explain the apparent relationships among certain observed behavior.

Variables:

A concept which takes on different quantitative value is called variable.

Types of variables:

- Dependent variable
- Independent variable
- Continuous variable
- Discrete variable
- Moderating variables
- Extraneous variable

Construct:

It is an image or abstract and idea invented for a given research or theory building.



VALIDITY	RELIABILITY
Validity implies the extent to which the research instrument measures, what it is intended to measure.	It is the degree to which an assessment tool produces stable and consistent results.
It relates to the correct applicability of the instrument/test/procedure in a needed situation	It relates to the extent to which an experiment, test or any procedure gives the same result on repeated trials.
Influencing factors for validity are: process, purpose, theory matters, logical implications, etc.	Influencing factors for reliability are: test length, test score variability, heterogeneity, etc.
There cannot be validity without reliability	There can be reliability without validity.
Validity has more analysis and is harder to achieve	Reliability is comparatively easier and yields faster results.
Examples of different types of validity are: Face validity Construct validity Content validity Criterion validity External validity & Internal validity	Examples of different types of reliability are: Test-retest reliability Parallel forms reliability Intra rater reliability Internal reliability External reliability

Face validity:

It is the extent to which a measurement method appears “on its face” to measure the construct of interest.

Content validity:

It is the extent to which a measure “covers” the construct of interest.

Criterion validity is the extent to which people’s scores on a measure are correlated with other variables that one would expect them to be correlated with

Test-retest reliability:

It is a measure of reliability obtained by administering the same test twice over a period of time to a group of individuals

Inter-rater reliability:

It is a measure of reliability used to assess the degree to which different judges or raters agree in their assessment decisions.

Pilot Study:

Pilot study is a small scale preliminary study conducted in order to evaluate feasibility of the key steps in a future, full-scale project



Population\ Universe:

- The study of various characteristics relating to items \ individual belong to a particular group is called as population.

Sampling:

- A finite subset selected from a population with the object of investigating its properties is called sampling.

Sampling frame:

- The frame describes the population in terms of sampling units.
- Samples are drawn from lists are called as sources lists \ sampling frames.

Sampling Units:

- It is a set of elements considered for selecting a sample.

Sample Size:

- The numbers of units in the sample is called as sample size.

Determinant of a Sample Size:

- Nature of the universe
- Number of group
- Nature of study
- Sampling techniques
- Confident level & Significance level
- Types of sampling
- Type of measuring techniques
- Availability of resources
- Type of statistical analysis
- Determining precision level

UNIT -3

Data:

- It is a process of gathering, modeling, and transforming data with the goal of highlighting useful information, suggesting conclusions, and supporting decision making.
- It has two types a. Quantitative data
b. Qualitative data

Tabulation:

- It is the process of summarizing or grouped data in the form of a table to locate the desired information.

Univariate:

- It focuses on the level coverage and distribution of a single variable.

Bivariate:

- It focuses on the degree of relationship between two variables.

Multivariate:

- It is the analysis of the simultaneous relationship among three or more variables.



Measure of central Tendency:

- It is a typical value around which other figures gather together.

Arithmetic Mean:

- It is defined as a sum of value divided by the number of values.

Median:

- It is defined as the middle most or central value of the variable in a set of observation, when the observation are arranged in ascending order of their magnitude.

Mode:

- It is the value that occurs often or equivalently has largest frequency.

Range:

- It is the difference between the largest frequency and smallest frequency of the value.

Standard deviation:

- It is the square root of the average of square deviations taken from arithmetic mean.

Mean/Average deviation:

- It is the average of the modulus of the deviation of the observation in a series taken from mean.

Variance:

- It is the square of standard deviation.

Correlation	Regression
1. The statistical tools with the help of which relationship between two or more variables are studied are called correlation.	The statistical tool with the help of which we are in a position to estimate the unknown values of one variable from known values of another variable.
2. It is not possible to study the cause and effect relationship.	It is possible to study the cause and effect relationship.
3. It is independent of changes of scale and origin.	It is independent of changes of origin but not of scale.
4. It is use to examine measure of degree of covariability between the variables.	It is use to examine the nature of relationship between the variables.



UNIT -4

Multi dimensional Scaling:

Multidimensional scaling (MDS) is a technique that creates a map displaying the relative positions of a number of objects, given only a table of the distances between them.

Application of SPSS:

- It stands for **S**tatistical **P**ackage for the **S**ocial **S**ciences such as SPSS, SAS, NCSS. RATS, GAUSS, JMP and ARIMA.
- It is a computer program used to analyze data in management research.
- It is also used for data analysis in management research.
- They are useful for setting up for computer cards for data analysis:
 - ✓ SPSS Cards
 - ✓ Job control cards
 - ✓ Program cards.
 - ✓ Procedure cards
 - ✓ Computer time
 - ✓ Error message.

Factor Analysis:

- It is a technique that is used to summarize the information contained in a large number of variables into smaller number of factors.

Cluster Analysis:

- It is a group of relatively homogeneous cases.
- It deals with objects rather than variables.
- It deals the relationship that need not be linear.

Discriminant Analysis:

- It is a technique for classifying a set of observations into predefined classes.
- The purpose is to determine the class of an observation based on a set of variables known as predictors or input variables.

Conjoint analysis:

- It is a statistical technique used in market research to determine how people value different features that make up an individual product or service.

Canonical Correlation:

- It is a techniques used to determine the degree of linear association between two sets of variables each consisting of several variables.

SEM Analysis:

- It is a set of statistical techniques used to measure and analyze the relationships of observed and latent variables.



UNIT -5

Report:

- It is a written document through which the researcher intimates to the world.
- It is a channel of communicating the research finding to the readers of the report.

Importance of a Report:

- It is necessary for decision making in various functional areas of management.
- It gives information to investors, speculators, government, customers and people at large.
- It is important for philosophers, thinkers, analyst, and students for the development of new concepts

Bibliography:

- It means booklist.
- It refers to list of written sources either published or unpublished.

Synopsis\ Abstract:

It is a brief account of the research study that provides an overview, and highlights the following important related to it such as problem statement, sampling design, data collection method & result of data analysis.

Oral Presentation:

- This type of reporting takes place in public viva voce examination.
- The researcher would present the details of his work orally.
- He may use overhead projector, slide projector, simple presentation on board, and printed matter.
- He should maintain a logical sequence in his presentation.

Executive Summary:

- It is the brief introduction to a business plan
- It is a short document that 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.

Different Styles of Referencing:

- Author-date styles- APA Citation Style , MLA Citation Style and Harvard reference style
- Documentary note styles -Chicago/Turabian Citation Style and oxford style

Citation:

It is a quotation from or reference to a book, paper, or author, especially in a scholarly work.

Research Ethics:

- It is defined here to be the ethics of the planning, conduct, and reporting of research.



5 MARKS QUESTIONS AND ANSWERS

UNIT- 1

1. Describe the rules (Theorem) and Approaches of Probability?

PROBABILITY:

- It means a chance, a possibility, likelihood or an odd.
- It refers to an event the happening and non-happening of which is uncertain.

FUNDAMENTAL THEOREM/ RULES:

- The Addition Theorem
 - The multiplication Theorem
1. $P(A \cup B) = P(A) + P(B)$ (For mutually exclusive events)
 2. $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ (for Non –mutually exclusive events)
 3. $P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(C \cap A) + P(A \cap B \cap C)$
 4. $P(A \cap B) = P(A) \cdot P(B)$ (Independent events)
 5. $P(A \cap B) = P(A) \cdot P(B/A)$ (Dependent events)
 6. $P(\Phi) = 0$
 7. $P(S) = 1$
 8. $P(A) + P(A^c) = 1$

FUNDAMENTAL APPROACHES / TYPES:

The different types of probability are as

1. Subjective probability
2. Conditional probability
3. Joint probability
4. Marginal probability
5. Bayesian probability
6. Objective probability
7. Mathematical /classical/Priori probability
$$P(A) = \frac{\text{Number of favorable outcomes}}{\text{Total Number of possible outcomes}}$$
8. Statistical / Empirical / Posteriori probability
$$P(A) = \lim_{n \rightarrow \infty} (m/n)$$
9. Axiomatic probability
 - Axiom 1: $0 \leq P(A) \leq 1$
 - Axiom 2: $P(S) = 1$
 - Axiom 3 : $P(A_1 \cup A_2 \cup \dots) = P(A_1) + P(A_2) + \dots$



2. Describe the properties of BINOMIAL DISTRIBUTION?

DEFINITION:

A random variable X is said to follow binomial distribution, if it assumes only non-negative values and its probability mass is given by $P(X) = nC_x P^x Q^{n-x}$

Where n = Number of trails

x = Number of success

P = Probability of success

Q = Probability of failure

APPLICATIONS:

1. Scientific and Engineering application as Quality measures
2. Medical applications as success or failure of a surgery cure
3. Automobile applications as defective or Non-defective items.

PROPERTIES/CHARACTERISTIC:

1. Mean = np
2. Variance = npq
3. Standard Deviation = \sqrt{npq}
4. Skewness = $\frac{(p-q)^2}{npq}$
5. It has two parameters n and p or q .
6. It is a discrete probability distribution
7. The binomial distribution has either 1 or 2 modes
8. A binomial distribution is positively and negatively skewed.

3. Describe the properties of POISSON DISTRIBUTION?

DEFINITION:

A random variable X is said to follow Poisson distribution, if it assumes only non-negative values and its probability mass is given by $P(X) = \frac{e^{-\lambda} \cdot \lambda^x}{x!}$
Where λ is the parameter

APPLICATIONS:

1. The Emission of radioactive (α) particles.
2. The number of suicides reported in a particular day.
3. The number of accidents taking place per day in busy road.
4. The number of telephone calls received at a particular telephone exchange.
5. The number of printing mistakes per page in a book.
6. The number of defective materials in a package.
7. The number of faulty blades in a packet of 100.

PROPERTIES/CHARACTERISTIC:

1. Mean = λ
2. Variance = λ
3. Standard Deviation = $\sqrt{\lambda}$
4. Skewness = $\frac{1}{\lambda}$
5. It has single parameter λ .
6. It is a discrete probability distribution.
7. The Poisson distribution may have either 1 or 2 modes



4. Describe the Properties of NORMAL DISTRIBUTION?

DEFINITION:

A continuous random variable X is said to follow normal distribution with mean (μ) and standard deviation (σ), if its probability density function

$$P(X) = \frac{1 \cdot e^{-1/2(x-\mu/\sigma)^2}}{\sigma\sqrt{2\pi}}$$

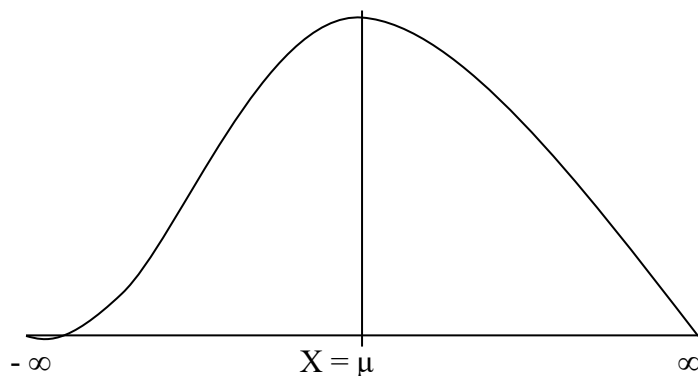
Where μ = Mean

σ = Standard deviation

APPLICATIONS:

1. It is used in industry for setting control limits in Statistical Quality Control.
2. It is applied to the graduation of the curves which are not normal.
3. It is used in both experimental and physical sciences.

SHAPE OF THE CURVE:



PROPERTIES/CHARACTERISTIC:

1. Mean = μ
2. Variance = σ^2
3. Standard deviation = σ
4. Skewness = 0
5. It is a continuous probability distribution.
6. It has only one mode.
7. Mean = Median = Mode = μ
8. The normal curve is bell shaped.
9. It is symmetrical at $X = \mu$
10. The point of inflections are $X = \mu + \sigma$
11. X-axis is an asymptote to the curve.
12. The total area between X-axis and the curve is unity.
13. The first and third quartiles are Equidistant from Median.
14. The height of the curve is maximum at its Mean value.



5. State the Application and Prove BAYES THEOREM?

STATEMENT:

“Let A_1, A_2, \dots, A_n be mutually exclusive exhaustive events and Let B be an independent event such that $P(B/ A_i)$ is the conditional probability of B given that A_i has already occurred then

$$P(A_i / B) = \frac{P(A_i). P(B/ A_i)}{\sum_{i=1}^n P(A_i). P(B/ A_i)}$$

PROOF:

By Definition of Conditional probability, we have

$$P(A_i \cap B) = P(A_i/ B). P (B) = P (B/ A_i).P (A_i) \text{ -----Equation 1}$$

From Equation 1, we have

$$\begin{aligned} P(A_i/ B) &= \frac{P(A_i \cap B)}{P (B)} \\ &= \frac{P(A_i \cap B)}{\sum_{i=1}^n P (A_i). P (B/ A_i)} \\ &= \frac{P (A_i). P (B/ A_i)}{\sum_{i=1}^n P (A_i). P (B/ A_i)} \quad \text{FOR } i= 1,2,3,4 \dots n \end{aligned}$$

Hence it is proved.

APPLICATIONS:

1. To find out the defective items in manufacturing of a product.
2. To find out the chances of solving a problem in mathematics.
3. To find out the performance of a machine having same functions in a company.
4. To find out the standard quality of a product.
5. To find the solution for statistical problems.

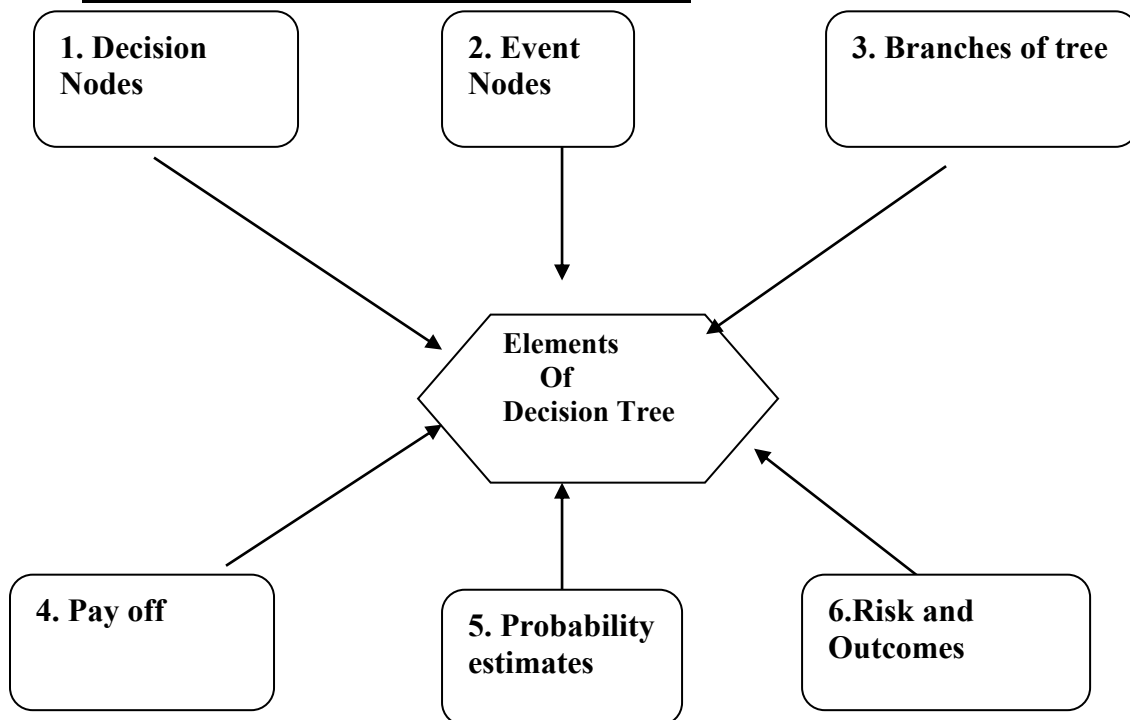


6. Describe the application and Construction of DECISION TREE ANALYSIS WITH EXAMPLES?

DECISION TREE ANALYSIS:

1. It is a graphical device to show sequence of decisions to be made and the possible events that may occur.
2. It shows all possible courses of action, states of nature and the probabilities associated with the state of nature.
3. The decision diagram looks very much like a drawing of a tree, so it called as “Decision Tree”.
4. It consists of
 - ✓ Nodes
 - a. Decision Node - It is represented by square □
 - b. Event /Chance Node – it is represented by circle○
 - ✓ Branches
 - ✓ Probability estimates
 - ✓ Pay offs.
5. There are basically 2 types of Decision tree as
 - a. Deterministic Decision tree
 - b. Probabilistic Decision tree
 - c. Static Decision tree
 - d. Sequential Decision tree

BASIC ELEMENTS OF DECISION TREE:





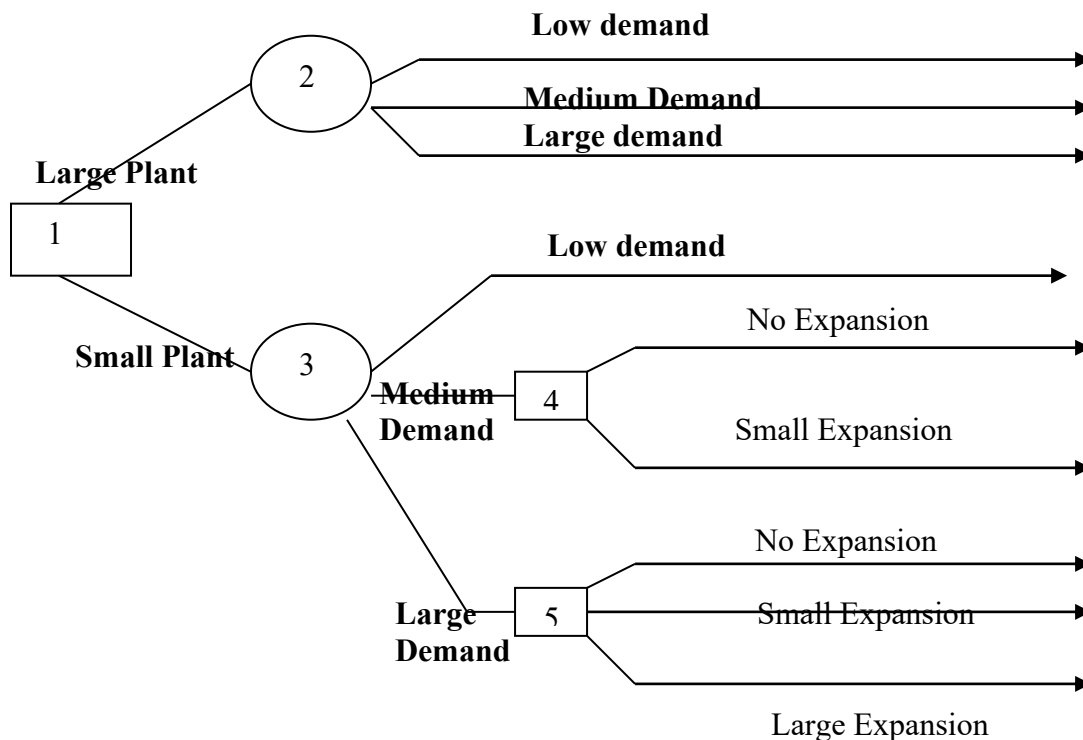
BASIC STEPS / RULES IN DRAWING A DECISION TREE:

1. Identify all decisions and their alternatives to be made and the order in which they must be made.
2. Identify the Chance events.
3. Develop a tree diagram showing the sequence of decisions and chance events.
4. The tree is constructed starting from left and moving towards right.
5. Estimates the probabilities of occurrence of the various events.
6. Obtain outcome of interaction among decision and events.
7. Calculated the expected value of all possible decision alternatives.
8. Select the decision alternative offering the most attractive expected value.

APPLICATION OF DECISION TREE:

1. Investment decision Problems.
2. Replacement decision Problems.
3. Distribution decision Problems.
4. Site decision Problems.
5. helps in the introduction of New Product Development
6. helps in Marketing strategy.

ILLUSTRATION/ EXAMPLE/ CONSTRUCTION OF DECISION TREE ANALYSIS:



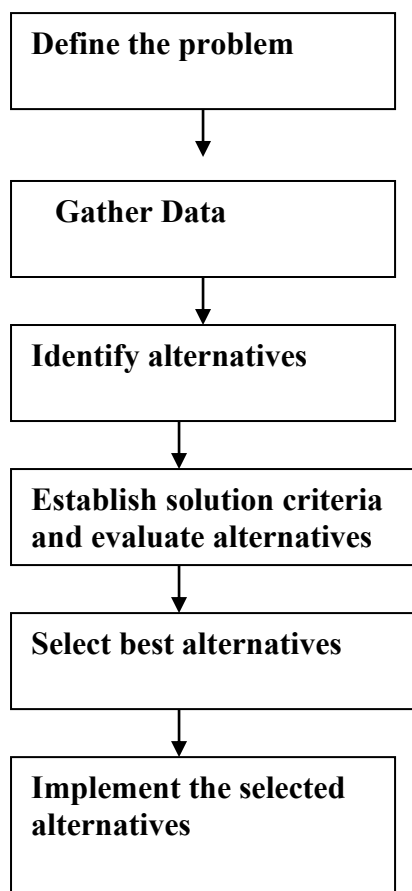


7. Explain the role of Quantitative methods in Decision Making / describe the different techniques of Decision Making/ describe the types of Decision Making Environment?

DECISION MAKING/ TAKING/THEORY:

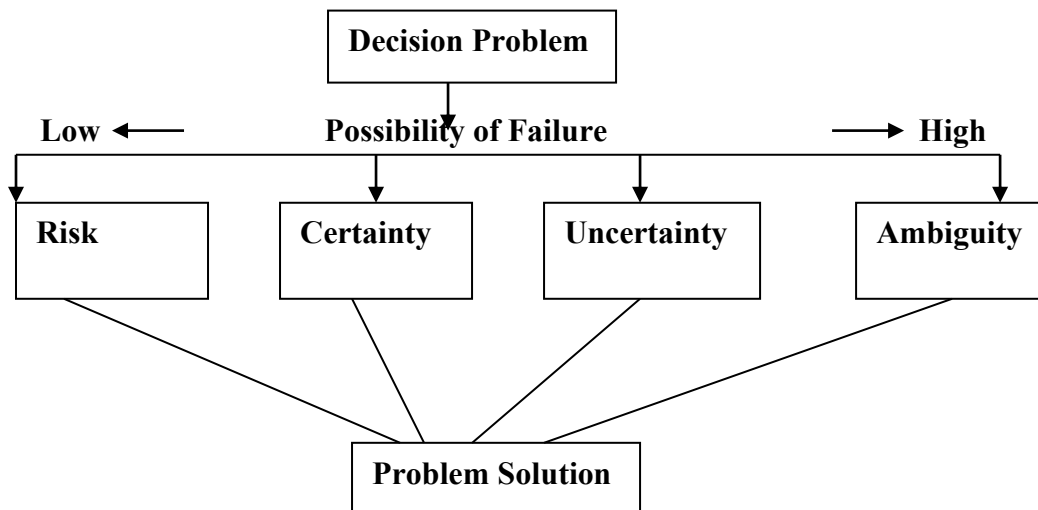
1. It refers to a process of best selection from a set of alternative course of action.
2. It can define as a choice that can be made from available alternatives.
3. The decision theory refers to an optimal choice under condition of uncertainty.
4. The basis elements of Decision Making are as
 - ✓ Decision Makers
 - ✓ Course of actions
 - ✓ State of nature/Events
 - ✓ Pay off
 - ✓ Regret
 - ✓ Decision alternatives
5. The Quantitative Methods helps a decision Maker in three ways:
 - ✓ Guide Decision Making
 - ✓ Aid Decision Making
 - ✓ Automate Decision making

STEPS IN DECISION MAKING PROCESS:

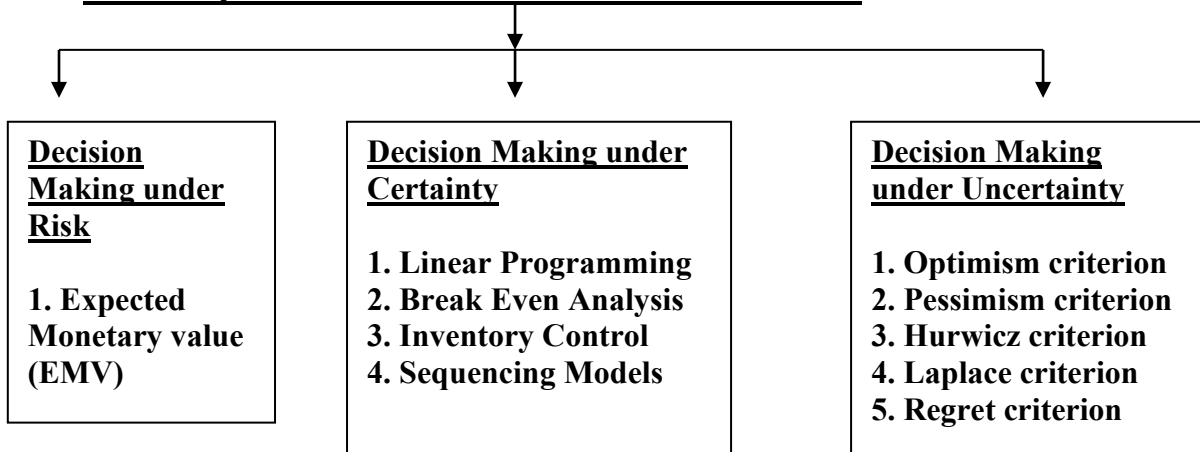




TYPES OF DECISION MAKING ENVIRONMENTS:



TECHNIQUES / METHODS OF DECISION MAKING:



A. Decision Making under Risk:

1. In this case, the Decision Maker has less than complete knowledge with certainty of the consequence of every decision choice.
2. The decision maker faces many states of nature.
3. This category comes under stochastic models.
4. The example of problems of Stochastic nature are as
 - a. Forecasting safety stock of an item
 - b. Determining the quantity of an insurance spare.
5. The Expected Monetary value(EMV) consists
 - a. Payoff Matrix
 - b. Determination of EMV
 - c. Selection of optimal alternative



B. Decision Making under Certainty

1. In this case, the Decision Maker has complete knowledge of the consequence of every decision choice with certainty.
2. This Category comes under Deterministic models.
3. The example of problems of Deterministic models are as
 - a. Make or buy Decision
 - b. Determination of Economic lot size.

C. Decision Making under Uncertainty:

1. In this case, the Decision Maker is unable to specify the probabilities with which the various states of nature will occur.
2. This category comes under uncertain situations.
3. The Example of problems are as
 - a. Launching a new product with no competitors
 - b. Determining the quantity of an insurance spare in the absence of data.

(i) Optimism criterion/ Maximax/Minimin Principle:

1. It is the decision to take the course of action which maximizes the maximum payoff.
2. Since the Decision Maker selects an alternative with the highest possible payoff value, it is called "Optimism criterion".
3. The steps involved are as
 - a. Determine the best outcome for each alternative.
 - b. Select the alternative associated with the best.

(ii) Pessimism criterion/ Maximin/Minimax Principle:

1. It is the decision to take the course of actions which maximizes the minimum possible pay off
2. Since the Decision Maker selects an alternative with the lowest possible payoff value, it is called "Pessimism criterion".
3. The steps involved are as
 - c. Determine the lowest outcome for each alternative.
 - d. Select the alternative associated with the best.

(iii) Hurwicz /Realism Criterion:

1. It is a mixture of Optimistic and Pessimistic Decision criterion.
2. The coefficient of Optimism is denoted by α and lies between 0 and 1.
3. According to Hurwicz,
$$H = \alpha (\text{Maximum payoff in column}) + (1-\alpha) \text{Minimum payoff in column.}$$

(iv) Laplace / Bayes/ Equally Likely Criterion:

1. Each state of nature is assigned an equal probability.
2. Assign Equal probability = $1 / \text{Number of state of nature}$
3. Compute the expected Payoff value.
4. Select the best expected payoff value.

(v) Regret/ Savage / Minimax Criterion:

1. It is also known as opportunity loss decision criterion because the decision maker feels regret after adopting a wrong course of action resulting in loss of pay off.



UNIT -2

**1. Discuss the relevance of research for decision making in various functional areas of management?
\ Explain various functional areas that are used in BUSINESS RESEARCH?**

BUSINESS RESEARCH:

- The Scope of research in social research covers the disciplines of Economics, education, History, Geography, Law & Management.
- An increasing amount of attention is being devoted to the decision making process of business managers, customers and employees.
- Business research may be sub divided into marketing, finance, personnel and production.

A. Marketing Function:

- It deals with production and distribution problems, marketing institutions, marketing policies and practices.
 1. Marketing Policy
 2. Product Research
 3. Market research
 4. Advertising & Sales Promotion Research

B. Finance Function:

- Research in financial management includes operations of specialized financial institutions as well as the financial side of regular business firms.
 1. Financial analysis
 2. Rationing Resources
 3. Financial market & Intermediaries
 4. Management o f funds

C. Production Function:

- It is also known as manufacturing research has tended to focus on materials and equipments rather than on the human aspects.
 1. Equipment purchase & replacement
 2. Cost reduction research
 3. Processes improvement studies
 4. Quality control studies
 5. Inventory control research
 6. Work measurement.

D. Personnel functions:

- It provides wide scope for research than any other functional areas, because human behavior is prone to constant changes.
 1. Personnel policies
 2. Organization structure
 3. Job & Manpower requirements
 4. Job evaluation
 5. Recruiting
 6. Labour relations.

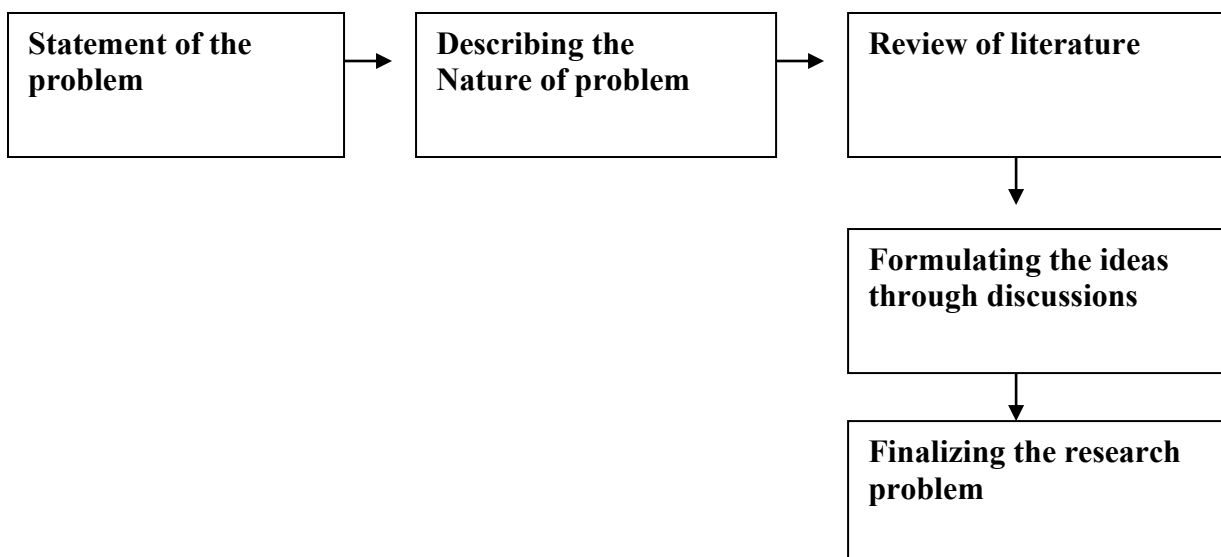


2. Explain steps, source and selection \ criteria of good Research Problems?

Research Problems \ Questions:

- It refers to some difficulty which a researcher experiences in the content of either a theoretical or practical situation and wants to obtain a solution for same.
- There are two types of research problems.
 - (i.) Those which relates to states of nature
 - (ii) Those which relates to relationship between variables.
- The feasible of the problem should be determined based on the following aspect:
 - ✓ Cost Factor
 - ✓ Time Factor
 - ✓ Facilities Factor
 - ❖ Libraries facilities
 - ❖ Data analysis facilities
 - ❖ Training facilities
 - ❖ Administrators and Sponsorship co-operation.

Steps in Defining Research Problem:



Source \ Formulation of Research Problem:

1. Reading Books
 - ✓ By means of Journals
 - ✓ By means of Magazines
2. Academic Experience
3. Daily Experience
4. Exposure to field situations
5. Consultations
6. Brainstorming



3. Discuss various research designs? \ Explain various research designs that are used in business research? \ Explain descriptive, Exploratory and Experimental research design?

RESEARCH DESIGN:

- It is purely and simply the framework or plan for a study, that guides the collection and analysis of data.
- It constitutes the blueprint for the collection, measurement and analysis of data.
- It is a catalogue of the various phases & facts relating to the formulation of a research effort.
- The research design contains answers to the following questions:
 1. What is the study about?
 2. Why is the study being made?
 3. Where will the study be carried out?
 4. What type of data is required?
 5. What period of time will study include?
 6. What techniques will be used?
- 7. In what style the report will be prepared?

TYPES OF RESEARCH DESIGN:

1. Descriptive Research design:

- It simply describes something such as demographic characteristics of consumer who use the product.
The two basic types of research design used in descriptive research are
 - (i) Case research design
 - (ii) Statistical research design

2. Exploratory Research design:

- The major emphasis is an discovery of ideas and insights.
- It is used to split the vague problem into smaller and sub problem into hypothesis for futher research.
 - (i) Literature surveys
 - (ii) Experience surveys
 - (iii) Analysis of selected cases

3. Experimental Research design:

- It is also called as casual research design.
- These designs can be used where:
 - 1) There is time priority in a causal relationship
 - 2) There is consistency in a causal relationship.
 - 3) The magnitude of the correlation is great.

The following are the areas where experiments are used.

- (i) Product design
- (ii) Package design
- (iii) Pricing policies
- (iv) Distribution policies



4. What are the different types of OBSERVATION used for collecting primary data?

OBSERVATION:

- It means “recording of events or actions” as it is found in the environment.
- It is defined as the process of recognizing, noting people, objects and occurrences rather than asking for information.
- The researcher records “what is happening rather than what has happened or what is going to happen”.
- The process of observation takes place in three steps as
 1. Sensation
 2. Concentration
 3. Perception.
- While using this methods, the researchers should keep the following things in his minds
 1. What should be observed?
 2. How the observation should be recorded?
 3. How accuracy observation can be ensured?

INSTRUMENTAL AID IN FIELD OBSERVATION:

- Detailed observation plan
- Observation schedules
- Observation training
- SET meter
- Check lists
- Mechanical counter
- Field notes
- Score cards
- Socio metric scales
- Audio and Video tape recorders

TYPES OF OBSERVATION:

1. Participant Observation
2. Non- Participant Observation
3. Non-controlled observation
4. Controlled observation
5. Structured observation
6. Unstructured observation
7. Behavioural observation
8. Non- Behavioural observation
9. Mechanical observation
10. Disguised observation



5. Discuss the INTERVIEW as techniques of data collection?

INTERVIEW:

- It is a face to face interaction between two or more persons for a particular purpose.
- It is a technique that is primarily used to gain an understanding of the underlying reasons and motivations for people attitudes, preference or behaviour.
- It is not only used in employee selection, but for placement, appraisal, disciplinary action, counseling and general problem solving.

Advantages:

- Serious approach by respondent resulting in accurate information.
- Good response rate.
- Possible in depth questions.
- Can investigate motivate and feelings.
- Can use recording equipment

Disadvantages:

- Expensive method
- Time consuming method
- Need to set up interviews
- Geographic limitations.
- Transcription and analysis can present problems.

STEPS INVOLVED IN CONDUCTING AN INTERVIEW:

1. List the areas in which you require information.
2. Decide on type of interview
3. Transform areas into actual questions.
4. Try them out on a friend or relative.
5. Make an appointment with respondents
6. Try and fix a venue and time when you will not be disturbed.

TYPES OF INTERVIEW:

1. Formal interview
2. Informal interview
3. Personal interview
4. Group interview
5. Panel \ Committee interview
6. Structure interview
7. Unstructured interview
8. Stress interview
9. Case interview
10. . Mock interview
11. Depth interview
12. Telephone interview



6. Discuss the determinants and approaches in fixing optimal Sample Size?

Sample Size:

- The numbers of units in the sample is called as sample size.

Determinant of a Sample Size:

- Nature of the universe
- Number of group
- Nature of study
- Sampling techniques
- Confident level & Significance level
- Types of sampling
- Type of measuring techniques
- Availability of resources
- Type of statistical analysis
- Determining precision level

Approaches to determine of a Sample Size:

1. Estimating the sample size based on proportion
2. Estimating the sample size based on mean
3. Estimating the sample size based on Bayesian

1. estimating the sample size based on proportion

When the population is infinite:

$$n = \frac{Z^2 \times P(1 - P)}{d^2}$$

n = Sample Size

Z = Z Statistic for a level of confidence

P = Expected prevalence or Proportion (p is 10%)

d = Acceptable Amount of Sampling Error is 5%

When the population is finite:

$$n = \frac{N z^2 \sigma^2}{(n-1) D^2 + z^2 \sigma^2}$$

n = Sample Size

Z = Z Statistic for a level of confidence

σ = Standard deviation from prior research

E = Sampling Error Rate



UNIT -3

1. Describe the concept of EDITING and CODING?

EDITING:

- It is the process of examining the data collected in questionnaire \ schedule to detect errors and omissions.
- It is used to see whether they are corrected and schedule prepared for tabulation.
- The Editor is responsible for seeing that the data are
 - ✓ Uniformly entered
 - ✓ Acceptable for tabulation
 - ✓ As accurate as possible
- **Types of Editing**
 1. Field Editing
 2. Central Editing

Guidelines for Editor:

- Each Editor should be familiar with instructions given to interviewers and coders.
- Editor should not destroy, erase or make illegible the original entry by the interviewer.
- Original entries should be crossed out with a single line so as to remain legible.
- Editor must make entries on the form in some distinctive colour and in a standardized form.
- All answers changed or supplied by the editor should be initiated.
- Editor's initials and data of editing should be placed on each schedule completed.

CODING:

- It refers to the process of assigning numerals \ symbols so that responses can be put into a limited number of classes.
- The purpose of symbol is to translate raw data into symbols, which may be counted and tabulated.
- Transcription sheet is a large summary sheet the answers of all the respondents.

Guidelines for Coders:

- Give code numbers for each respondent for identification.
- Give code numbers for each question.
- Give code numbers for each response.
- Give numbers for qualitative responses.
- Do not delegate the work of categorization to others.
- Prepare the coding frame.
- Decide on the instructions to coders.
- Prepare and supply coder's instruction manual.
- May take the services of trained coders with close supervision.
- Carefully examine every code item in the initial stages of coding.
- Afterwards have a random checking of the coded times.
- One standard method is to code in the margin with a coloured pencil.



2. Explain the standard test for hypothesis? \ Explain the application of Parametric and Non – Parametric Tests?

Parametric Test	Non –Parametric Test
1. The test of hypothesis which deals with population with the assumption is called Parametric test.	The test of hypothesis which deals with population with no assumption is called Non – Parametric tests.
2. All the tests are based on the assumptions of normality.	All the tests are based on the assumptions of normality or non-normality
3. The population from which the sample is drawn is normally distributed.	The population from which the sample is drawn is not normally distributed
4. Parametric tests are called so because they measure the statistical significance between the parameter and a given statistic.	They are also known as distribution-free tests and the data are generally ranked or grouped.
5. The types of Parametric test are as <ul style="list-style-type: none"> ✓ Z-Test ✓ T-test ✓ F-test 	The types of Non –Parametric test are as <ul style="list-style-type: none"> ✓ Sign test ✓ Signed Rank test ✓ Chi- Square test ✓ Mcnemer test ✓ Fisher Irwin test ✓ U test / Mann Whitney test ✓ H test / Kruskall wall test ✓ Spearman’s Rank Correlation

A. Parametric Test:

1. Z-Test:

- This test was developed by fisher and is based on the normal distribution.
- It is more generally applied to the confidence that can be placed in judgments made from large samples.
- The standard score are also called as Z- values, Z- score and normal scores.

2. T-test:

- This test was developed by Gosset and it is based on t-distribution.
- The t-test is more generally applied to the confidence that can be placed in judgments made from small samples.
- Since he published his finding under the pen name “student”, it is known as student’s t – test.

B.Non- Parametric Test:

1. Chi- Square test:

- It is used to describe the magnitude of difference between the fact and theory and it is based on chi-square distribution.
- It is used to compare the observed data with the expected data according to the hypothesis.

2. Spearman’s Rank Correlation:

- It is used to determine the degree of correlation between two variables is based upon the rank of the values in each variable.
- It is useful in case of data, which are qualitative in nature like intelligence, honesty, efficiency, competitive events.



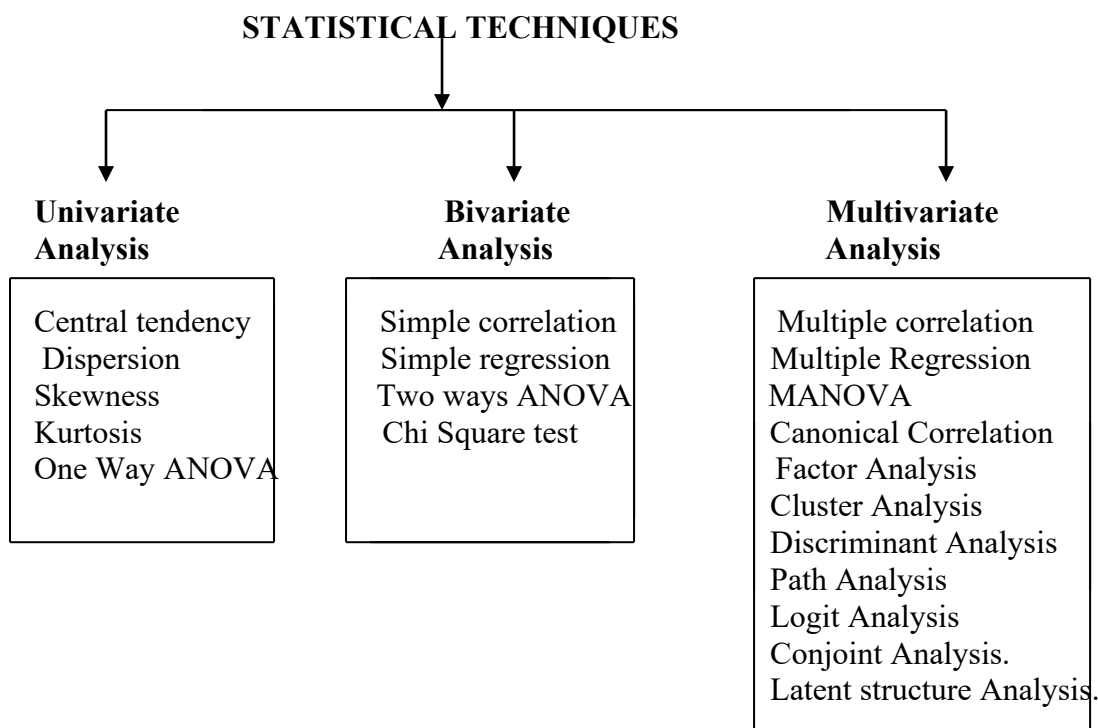
3. Explain the various STATISTICAL TECHNIQUES used in management research or Managerial Decision making?

STATISTICAL TECHNIQUES:

- **Statistics** is a mathematical science pertaining to the collection, analysis, interpretation or explanation, and presentation of data.

Merits:

- They provide definiteness
- They provide data in a condensed form.
- They provide compararitive knowledge.
- They help to design policies.
- They help to test the hypothesis.
- They help to forecast future trends.



Univariate Analysis:

- It focuses on the level coverage and distribution of a single variable.

Bivariate Analysis:

- It focuses on the degree of relationship between two variables.

Multivariate Analysis:

- It is the analysis of the simultaneous relationship among three or more variables.
- It is arranging a large amount of complex information involved in the real data into a simplified visible form



UNIT -4

1. What is CLUSTER ANALYSIS? Explain the methods and application of Cluster analysis?

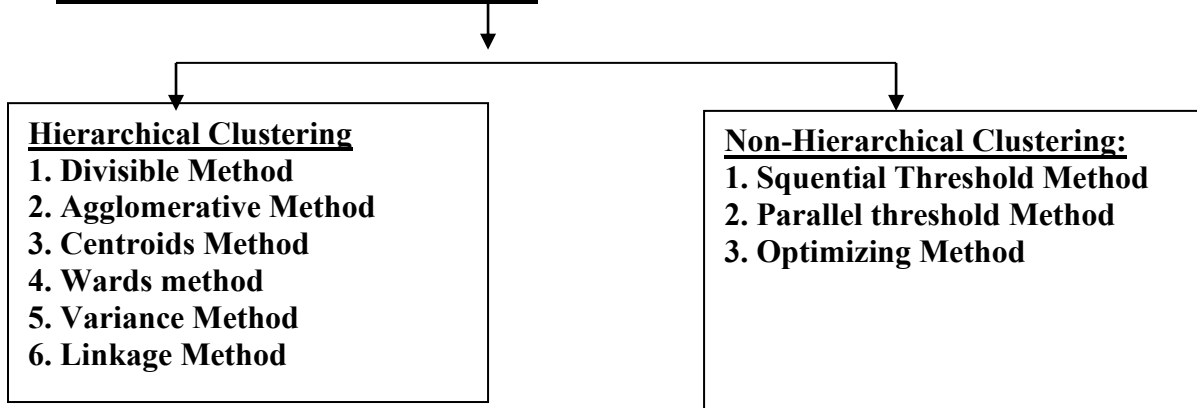
CLUSTER ANALYSIS:

- It is a group of relatively homogeneous cases.
- It deals with objects rather than variables.
- It deals the relationship that need not be linear.
- It deals with the variable that may be nominal, ordinal, interval scaled.

General Steps/ Procedure in Cluster Analysis:

1. Formulate the problem.
2. Select a distance measure
 - ✓ Squared Euclidean distance
 - ✓ Manhattan distance
 - ✓ Chebychev distance
 - ✓ Correlation distance
3. Select a clustering procedure
4. Decide on the numbers of clusters.
5. Map and interpret clusters using illustrative techniques
 - ✓ Perceptual maps
 - ✓ Icicle plots
 - ✓ dendrograms
6. Assess reliability and validity using various methods
 - ✓ Repeat analysis but use different distance measure
 - ✓ Repeat analysis but use different clustering technique
 - ✓ Repeat analysis several times , deleting one variable each time
 - ✓ Repeat analysis several times, using a different order each time.

Methods of Clustering Techniques:



Application of Cluster Analysis:

- It is widely used in marketing research for studying the preference for various types of product attributes.
- It is widely used in marketing research to classify respondents into market segments



2. Explain DISCRIMINANT ANALYSIS? Mention its types and Applications?

DISCRIMINATION ANALYSIS:

- It is a technique for classifying a set of observations into predefined classes.
- The purpose is to determine the class of an observation based on a set of variables known as predictors or input variables.
- The model is built based on a set of observations for which the classes are known.
- This set of observations is sometimes referred to as the training set.
- Based on the training set, the technique constructs a set of linear functions of the predictors, known as discriminant functions, such that
$$L = b_1x_1 + b_2x_2 + \dots + b_nx_n + c,$$
Where the b's are discriminant coefficients,
the x's are the input variables or predictors
and c is a constant.
- These discriminant functions are used to predict the class of a new observation with unknown class.
- Discriminant Analysis may have a descriptive or a predictive objective.

Function of Discriminant Analysis:

1. Identification
2. Decision making
3. Prediction
4. Pattern Recognition
5. Learning

Methods implemented in Discriminant Analysis:

1. Multiple Discriminant Analysis
2. Linear Discriminant Analysis
3. K-NNs Discriminant Analysis

Application of Discriminant Analysis:

- To classify respondents into mutually exclusive groups.
- It is widely used in marketing research to predict target market membership.
- The purpose of Discriminant Analysis is to classify objects such as people, customers, things, etc into one of two or more groups based on a set of features that describe the objects such as gender, age, income, weight & preference score.
- The technique is typically used to measure changes in market share/volume sales at different prices and understand brand interaction with competitors.



3. Describe CONJOINT ANALYSIS and its Applications?

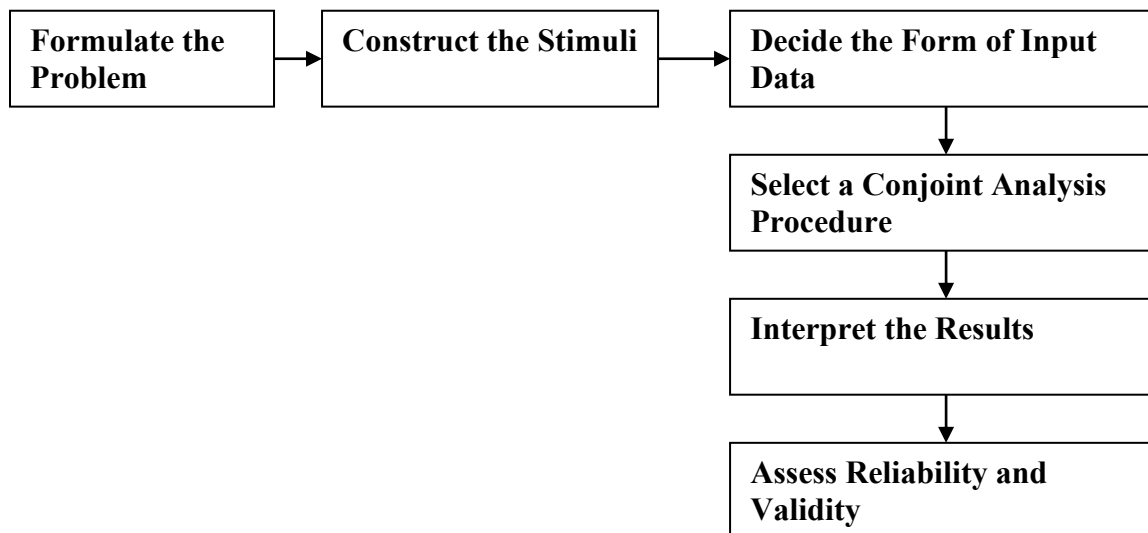
CONJOINT ANALYSIS:

- **Conjoint analysis** is a statistical technique used in market research to determine how people value different features that make up an individual product or service.

Terminology in conjoint analysis:

- Part-worth functions
- Relative importance weights
- Attribute levels
- Full profiles
- Pairwise tables
- Cyclical designs
- Fractional factorial designs
- Orthogonal arrays
- Internal validity.

Conducting conjoint analysis:



Application of conjoint analysis:

1. Optimum product design
2. Market segmentation
3. Estimating Customer level brand equity
4. SWOT Analysis
5. estimates psychological tradeoffs
6. profitability of new designs



4. Describe MULTIPLE REGRESSION ANALYSIS?

- It is a powerful technique used for predicting the unknown value of a variable from the known value of two or more variables- also called the predictors.
- It is a flexible method that may be appropriate whenever a dependent variable is to be examined in relationship to any other independent variable.
- The purpose of multiple regressions is to analyze the relationship between metric or dichotomous independent variables and a metric dependent variable.
- A multiple regression equation for predicting Y can be expressed as follows:

$$(1) \quad Y = A + B_1X_1 + B_2X_2 + B_3X_3$$

Where Y = Dependent variable

X₁, X₂ = Independent variable

A, B₁, B₂ = constant

Terminology in multiple regressions:

- Partialing
- Controlling for
- Residualizing
- Holding constant

Assumptions of multiple regressions:

- The errors are normally distributed
- The mean of the errors is zero
- Errors have a constant variance
- The model errors are independent

Types of multiple regressions:

1. Standard multiple regressions:

It is used to evaluate the relationships between a set of independent variables and a dependent variable.

2. Hierarchical multiple regression:

It is used to examine the relationships between a set of independent variables and a dependent variable, after controlling for the effects of some other independent variables on the dependent variable.

3. Stepwise Multiple regression:

It is used to identify the subset of independent variables that has the strongest relationship to a dependent variable.

Application of multiple regressions

- Use of categorical variables in prediction
- Calculation of the unequal n ANOVA problem
- Model nonlinear relationships between Y and a set of X
- Prediction of a continuous Y with several continuous X variables



5.Explain the concept of Structural Equation Modelling (SEM)/ Casual modelling Analysis?

STRUCTURAL EQUATION MODELING (SEM)

- Structural Equation Modeling (SEM) is a multivariate statistical approach, hypothesis-driven technique for analyzing structural and causal correlations between two or more variables.
- It is a set of statistical techniques used to measure and analyze the relationships of observed and latent variables.
- The analysis of covariance structures is also known as casual modelling since the Structural Equation Model provides a framework for the covariances between the measured variables.
- It is used for multivariate processes such as factor analysis, regression analysis, discriminant analysis, and canonical correlation.
- SEM is a combination of two statistical methods namely confirmatory factor analysis and path analysis. Confirmatory factor analysis, which originated in psychometrics, has an objective to estimate the latent psychological traits, such as attitude and satisfaction. Path analysis, on the other hand, had its beginning in biometrics and aimed to find the causal relationship among variables by creating a path diagram.

PROCESS/STEPS OF STRUCTURAL EQUATION MODELING

1. review the relevant theory and research literature to support model specification
2. specify a model (e.g., diagram, equations)
3. determine model identification (e.g., if unique values can be found for parameter estimation; the number of degrees of
4. freedom, df, for model testing is positive)
5. select measures for the variables represented in the model
6. collect data
7. conduct preliminary descriptive statistical analysis (e.g., scaling, missing data, collinearity issues, outlier detection)
8. estimate parameters in the model
9. assess model fit
10. respecify the model if meaningful
11. interpret and present results.

EXAMPLE OF A STRUCTURAL EQUATION MODELING

- Suppose there are various factors that affect an organisation's skills with respect to time management and job stress, such as:
- Time management factors: goal setting, operational planning, communication management and meeting management.
- Job stress factors: submission, targeting and meetings.
- In order to determine how these factors affect organisational skills, SEM can be used.



UNIT -5

1. Explain the mechanics \ rules \ Guidelines \ criteria \ norms \ factors of writing a research report?

GUIDELINES FOR WRITING RESEARCH REPORT:

1. Size & Physical design
2. Procedure
 - a. Logically
 - b. Chronologically
3. Layout
4. Quotations
5. Documentation style
6. Footnotes
7. Punctuation and Abbreviations in footnotes
8. Use of statistics, Charts & Graphs
9. The final Draft
10. Bibliography
11. Index

2. What points will you keep in mind while preparing a research report? (Or) Explain the precaution for writing a research reports?

FACTORS TO BE CONSIDERED:

1. Audience to be satisfied.
 2. Objectives to be accomplished.
 3. Report to be used.
 4. Outline to be developed.
 5. Deciding the final writer.
 6. Length of the report.
 7. Terminology used.
 8. A research report should be objectivity.
 9. A research report should be selectivity.
 10. A research report should not be dull.
 11. The report must be attractive in appearance.
 12. The report must be attractive in appearance.
 13. The reports should be free from grammatical mistakes.
 14. The report must present the logical analysis of the subject matter
 15. The report should be able to convey the matter as simple as possible.
 16. Charts, graphs and statistical tables may be used for the various results.
 17. Appendices should be enlisted in respect of all the technical data in the report.
 18. Bibliography of sources is a must for a good report and necessarily be give.
- Index is also considered an essential part of a good report.



3. Explain the DIFFERENT TYPES OF RESEARCH REPORTS and its contents?/ Distinguish between ACADEMIC AND BUSINESS RESEARCH?

A. ACADEMIC/TECHNICAL REPORTS:

- It is written for fellow researchers and therefore it should be organized on a different footing.
- In such a report, the researchers are expected to give a full account of the technical aspects, both in the sampling methods and the subject matter.
- The content of academic Reports contains :
 1. Major findings & Contents
 2. Nature of the research Work
 3. Research methodology
 4. Data Analysis
 5. Presentation of findings
 6. Main conclusion
 7. Bibliography
 8. Technical Appendices

B. BUSINESS REPORTS:

- It is one, which gives emphasis on simplicity and attractiveness.
- It has an attractive layout, large print size, sub-headings and also has cartoons.
- The content of Business Reports contains :
 1. Major findings
 2. Recommendation for action
 3. Objective of the study
 4. Methods employed
 5. Results
 6. Appendices

TYPES OF BUSINESS REPORTS:

1. **Informal Reports**
2. **Formal Reports**
3. **Periodic or Routine Reports**
4. **Special Reports**
5. **Information Reports**
6. **Interpretative Reports**
7. **Problem determining reports**
8. **Report by Individual**
9. **Report by Committee**



1. Informal Reports:

It is usually in the form of a person-to-person communication. It may range from a short almost fragmentary statement of facts on a singly page to a more developed presentation taking several pages.

2. Formal Reports:

A Formal report is one which is prepared in a prescribed form and is presented according to an established procedure to a prescribed authority.

3. Periodic or Routine Reports:

These are prepared and presented at regular prescribed interval in the usual routine of business.

4. Special Reports:

These are related to a singly occasion or situation. A report on the desirability of opening a new branch or on the unrest among staff in a particular branch is special reports.

5. Information Reports:

If a report merely presents facts pertinent to an issue or a situation it is informative.

6. Interpretative Reports:

If it analyses the fact, draws conclusions and makes recommendations it is analytical or interpretative or investigative.

7. Problem determining report:

It determine causes the underlying a problem or to ascertain whether or not the problem actually exists.

8. Report by Individual:

Report submitted by an individual like personnel manager and related to the work in their own department.

9. Report by Committee:

The report prepared by a group members ie., committee in formal style.



4. Explain the Principle of Ethics in Writing Business Research?

- It is defined to be the ethics of the planning, conduct, and reporting of research.
- It is the application of moral rules and professional codes of conduct to the collection, analysis, reporting, and publication of information about research subject's in particular active acceptance of subjects' right to privacy, confidentiality, and informed consent.

- 1. Honesty**
- 2. Objectivity**
- 3. Integrity**
- 4. Carefulness**
- 5. Openness**
- 6. Respect for Intellectual Property**
- 7. Confidentiality**
- 8. Responsible Publication**
- 9. Responsible Mentoring**
- 10. Social Responsibility**
- 11. Non-Discrimination**
- 12. Human Subjects Protection**

Honesty:

Honestly report data, results, methods and procedures, and publication status. Do not fabricate, falsify, or misrepresent data.

Objectivity:

Strive to avoid bias in experimental design, data analysis, data interpretation, peer review, personnel decisions, grant writing, expert testimony, and other aspects of research.

Integrity:

Keep your promises and agreements; act with sincerity; strive for consistency of thought and action.

Carefulness:

Avoid careless errors and negligence; carefully and critically examine your own work and the work of your peers. Keep good records of research activities.

Openness:

Share data, results, ideas, tools, resources. Be open to criticism and new ideas.

Respect for Intellectual Property:



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Honor patents, copyrights, and other forms of intellectual property. Do not use unpublished data, methods, or results without permission. Give credit where credit is due. Never plagiarize.

Confidentiality:

Protect confidential communications, such as papers or grants submitted for publication, personnel records, trade or military secrets, and patient records.

Responsible Publication:

Publish in order to advance research and scholarship, not to advance just your own career. Avoid wasteful and duplicative publication.

Responsible Mentoring:

Help to educate, mentor, and advise students. Promote their welfare and allow them to make their own decisions.

Social Responsibility:

Strive to promote social good and prevent or mitigate social harms through research, public education, and advocacy.

Non-Discrimination:

Avoid discrimination against colleagues or students on the basis of sex, race, ethnicity, or other factors that are not related to their scientific competence and integrity.

Human Subjects Protection:

When conducting research on human subjects, minimize harms and risks and maximize benefits; respect human dignity, privacy, and autonomy



10 MARKS QUESTIONS AND ANSWERS

1. Discuss the scope, qualities and significance of RESEARCH in management?

RESEARCH:

- It refers to a search for knowledge.
- It is simply the process of finding solutions to a problem after through study and analysis of the situational factors.

Scope\ Objective of Research:

- To achieve new insights into it.
- To gain familiarity with a phenomenon.
- It discovers new techniques.
- It may develop hypothesis & test it.
- To test a hypothesis of a casual relationship between variables.
- To get a research degree along with its consequential benefits.
- To get intellectual joy of doing some creative work
- To face the challenging in solving unsolved problems.
- To find the truth which is hidden & which has not been discovered as yet.
- To determine the frequency with which something occurs.
- It emphasizes the development of principle or theories.
- To portray accurately the characteristics of a particular individual, situations or group.

Criteria \ quality of Research:

- The research is structured with specific step to be taken in specific sequences in accordance with defined set of rules. (i.e.) systematic.
- The research is guided by the rules of logical reasoning and logical process.(i.e.) logical.
- The research is based on experience or scientific experiments. (i.e.) empirical.
- The research results to be verified by replicating the study and there by building sound basis for decision. (i.e.) replicable.
- The purpose of research should be clearly defined and common concept be used.
- The research process should be described in sufficient details.
- The research design should be carefully planned to yield results.
- The analysis of data should be sufficiently adequate to its study.
- The research reports with complete frankness, flaws in procedure design should be mentioned.



Significance\ Importance of Research:

- It provides the basis for nearly all govt policies in our economic system.
- It is necessary with regard to all the allocations of nation's resources.
- It is necessary for decision making in various functional areas of management.
- It is necessary in collecting information on the economy & social structure of the nation
- It is importance in solving various operational & planning problems of business & industry.
- It is important for social scientists for studying social problems and in seeking answers to various social problems.
- To philosophers & thinkers, research may mean the outlet for new ideas and insights.
- To analyst, research may mean the generalizations of new theories.
- To literary men and women, research may mean the development of new styles and creative work
- To professionals in research methodology, research may mean a source of livelihood.
- To students and scholars, research may mean to attain high position in the social structure.
- It is important for philosophers, thinkers, analyst, and students for the development of new concepts.
- Research tests assumptions and observations made about user needs and services and create new knowledge that can be used to improve services.
- Research provides the theoretical framework needed to understand the information reported by individual practitioners.

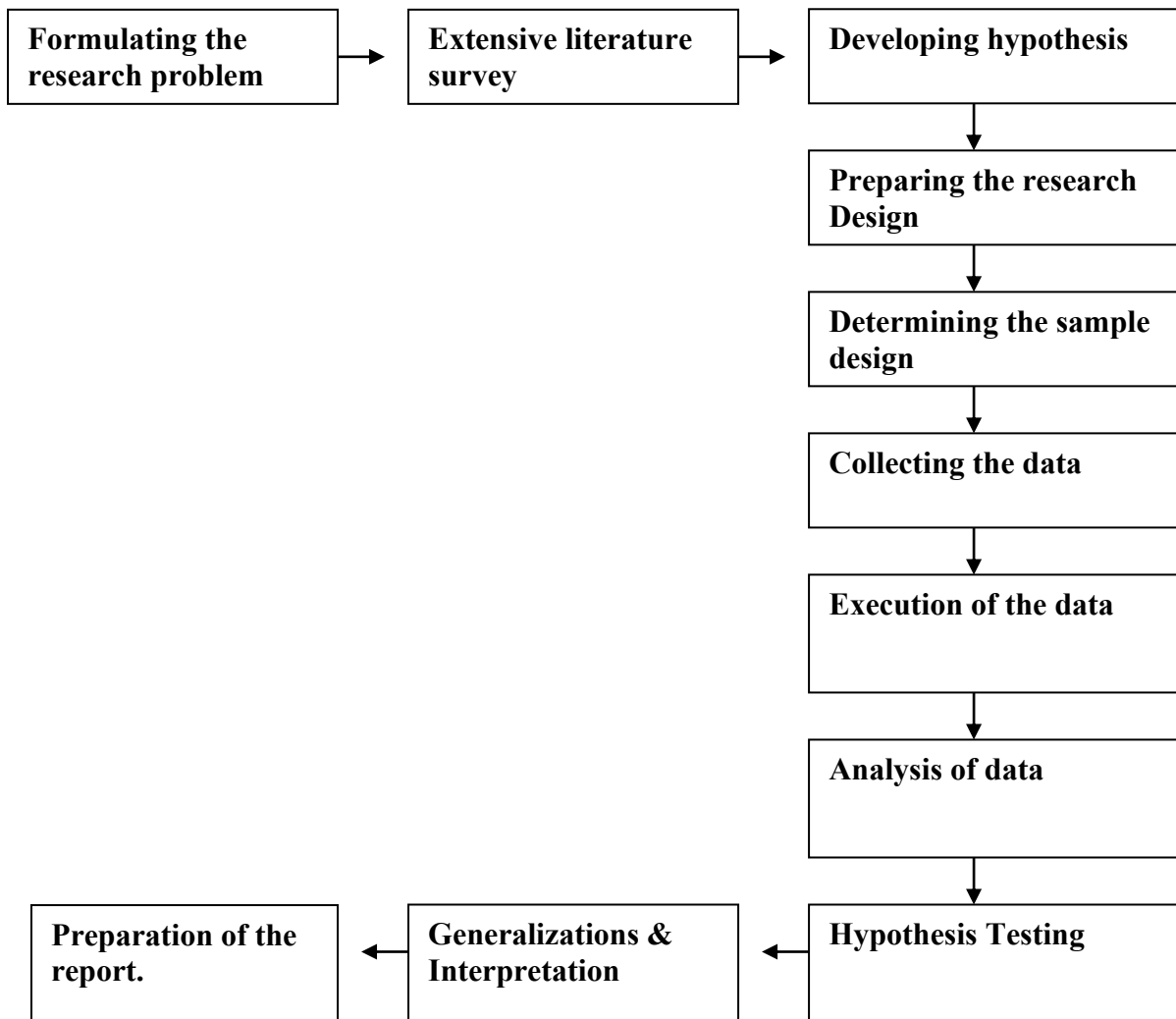
Problems faced by the Researchers:

- The lack of scientific training in the research methodology.
- There is sufficient interaction between the university departments and business establishments, govt departments.
- There does not exist a code of conduct for researchers.
- Library managements and functioning is not satisfactory at many places.
- There is also the difficulty of timely availability of published data from various government and other agencies.
- Research studies overlapping one other are undertaken quite often for want of adequate information.
- Many researchers face the difficulty of adequate and timely secretarial assistance.



2. Explain the different steps involved in a RESEARCH PROCESS? \ Do you agree that the research in business is discontinuous in nature?

RESEARCH PROCESS:



1. Formulating the research problem:

- There are two types of research problems. They are
 - i. those which relates to state of nature
 - ii. those which relates to relationship between the variables.
- The two steps are involved in formulating the research problem viz, understanding the problem thoroughly and rephrasing the same into meaning terms from an analytical point of view.



2. Extensive literature survey:

- Once the problem is formulated, a brief summary of it should be written down.
- The research should undertaken extensive literature connected with the problem.
- A good library will be a great help to the researchers at this stage.

3. Developing the Hypothesis:

- . It is a statement capable of being tested and there by verified or rejected.
- It is tentative assumption made in order to draw out and test its logical consequences.
- As a general rule, specification of working hypothesis is another basic step of the research process in most research problems.

4. Preparing the research Design:

- It is purely and simply the framework or plan for a study, that guides the collection and analysis of data.
- It involves the consideration of the following:
 - i. the means of obtaining the information
 - ii. time and cost factor relating to research
 - iii. availability and skills of the researchers

5. Determining the sample design:

- A brief mention the important sample design is as follows:
 - i. Deliberate sampling
 - ii. Simple random sampling
 - iii. Systematic sampling
 - iv. Stratified sampling
 - v. Quota sampling
 - vi. Cluster and area sampling
 - vii. Multi stage sampling
 - viii. Sequential sampling
- The sample design to be used be decided by the researchers taking into consideration, the nature of the inquiry and others related factors.

6. Collecting the data

- The collection of data can be done through primary data or through secondary data.
- The primary can be done through survey methods
 - i. By Observation
 - ii. By interview
 - iii. By questionnaire
 - iv. By schedule
- The secondary can be done through
 - i. Journals
 - ii. Magazines
 - iii. Govt publications



7. Execution of the data:

- If the execution of the project proceeds on correct lines, the data to be collected would be adequate and dependable.
- The researchers should see that the project is executed in a systematic manner and in time.

8. Analysis of Data:

- It requires a number of closely related operations such as establishments of categories, application of these categories to raw data through coding, tabulation, and the drawing statistical inferences.

9. Hypothesis Testing:

- The hypothesis may be tested through the use of parametric & non- parametric test
- The parametric tests are
 - i. Z – test
 - ii. T-test
 - iii. F-test
- The non- parametric test are
 - i. sign test
 - ii. fisher Irwin test
 - iii. Spearman's rank correlations
 - iv. Kendall's coefficient of correlations.

10. Generalizations & Interpretation:

- The real value of research lies in its ability to arrive at certain generalizations.
- The process of interpretations may quite often trigger off new questions which in turn may lead to further researches.

11. Preparation of the report:

- The report writing must be done with great care keeping in view the following:
- Report should be written in a simple language and brief manner.
- Charts and illustrations in the main reports only.
- Layout of the report
 - i. Preliminary pages
 - ii. Main text
 - iii. End matter



3. Describe briefly the various TYPES OF RESEARCH?

1. Applied \ Action Research:

- It aims at finding a solution for an immediate problem facing a society or industrial organizations
- One is to solve a current problem faced by the manager in the work setting demanding a timely solution.
- It discovers the what, how and why of actual life.

2. Basic \ Fundamental \ pure \ Theoretical research:

- It is mainly concerned with generalizations and formulation of theories.
- One is to generate a body of knowledge by trying to find how certain problems that occur in firms can be solved.
- It tries to say why problems happen.

3. Descriptive \ Explanatory \ Conclusive \ Statistical Research:

- It is a fact finding approach related to the current situation.
- It deals with determining frequency with which something occurs.
- As the name suggests that, it provides clear specification of who, what, when, where, why and how aspects of the research.

Example: As investigation of the trends in consumption of TVS bikes in relation to socio- economic characteristics such as age, sex, occupation, family, income, educational level, geographic location.

4. Formulative \ Exploratory Research:

- The major emphasis is on the discovery of ideas and insights.
- The main aim is used to split the broad and vague problem into smaller, more precise such problem statements in the form of specific hypothesis.
- Exploratory research helps determine the best research design, data collection method and selection of subjects.

Example: Soft drinks firms might conduct on exploratory study to generate possible explanations.

5. Experimental Research \ Casual Research:

- It is a tool of the physical sciences for tracing cause and effect relationship and verifying inferences.
- The essential of experimental research are
 - i. Dependent variable
 - ii. Independent variable
 - iii. Treatment.

Example: if a clothing company sells blue denim jeans, casual research can measure the impact of the company changing the product design to the white colour. Following the research, company boss will be able to decide whether changing the colour of the jeans to white would be profitable. To summaries, casual research is a way of how actions now will affect a business in the future.



6. Clinic \ Diagnostic Research:

- This type of research follows case study methods or in depth approaches to reach basic relationships.
- This type of research covers social units like persons, group and social institution like courts, churches, and transport and banking companies.

7. Historical research:

- This types of research utilizes historical sources like document, literature, leaflets, events or ideas of the past.
- This type of research covers films, books, navels, coins, tales, and songs.

8. Qualitative Research:

- It is concerned with qualitative phenomenon.
- It allows you to explore perceptions, attitudes and motivations and to understand how they are formed.

9. Quantitative research:

- It is based on the measurement of quantity.
- It is descriptive and provides hard data on the numbers of people exhibiting certain behaviors, attitudes.

10. Desk Research:

- The collection and analysis of secondary data is called desk research.
- It means the collection and uses of information from published sources like journals, magazines, reports.

11. Market research:

- It involves analysis of market potentials for existing products and estimating demand for new products, sales forecasting, characteristics of products, market analysis of sales potentials.
- It involves product research, media and advertising research.

12. Longitudinal Research:

- When the research is carried on several periods, the it is called as Longitudinal Research.
- It is research that studies a person or group over a set period of time, normally to track the effect of some variable.

13. Analytical Research:

- The researchers have to use facts and information already available and analyze to make critical evaluation of the material.

14. Original Research:

- It is research that is not exclusively based on a summary, review or synthesis of earlier publications on the subject of research.



4. Explain the role, TYPES AND PROCEDURE FOR HYPOTHESIS testing with a flow diagram?

HYPOTHESIS:

- It is a statement capable of being tested and there by verified or rejected.
- It is a proposition which can be put to test to determine validity.

Function:

- To test theories
- To suggest theories
- To describe social phenomena
- It will provide a guideline to the problem

Types of Hypothesis:

1. Descriptive Hypothesis:

- These are propositions that describe the characteristics such as size, form or distribution of a variable.
- The variable may be an object, person, organizations situation or event.

2. Relational Hypothesis:

- These are propositions that describe the relational between two variables.
- The relationship suggested may have a positive or negative correlation or a casual relationship.

3. Working Hypothesis:

- Hypotheses are formed while planning the study of a problem.
- Initially they may not be very specific.
- In such cases, they are referred to as “working hypothesis” which are subject to modification as the investigation proceeds.

4. Null Hypothesis:

- The statistical hypothesis that states that there is no difference between observed and expected.
- When a hypothesis is stated negatively, it is called null hypothesis.

5. Alternative Hypothesis:

- The set of alternatives to the null hypothesis is referred to as the alternative hypothesis.

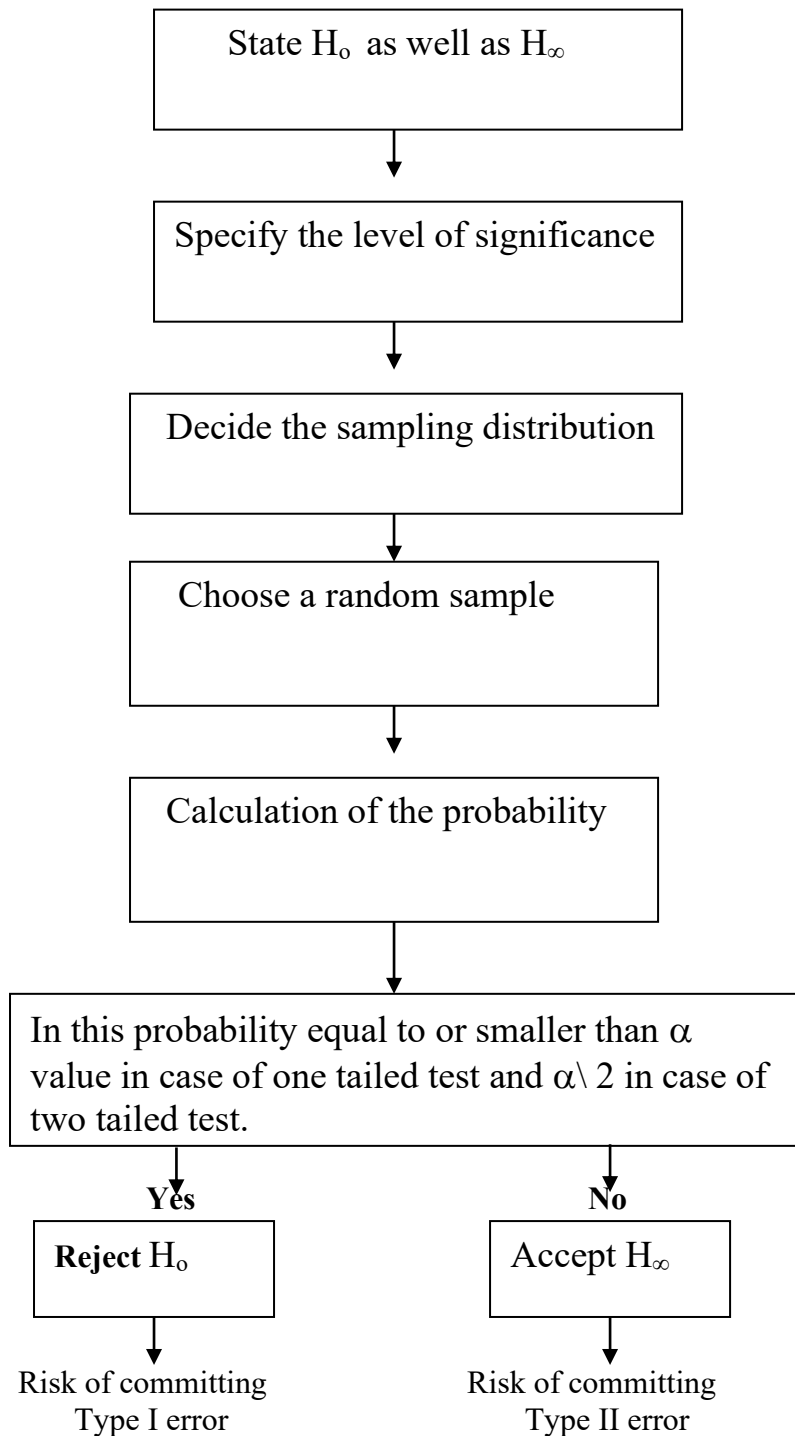
6. Complex Hypothesis:

- These aim at testing the existence of logically derived relationship between empirical uniformities.
- The function of hypothesis is to create tools and problems for further in otherwise very complex areas of investigation.



Procedure for Hypothesis Testing:

The various steps involved in hypothesis testing are stated as below with the flow diagram.





1. Making a formal statement:

- This step consists of making a formal statement of the null hypothesis (H_0) and alternative hypothesis (H_∞)
- This means that hypotheses should be clearly stated, considering the nature of the researcher problem.
- It also indicated whether we should use a one tailed test or two tailed test.

2. Selecting a significance level:

- The hypothesis is tested on a predetermined level of significance and as such the same should be specified.
- Generally, in practice either 5 % or 1 % level is adopted for the purpose.
- The factor that affect the level of significance are
 - a. The magnitude of the difference between sample means.
 - b. The size of the samples
 - c. The variability of measurements within samples
 - d. Whether hypothesis is directional or non- directional.
- The level of significance must be adequate in the context of the purpose and nature of enquiry.

3. Deciding the distribution to use:

- After deciding the level of significance, the researcher has to determine the appropriate sampling distribution.
- The choice generally remains between normal and t – distribution.

4. Selecting a Random Sample:

- The next step is to select a random sample and compute an appropriate value from the sample data.
- In othewords, draw a sample to furnish empirical data.

5. Calculation of the probability:

- The researcher has to calculate the probability that the sample result would diverge as widely as it has from expectations.

6. Comparing the probability:

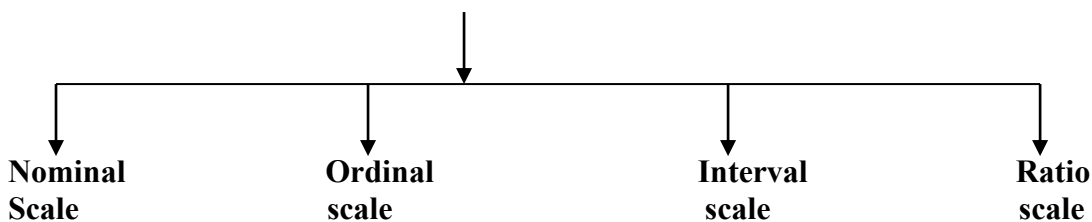
- Afterwards, the researcher has to compare the probability thus calculated with the specified value for alpha, the significance level.
- If the calculated probability is equal to or smaller than α value, in case of one tailed test, then reject null hypothesis.
- If the calculated probability is greater than α value, then accept null hypothesis.
- In case we reject null hypothesis, we run risk of committing Type I error.
- In case we accept null hypothesis, we run risk of committing Type II error.



5. What is measurement? What are the various test\ tools \ Characteristics of a Measurement and explain VARIOUS MEASUREMENT SCALES? /Explain the different scales that are used in management research? Explain the various SCALING TECHNIQUES in measuring the variables? \ Explain comparative and Non- comparative scales? Explain types of Attitude Measurement Scales?
MEASUREMENT:

- It means the process of assigning numbers to objectives, persons, state or event according to rules.
- It is the process of mapping aspects of a domain onto other aspects of a range according to some rule.
- The instrument with which a concept is measured is called scale.

Measurement of scale



A. Nominal Scale:

- It is a system of assigning numbers to events in order to label them
- It provides convenient ways of keeping track of people, objects and events.
- It is used to calculate the percentage of objects within each category.
- Example:
 - ✓ The number pinned on a sport person
 - ✓ A set of countries.

B.Ordinal scale:

- It provides the event in order and rank order represents ordinal scales.
- It permits the ranking of items from highest to lowest.
- It is frequently used in marketing research and qualitative research.
- Example:
 - ✓ The first, second & fifth person in a race.
 - ✓ Pay group in an organization as denoted by A, B, C, D

C.Interval scale:

- The intervals are adjusted in terms of some rule that has been established as a basic for making the units equal.
- It is measured along a scale in which each position is equidistant from one another.
- Interval scale cannot be multiplied or divided.
- Example:
 - ✓ My level of happiness, rated from 1 to 10
 - ✓ Temperature in degrees

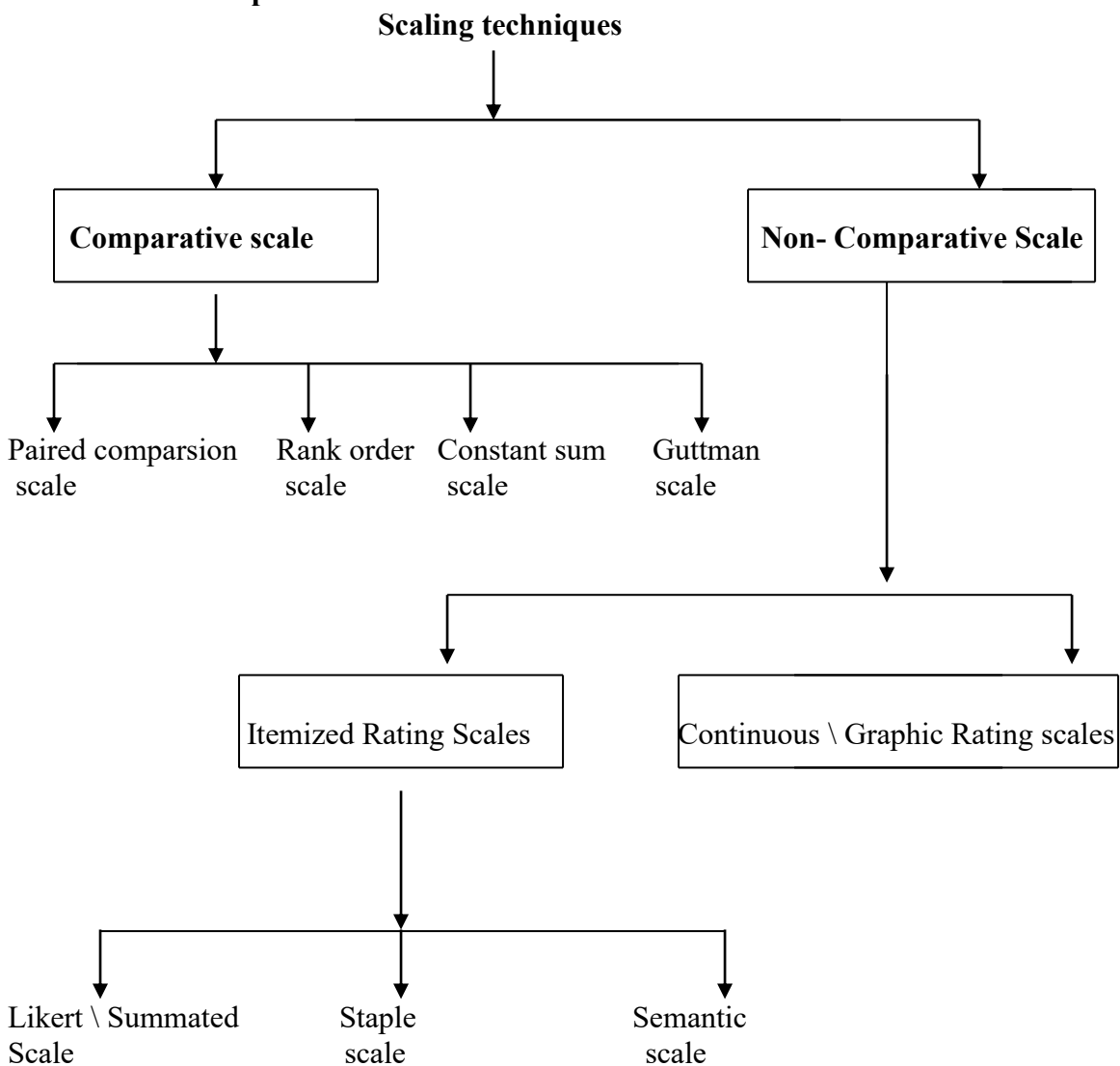


D. Ratio scale:

- It represents the actual amount of variables.
- It measures the physical dimensions such as weight, height, distance, length, time, energy.
- Example:
 - ✓ A person's weight.
 - ✓ Male and Female attending the festivals

SCALING:

- It is the process of measuring or ordering entities with respect to quantitative attributes.
- It provides the procedures of assigning numbers to various degree of opinion, attitude and other concepts.





A. Comparative scale:

- The items are directly compared with each others.
- Example : Brand A, with B, C

1. Paired comparison scale:

- In this method, a respondent is asked to compare two objects at a time according to some criterion such as preference, taste, or style.
- A respondent is presented with two items at a time and asked to select one.

Ex:

Do you prefer Pepsi or coke?

2. Rank order scale:

- In this method, the respondent is asked to rank a set of objects according to some criterion.
- The respondent may be asked to rank five brands of toothpaste on his preference, taste, style, package design.
- The major drawback of this produce only ordinal data.

Ex:

“Preference for tooth paste brands”

Brand	Rank order
a. Colgate	-----
b. Pesposdent	-----
c.close up	-----

3. Constant sum Scale:

- In this method, the respondent is given a constant sum of money, script, or points and asked to allocate these to various items.
- It is also called ordinal level techniques.
- This is an ordinal level technique.

Ex:

“Scale used in Tennis sportswear study”

Characteristics	No.of.points
a.Is comfortable to wear	-----
b.Is durable	-----
c.Is well known brand	-----

4. Guttman \ cumulative \ Scalogram scale:

- Any set of items that produces a pattern of responses is called Guttman scale.
- This is a procedure to determine whether a set of items can be rank ordered on a one-dimensional scale.
- The main object is to examine how closely a set of items corresponds with the ideas of cumulativeness.
- It utilizes the intensity structure among several indicators of a given variable.



B. Non-Comparative scale:

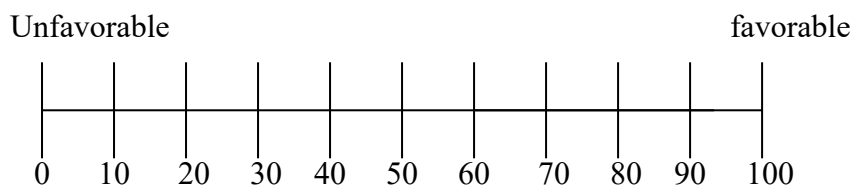
- Each item is scaled independently of others.
- Example: How do you feel about coke?

1. Continuous \ Graphic Rating scales:

- In this method, respondent rate the items by placing a mark on a line.
- The line is usually labeled at each end.
- The series of numbers is called “scale points” under the line.
- Scoring and codification is difficult.

Ex:

How do you feel about this brand?



2. Itemized Rating \ Numerical Scales:

- It presents a series of statement from which a respondent select one as best reflecting his evaluation.
- These statements are ordered progressively in terms of more or less property.
- It provides more information to the researcher and increase reliability.
- This method requires less time and used with a large number of variables.

Ex:

How do describe about Titans watch?

- a. Excellent
- b. Good
- c. Fair
- d. poor

a. Likert \ Summated scale:

- It consists of a number of statements which express either a favorable or unfavorable attitude towards the given objects to which the respondent is asked to react.
- The respondent indicates his agreement or disagreement with each statement in the instrument.
- Each response is given a numerical score and the scores are totalled to measure the attitude.
- The scale may be 3, 5 and 7 point.
- It provides more information to the researcher and increase reliability.
- It can be used in respondent centered and stimulus centered studies.
- This method requires less time to construct.
- This method examine whether respondents are more or less favorable to the topic.



Ex: “In choosing a soap, the factors are considered important”

Factors	Strongly agree	agree	Neither agree nor disagree	disagree	Strongly disagree
1.smell	5	4	3	2	1
2.price	5	4	3	2	1
3.quality	5	4	3	2	1

b.Staple scale:

- It refers to collection of rating scales anchored by unipolar adjectives.
- This is an unipolar ten point rating scale.
- It ranges from +5 to -5
- It has no neutral zero points.

Ex: **staple scale**

Factors	+5	+4	+3	+2	+1	-1	-2	-3	-4	-5
1. Fast service										
2. Honesty										
3. Location										
4. High saving rates.										

c. Semantic scale:

- It refers to collection of rating scales anchored by bipolar adjectives.
- It helps to measure the psychological meaning of an object to an individual.
- It helps to verify whether a respondent has a favorable attitude towards the objects.
- This is an bipolar seven point rating scale.
- It ranges from +3 to -3.

Ex:” Semantic scale for analyzing candidate for leadership position”

Factor	+3	+2	+1	0	-1	-2	-3	factor
1.successful								unsuccessful
2.strong								weak
3.active								unactive
4.true								false
5.sociable								unsociable



6. Briefly explain the METHODS OF DATA COLLECTION? \ Discuss the methods of data collection by big business houses in recent times? What are the different types of data used in business research?

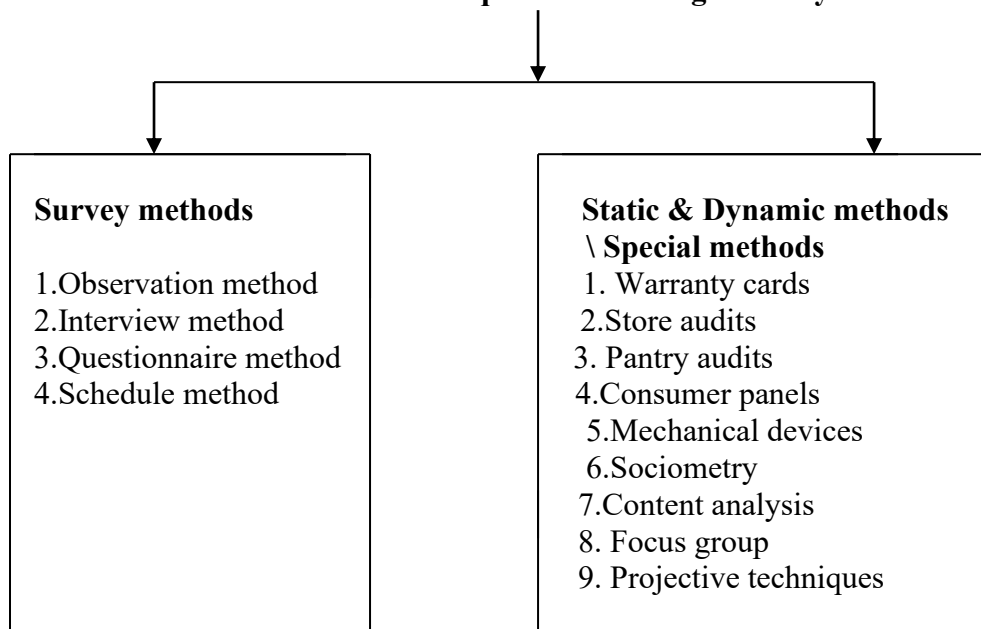
DATA COLLECTION METHODS:

- 1. Primary data**
- 2. Secondary data**

1. PRIMARY DATA:

- They are those which are collected afresh and for the first time and happen to be original in character.
- These are published by the researcher who themselves are responsible for their collection.
- It refers to information that is generated to meet the specific requirements of the investigation at hands.

Methods \ Techniques of collecting Primary Data



Surveys method:

- It is a fact finding study.
- It involves collection of data directly from a population or a sample at a time.
- The main object is devoted to the study of characteristics of the population under investigations.
- They are common in political polling and government, health, social science and marketing research.
- There are several ways of administering a survey including telephone, personnel, online survey.



Characteristics of Survey:

- It covers a geographical area.
- It involves extensive study and intensive study.
- It is always a field study, conducting in a natural setting.
- It covers a large population, thanks to sampling techniques.
- It dealing with casual & effect relationship.
- It is useful to specialists in all areas
- It is used by business enterprises.

Classification of survey:

A. Social survey

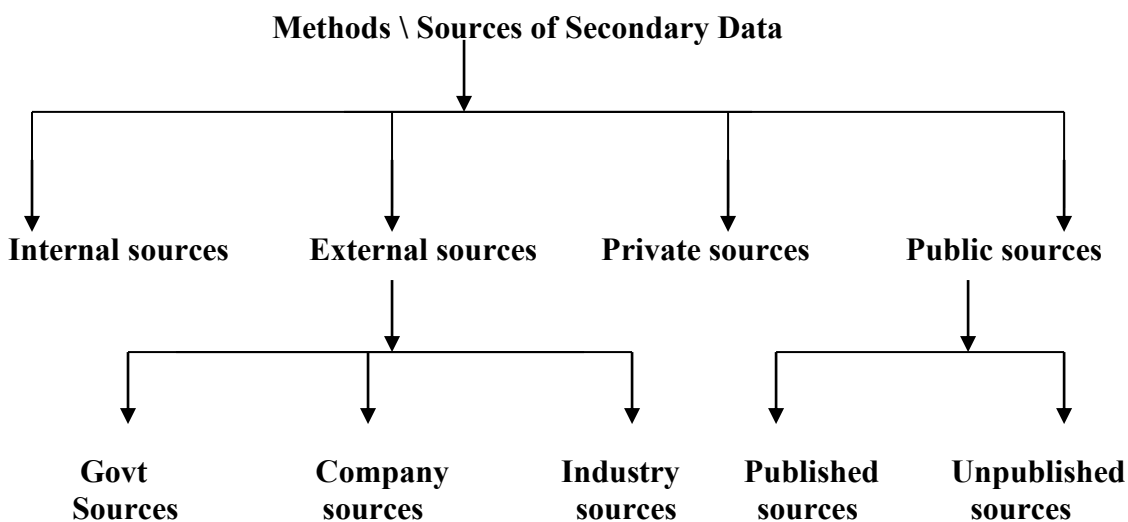
- Demographic characteristics of a group of people
- Social condition of people
- People opinions & attitudes
- People behaviour & activities.

B. Economic survey

- Economic condition of people.
- Working of economic units
- Operations of an economic system.

2. SECONDARY DATA:

- They are those which have already been collected by some other agency and which have already been processed.
- It is collected by some other organizations to satisfy its own needs, but it is being used by various departments for different reasons.
- The process of secondary data collection and analysis is called as **Desk Research**.
- It provides enough information to resolve the problem being investigated.
- It helps to define the problem and formulate hypotheses about its solution.





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1. Internal sources :

A. Accounting Record

- ✓ Sales invoice
- ✓ Level of profit
- ✓ Advertising expenditure
- ✓ Budget

B. Sales for Report

- ✓ Marketing information
- ✓ Customer opinion
- ✓ Competitor information
- ✓ Area wise sales

C. Miscellaneous

- ✓ Company history
- ✓ Company background
- ✓ Market share
- ✓ Pamphlet
- ✓ Organizational report
- ✓ Organizational chart
- ✓ Organizational manual
- ✓ Annual general body meeting report

II. External sources:

A. Govt Sources:

- ✓ Central level government sources
- ✓ State level government sources
- ✓ District & Panchayat level sources

B. Company Sources:

- ✓ Advertising agencies
- ✓ Marketing research
- ✓ Commercial agencies
- ✓ Business firms

C. Industry Sources:

- ✓ Education institution
- ✓ Universities
- ✓ Documentation centers
- ✓ Professional & Trade Association

III. Private Sources:

- ✓ Life history
- ✓ Diaries
- ✓ Letters
- ✓ Memoirs

IV. Published Sources:

A. Published Sources- Newspaper, Radio, T.V, Films, Public speech, Journal& Magazines

B. Unpublished Sources- Letters available with scholar & Diaries available with scholar



7. What is Questionnaire? Explain various aspects involved in questionnaire design? Also discuss the STEPS OF QUESTIONNAIRE DESIGN?

QUESTIONNAIRE:

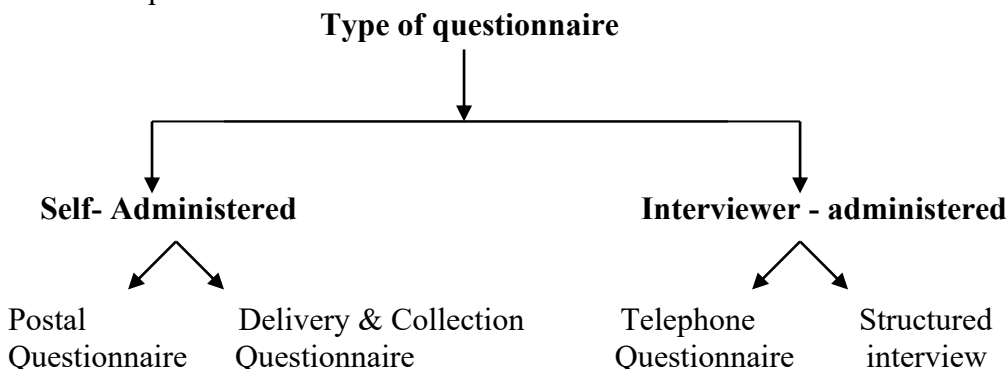
- A **questionnaire** is a research instrument consisting of a series of questions and other prompts for the purpose of gathering information from respondents.
- It is a device for securing answers to questions by using a form which the respondent fills by himself.
- It is a sheet of paper containing questions relating to certain specific aspect regarding which the researchers collect the data.

Advantages:

- Economical
- Time saving

Disadvantages:

- Uncomfortable for illiterate people.
- Proportions of return is low



Various aspects involved in questionnaire design:

1. General form:

- The questionnaire can either be structured or unstructured questionnaire.
- The question is presented with the same wording & in the same order to all respondents.

2. Question Sequence:

- The sequence must be clear and smooth.
- Question sequence should be constructed with logical plan.

3. Question Formulation:

a. Open ended Questions: here the respondents are given freedom to express their views.

b. Closed ended Questions: here the respondents are not given freedom to express their views.

c. Multi choice questions: these questions consist of many questions. The respondent has to select any one of these.

d. Dichotomous Questions: in these questions, two alternatives are given. They are positive and negative option.

e. Ranking items of Questions: through these questions, the preference of the respondents is obtained.

Steps involved in questionnaire design:

1. Consult colleagues, friends to get their thinking on the problem.



2. Formulation of such a list of areas and questions.
3. Submit this list of experts both in the field of problems and related fields.
4. Drafting the questionnaire
5. Pretesting the questionnaire.
6. Re-examining & revising the questionnaire.
7. Conducting large scale study
8. Editing & coding the questionnaire responses.

Construction \ Qualities \ Precaution to be taken while drafting a Questionnaire:

- ❖ The title of the study should be on the front page.
- ❖ The question should be comparatively short and simple.
- ❖ The question should move in a logical way.
- ❖ Questions should flow from the more general to the more specific.
- ❖ Questions should flow from unaided to aided questions.
- ❖ The questionnaire should look attractive and impressive.
- ❖ The question should be capable of being answered without prejudice.
- ❖ The quality, size and colour of the paper must be good in nature.
- ❖ Necessary instruction regarding filling up the form must be given
- ❖ Technical questionnaire should be avoided.
- ❖ Irritating questions should be avoided
- ❖ Lengthy question should be avoided.
- ❖ Contradictory question to be avoided.
- ❖ Leading question should be avoided.
- ❖ Questions affecting the sentiments should be avoided.

Difference between Questionnaire and schedule:

Questionnaire	Schedule
1. It is a set of question which is filled by the respondents.	It is set of questions which are asked and filled by the interviewer.
2. It is indirect method.	It is a direct method.
3. It is cheaper method.	It is expensive method.
4. It cover wider sample.	It covers fewer samples.
5. No personal contact is established.	Personal contact is established.
6. The information collected is not in time.	It's in proper time.
7. The information collected may be wrong.	It's accurate one.
8. The information collected only from educated people.	It is collected from uneducated people also.
9. The success of questionnaire depends on quality & type of questions.	The success of schedule depends on honesty & competence of interviewers.
10. Respondents himself records the answers obtained.	Researcher records the answers obtained.



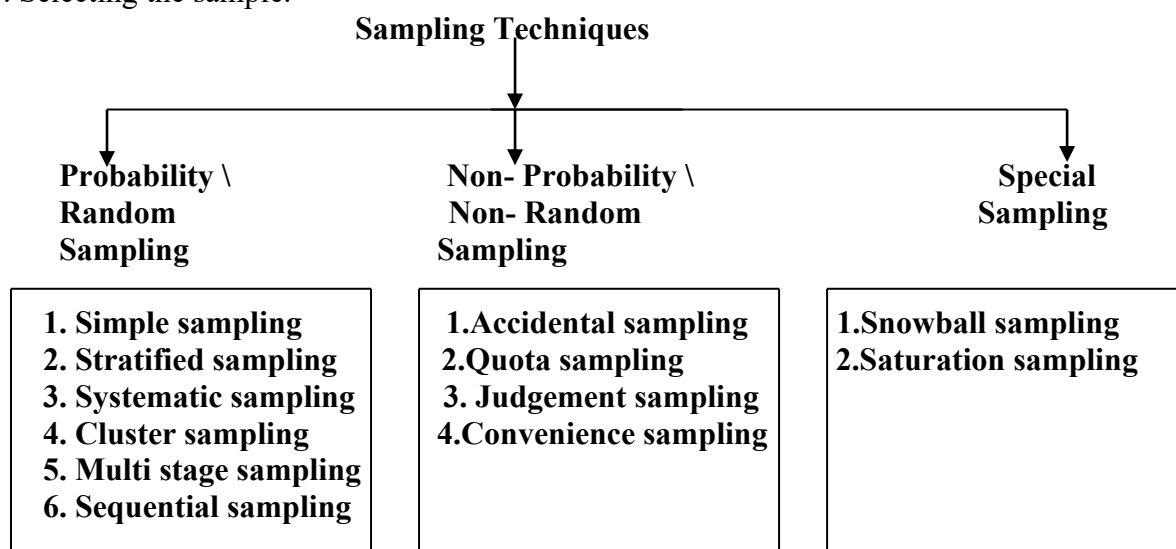
8. Explain the different types of SAMPLING TECHNIQUES? /Explain probability and non-probability Techniques?

SAMPLING:

- It is a method of selecting some fraction of a population.
- It saves time and money.
- It provides accurate measurements.
- To get information about the characteristics of the population
- To obtain optimum results

SAMPLING PROCESS:

1. Defining the population.
2. Specifying the sample frame.
3. Specifying the sample unit.
4. Specifying the sample method.
5. Determining sample size.
6. Specifying the sample plan.
7. Selecting the sample.



A. PROBABILITY \ RANDOM SAMPLING:

- The probability of each case being selected from the population is known and is usually equal for all cases.

1. Simple sampling:

- It is the process in which sample is so drawn that each and every unit in the population has an equal and independent chances.
- It is based on the concept of equi-probable outcomes.

2. Stratified \ mixed sampling:

- The entire population is divided \ sub divided into homogeneous group is called **strates** and a sample is drawn from each stratum at random.
- A strate may be status, age, gender, religious, martial status.



3. Systematic sampling:

- It is one in which the first sample unit is selected at random, while the remaining units are automatically select at equal space from one another.
- It is one in which every K^{th} item is selected in a list representing population.
- **The number K** is called sampling intervals.

$$K = \frac{\text{Size of the universe}}{\text{Size of the sample}}$$

4. Cluster sampling:

- The total population is divided into a number of relatively small subdivision which are themselves cluster of still small units.
- Large grouping within the population are called clusters.
- If cluster happens to be some geographic sub division, in that case, cluster is called **Area sampling**.

5. Multi stage sampling:

- It is a kind of complex sample design in which two or more levels are imbedded one in the other.
- If we select randomly at all stages, then it is called multi stage sampling.

6. Sequential sampling

- The ultimate size of the sample is not fixed in advance.
- One can go on taking sample one after another as long as one desires to do so.

B. NON- PROBABILITY \NON- RANDOM SAMPLING:

- The probability of each cases being selected from the total population is not known.

1. Accidental sampling:

- A sample population selected because it is readily available and convenient.
- This type of sampling is most useful for pilot testing.

2. Quota sampling:

- It is a combination of stratified plus judgment sampling.
- It is very popular in market survey.

3. Judgement sampling:

- It is one which is selected, according to ones personal judgement.
- It is used in solving every day business problems and making public decisions.

4. Convenience sampling:

- The sample comprises subjects who are simply available in a convenient way to the researcher.
- It is also called as **chunk**.

C. SPECIAL SAMPLING:

1. Snowball sampling:

- It is a technique for developing a research sample where existing study subjects recruit future subjects from among their acquaintances.
- Thus the sample group appears to grow like a rolling snowball.
- The first respondent refers a friend. The friend also refers a friend, etc.

2. Saturation Sampling:

- The study of entire population is called saturation.



9. Explain the STEPS INVOLVED in writing a report? Explain the CONTENT\ LAYOUT \ FORMAT \ PLAN \ DRAFT\ STRUCTURE OF THE RESEARCH REPORT?

RESEARCH REPORT:

- It is a written document through which the researcher intimates to the world.
- It is a channel of communicating the research finding to the readers of the report.

STEPS INVOLVED IN WRITING A REPORT/INVESTIGATION:

1. Logical arrangement of the subject matter
 - c. Logically
 - d. Chronologically
2. Preparation of the report outline
3. Preparation of the Rough Draft
4. Redrafting the report
5. Preparation of the final bibliography
6. Preparation of the Final draft

FORMAT / LAYOUT/STRUCTURE OF RESEARCH REPORT:

- The layout of the report means as to what the research report should contain.
- A comprehensive layout of the research report should comprise the following text.
 - A. Preliminary pages
 - B. Main content
 - C. End matter.

A. Preliminary pages:

- ✓ Title page
- ✓ Certificate from the guide
- ✓ Declaration by the scholar
- ✓ Preface, Acknowledgement
- ✓ Table of contents
- ✓ List of tables
- ✓ List of figures

B. Main content:

1. Introduction section:

- ✓ Objectives of the study
- ✓ Statement of the problem
- ✓ Review literature & Research studies.
- ✓ Time, place & materials of the survey.
- ✓ Scopes, assumptions & Limitations.

2. Method section:

- ✓ Population and sample
- ✓ Variable and measures used
- ✓ Data collection methods



3. Results Section:

- ✓ Statistical tools like mean, S.D, correlation are presented.
- ✓ Interpretation about the results.

4. Discussion section:

- ✓ A statement of the inference drawn from the present study which may be expected to apply in similar circumstances.
- ✓ The conclusion drawn from the study should be clearly related to the hypothesis.

5. Summary section:

- ✓ Report with brief summary
- ✓ Major findings
- ✓ Major conclusions drawn from the results.

C. End matter:

1. Bibliography:

- ✓ It means booklist.
- ✓ It refers to list of written sources either published or unpublished, check with the preparation of report during the course of research, books, articles, government documents,, unpublished materials, pamphlets, films, radio, records, lectures, interviews, etc.
- ✓ It is a last part of the research report which contains a list of books in some way applicable to the research which has been done.
- ✓ The entries in bibliography for books& pamphlets should be in the following order.
 - Name of author
 - Title
 - Place, publisher, and date of publications
 - Number of volume.

Example: Kothari, C.R., Quantitative Techniques, New Delhi, Vikas, publishing house pvt ltd., 1978.

2. Appendixes:

- ✓ It is used for additional \ supplementary materials which has not found place in the main text.
- ✓ The following materials are generally includes
 - Questionnaire
 - Derivation of equations
 - Data sheets
 - Sample of forms & Abbreviations
 - Statistical table

3. Index:

- ✓ At the end of the report, an index should be always given.
- ✓ Index may be prepared both as subject index and as author index.
- ✓ The former gives the name of the subject topics, concept used.
- ✓ The latter gives the similar information regarding the names of authors.
- ✓ Index should be arranged alphabetically.



10. What is a FACTOR ANALYSIS? Explain the various methods of factor analysis? Also explain the significance and uses of factor analysis?

FACTOR ANALYSIS:

- It is a data reduction technique.
- It is otherwise known as “Search technique”
- It was introduced by Thurstone in 1931.
- It is a technique in cases where the variable have a high degree of intercorrelation.
- It refers to a group of technique whose purpose is data reduction summarization.
- It is a technique that is used to summarize the information contained in a large number of variables into smaller number of factors.
- The factor analysis is done in two stages. They are
 - ✓ Extraction of factors
 - ✓ Rotation of the solution obtained in stages.

Object:

- To reduce the number of variable
- To classify the variables.

Merits:

- It is quite useful when we want to condense and simplify the multivariate data.
- It reveals the latent factors that determine relationship among several variables.
- It may be used in the context of empirical clustering of product, media or people.

Demerits:

- It is a highly subjective process.
- It involves laborious computations involving heavy cost burden.
- It can be used only when researchers has good knowledge & experience in handling.

Terminology Used in Factor Analysis:

- Factor
- Factor loadings
- Communality
- Eigen value
- Total sum of square
- Rotation
- Factor scores.

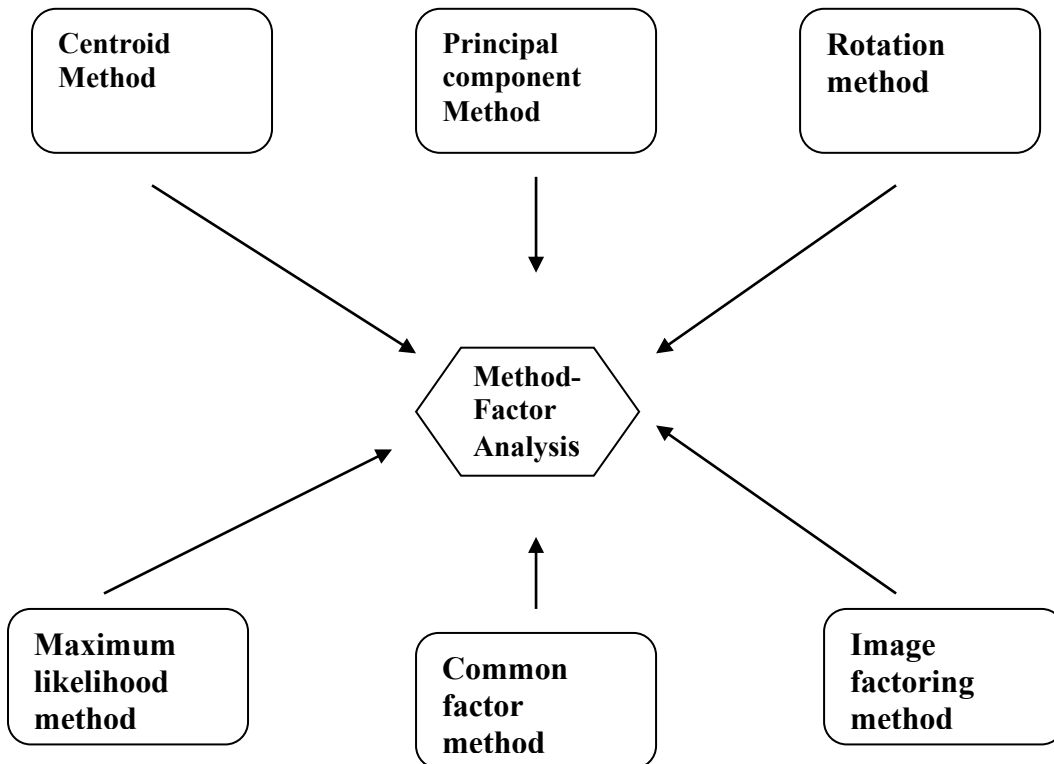
General Steps in Factor Analysis:

- Step 1: Selecting and measuring a set of variables in a given domain
- Step 2: Data screening in order to prepare the correlation matrix
- Step 3: Factor Extraction
- Step 4: Factor Rotation to increase interpretability
- Step 5: Interpretation
- Step6: Validation and Reliability of the measures



Methods of Factor Analysis:

There are different types of methods for factor analysis used to extract the factor from the data set:



1. Centroid Method:

- It is defined by linear combinations in which all weights are either + 1 or - 1.
- This method tends to maximize the sum of loadings, disregarding signs.
- It is the method which extracts the largest sum of absolute loadings for each factor in turn.

2. Principal component Method:

- This is the most common method used by researchers.
- PCA starts extracting the maximum variance and puts them into the first factor.
- After that, it removes that variance explained by the first factors and then starts extracting maximum variance for the second factor.
- This process goes to the last factor.

3. Rotation method:

- Rotation method makes it more reliable to understand the output.
- Eigenvalues do not affect the rotation method, but the rotation method affects the Eigenvalues or percentage of variance extracted.
- There are a number of rotation methods available:
 - ✓ No rotation method
 - ✓ Varimax rotation method



- ✓ Quartimax rotation method
- ✓ Direct oblimin rotation method
- ✓ Promax rotation method.

Two Types of Factor Analysis:

1. Exploratory factor analysis

- It attempts to discover the nature of the constructs influencing a set of responses.

Primary objectives:

- The number of common factors influencing a set of measures.
- The strength of the relationship between each factor and each observed measure.

Uses:

- It identifies the nature of the constructs underlying responses in a specific area.
- It determines what sets of items together in a questionnaire.
- It determines what features are most important when classifying a group of items.
- It demonstrates the dimensionality of a measurement scale.

Steps to perform an EFA:

1. Collect measurements.
2. Obtain the correlation matrix.
3. Select the number of factors for inclusion.
4. Extract your initial set of factors.
5. Rotate your factors to a Final solution.
6. Interpret your factor structure.
7. Construct factor scores for further analysis

2. Confirmatory factor analysis:

- It tests whether a specified set of constructs is influencing responses in a predicted way.

Primary objectives:

- It is to determine the ability of predened factor model to an observed set of data.

Uses:

- Establish the validity of a single factor model.
- Test the significance of a specific factor loading.
- Test the relationship between two or more factor loadings.
- Test whether a set of factors are correlated or uncorrelated.

Steps to perform an CFA:

1. Define the factor model.
2. Collect measurements.
3. Obtain the correlation matrix.
4. Fit the model to the data.
5. Evaluate model adequacy.
6. Compare with other models.

Application of Factor Analysis:

- It is widely used in marketing research for studying the preference for various types of product attributes.
- It is used to examine the television rating index's and television programme types.
- It has also been widely used in physical sciences such as geochemistry, ecology and hydrochemistry.