



The aim of the editor is to alleviate the students' community by providing the hand book at a modicum cost. This initiative is made to provide a study material for reference and to refresh their gained knowledge which was induced by the teachers.

This hand book is a reference copy covering the basics and not the proficiency in the

subject. I take this opportunity to thank the authors of various books in the same title for helping me in seeking the references.

Your suggestions and feedbacks are welcome as they will help in further enhancing the content. If the reader feels that, the efforts are to be appreciated then I would like to share and thank **Mr. J. P. Jaideep**, Head, BBA, for providing such a platform to embellish the skills of the faculties and students, I also thank **Mr. K. Sarvasvaran**, for documenting the notes which took a form of a handbook.

P. J's Counselling & Career guidance Center

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RESEARCH METHODOLOGY

- Hand Book

*Everyone knows something about everything
but only some people know everything
about something, because they do re-search
and remain one among us in the form of
Scientist, Scholars, Teachers...'*

- P.J.

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UNIT-I

RESEARCH METHODOLOGY

Research

Research could be understood as an organised activity with specific focus (objective) on a problem supported by compilation or related data and facts, involving application of relevant tools of analysis and deriving logically sound inferences based on originality.

Example: van hits road side tree

Reasons: speed of van, advertisement hoarding etc., and doctor's analysis with the incident.

What is a Social Research

- Understanding a problem offering a solution.
- Individuals differ from group. Group is to be considered.
- What is true for individual need not be true for society, but true of the society may be applicable for major individuals.
- Hence researches should focus on group.
- Conducting research on unemployment with one individual, it's worthwhile conducting it for a group.

Usefulness of Social Research

1. In Planning

- Helps in formulating and guiding social planning
- *Example:* understanding the cause of rural unemployment

2. Control over Social Phenomena

- As knowledge about working of the society & the institutions is acquired through social research.
- It helps greater control over phenomena.
- Awareness of evils of dowry – public are now encouraged reporting to authorities.

3. Achieve Social Cohesion

- Understanding ills of communal riots

4. Relation Among Variables

- > By making people aware of polio type of disease, it is possible to make people to vaccinate their children.

5. Helps reasonable prediction

- > Control over birth rate

6. Identify new solutions

- > Instead punishing criminals, give them a new opportunity to start a new life and be more useful to society.

Objectives of Research:

1. It develops focus. (Steam engine – electricity, fuel, etc.)
2. It reveals characteristics.
3. It determines frequency of occurrence.
4. To test hypothesis (malpractice due to low salary).

Academic Objective, Utility, Decision Making, Environmental, Market, Consumer, Profit.

Qualities of a Researcher

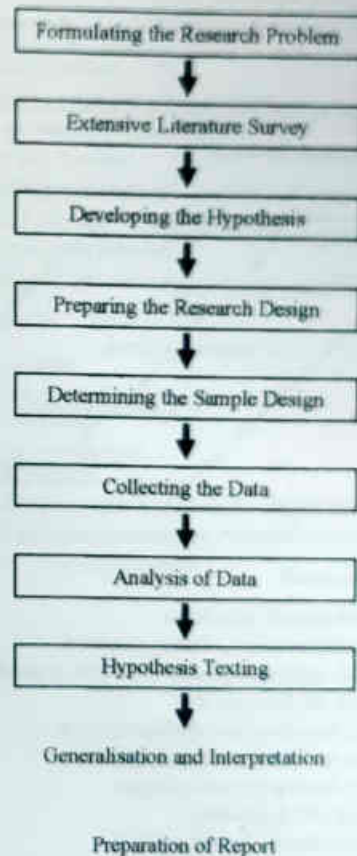
- | | |
|---|-------------------------------|
| 1. Truthful to focus. | 6. Time conscious. |
| 2. Alertness. | 7. Open to idea. |
| 3. Self confidence. | 8. Ability to identify guide. |
| 4. Guarded in utterance. (Not be hasty) | 9. Discuss his vicious. |
| 5. Strive to find out facts. | 10. Updating knowledge. |

Criteria for Good Research

- ❖ Objectives should be quantified, so as to avoid ambiguity.
- ❖ Concept should associate with research topic.
- ❖ Every step should be explained carefully – pave way for future research.
- ❖ Research design should match research objectives.
- ❖ Should be honest in reporting the facts.
- ❖ Data collection should be carefully planned.
- ❖ Carefully select analytical tools.
- ❖ Conclusion should emerge with data and analysis.
- ❖ Sources should be acknowledged.

- ❖ Referencing, footnote, bibliography - should be conforming to Ltd., prescribed.
- ❖ Research should be useful to society.

Research Process



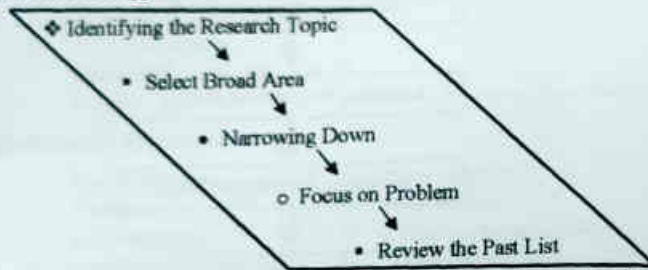
Problems in Social Research

- ❖ Complexity of social science. (Human behaviour various.)

- ❖ Lack of preciseness. (Prediction is impossible.)
- ❖ Difficulty is generalising.
- ❖ Lack of reliable data.
- ❖ Difficulty is interpreting the result.
- ❖ Identifying and establishing causes.
- ❖ Conceptual definition and clarity on social variables. (Per capita income is now not considered)
- ❖ Dynamic nature of social variables. (Money value fluctuates – petrol price.)
- ❖ Changes in data base structure. (Balance of payments given by

Identifying Research Problem

Who Should Suggest the Problem – Guide or Scholar?



Fred Kerlinger, "Research is an organised enquiry designed and carried out to provide information for solving problem."

Objectives of Research

- ❖ Research extends knowledge.
- ❖ Research unveils the history of nature.
- ❖ Research establishes general laws. (law of gravity)
- ❖ Research verifies and test.
- ❖ General laws developed through research.
- ❖ Applied research aims at finding solutions.
- ❖ Aims to develop tool and concepts.
- ❖ Research aids in planning
- ❖ Research helps in decision making

Scope

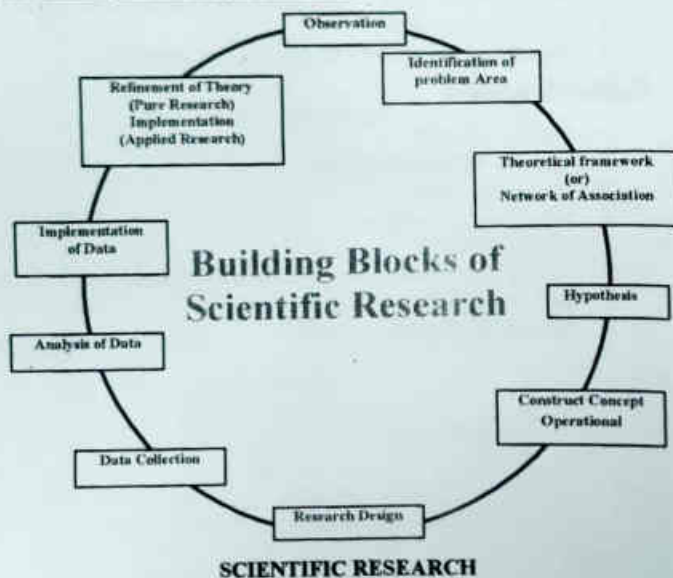
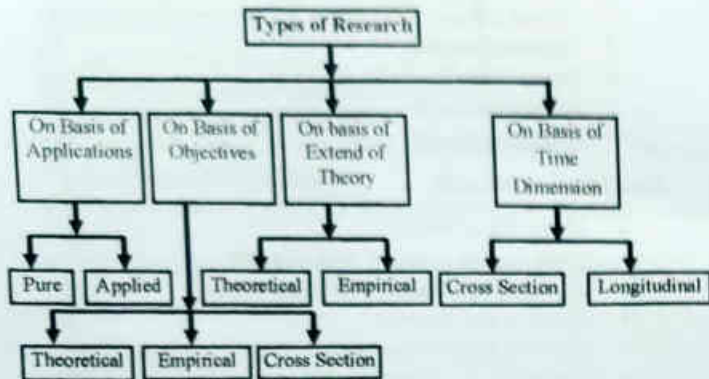
- ✓ Accounting and finance
- ✓ Human resource development and organisational behaviour
- ✓ Marketing research
- ✓ Organisational research
- ✓ Industrial research
- ✓ Production research

Significance of Research

- Market future forecast
- Understanding perceived value of goods
- Solving operational and planning problems
- Exploring new business
- Understanding market place
- Improving the quality of decision making
- Expanding existing business
- Broadening and depending technological capabilities

Problems in Research

- Shortage of funds.
- Lack of centralised database.
- No code of conduct.
- Poor library management.
- Ethics in research.
- Lack of proper contacts between research departments.
- Lack of confidence on researcher.
- Availability of quality researcher.



Problems in Scientific Research

- ❖ Possibility of biased conclusion.
- ❖ Imprecise measuring device.

- ❖ Influence of measurement process on result.
- ❖ Time constraints.
- ❖ Difficulty in using experiments to test hypothesis.
- ❖ Greater complexity of subject.

Possible Questions

- ✓ Distinguish between scientific and non-scientific research.
- ✓ Benefits of scientific research.
- ✓ Limitations of scientific research.

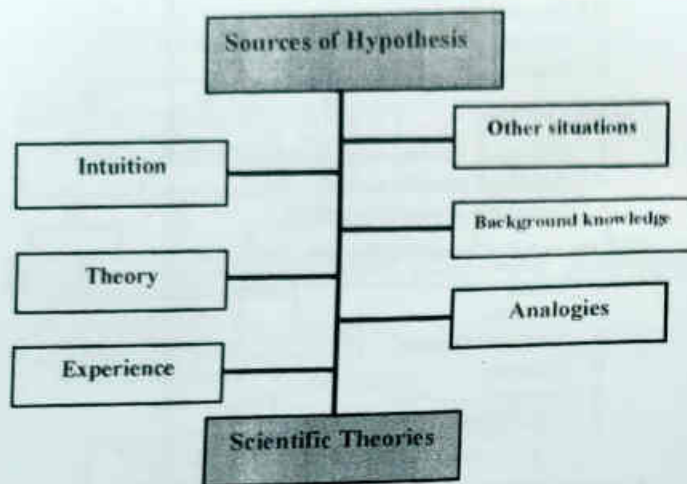
Characteristics of Scientific Research

- ❖ Validity.
- ❖ Reliability.
- ❖ Verifiable evidence.
- ❖ Accuracy.
- ❖ Precision.
- ❖ Systematisation.
- ❖ Objectivity.
- ❖ Recording.
- ❖ Controlling conditions.
- ❖ Training investigators.
- ❖ Generality.

OTHER QUESTIONS

Language of Research

1. Concepts
2. Constructs
3. Definitions
4. Variables
 - (IV – Independent variable)
 - (DV – Dependent variable)
 - (MV – Moderating variable)
 - (EV – Extraneous variable)
 - (IVV – Intervening variable)
5. Hypothesis
6. Theoretical framework
7. Models



UNIT II

HYPOTHESIS

Meaning and Definition

The term hypothesis derives from the Greek "hyposthenia" – meaning "to put under" or "to suppose". Hypothesis is a tentative conjecture explaining an observation, phenomenon, or scientific problems that can be tested by further observation, investigation, & / or experimentation. [It refers to the process of selecting and using a sample statistics to draw an inference about a population parameter based on a subset of it].

According to Palmer O Johnson, "A hypothesis is islands in the uncharted seas of thought to be used as bases for consolidation and recuperation as we advance into the unknown."

Types of Hypothesis

- Research Hypothesis
- Statistical Hypothesis
 - ❖ Null Hypothesis
 - ❖ Alternative Hypothesis

Steps for Formulating Hypothesis

- Step-1:** Identifying the problem area
- Step-2:** Gathering info and categorising ideas.
- Step-3:** Formulating the research question
- Step-4:** Conceptualising and operationalising variables
- Step-5:** Formulating the final hypothesis

Criteria for a Good Hypothesis

- | | |
|----------------|---------------|
| ➤ Clarity | ➤ Specific |
| ➤ Testable | ➤ Consistent |
| ➤ Relationship | ➤ Explainable |

Importance of Hypothesis

- ❖ Finding answers
- ❖ States purpose of researcher
- ❖ Forward looking
- ❖ States specific relationship
- ❖ Provides directions
- ❖ Helps in looking particular aspects
- ❖ Frame work for analysis
- ❖ Suggests areas of importance
- ❖ Ensures scientific nature of research

Need for Research Design

- ✓ Accurate results
- ✓ Provides blueprint
- ✓ Control of variance
- ✓ Facilitates systematic investigation
- ✓ Visualises and forecast potential problem

Features of Good Research Design

- Objectivity
- Validity
- Reliability
- Generalisation
- Adequate information
- Flexibility
- Adaptability
- Efficiency
- Economic
- Maximise accuracy of data

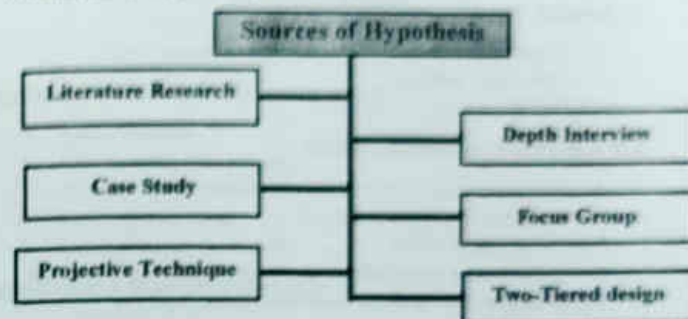
Exploratory Research

- Explore the hidden things
- Conducted for a problem that has not clearly defined
- Also termed as formulative research studies

Significance of Exploratory Research

- ❖ New discoveries can be made
- ❖ Increasing understanding
- ❖ Flexibility of resources
- ❖ Better conclusions
- ❖ Strategic planning

Techniques of Exploratory Research



Limitations of Exploratory Research

- > Not useful for decision making
- > Incomplete information
- > Not generalisable
- > Costly
- > Time consuming
- > Can mislead the data

Descriptive Research

- ❖ Designed to describe something
- ❖ Used in market survey – how many saw the add
- ❖ Includes screening, classification, personality description, prediction of output

Types of Descriptive Research

LONGITUDINAL ANALYSIS

- a) Time Series Analysis
- b) Panel Study
- c) Cohort Study

CROSS SECTIONAL ANALYSIS

- a) Descriptive
- b) Analytical

Techniques

- ✓ Observation Method
- ✓ Case study Method
- ✓ Survey Method

Advantages of Longitudinal Analysis

- Assess the stability and continuity of happenings
- Identifies developmental trends
- Avoid cohort effects
- Explains how group behaviour changes from single behaviour
- Combines both qualitative and quantitative data

Disadvantages of Longitudinal Analysis

- Very time consuming
- Very expensive
- High commitment is required
- High dropout rates of participants
- Repeated group may give a varied data

Cross Sectional Analysis

Advantages

- Data on many variables
- Data from large numbers of subject
- Data from dispersed subject
- Data on attitude and behaviour
- Answer questions on who, when, what, where
- Good for exploratory research
- Generates hypothesis for future research
- Data useful to many different researchers

Disadvantages

- Increased chances of errors
- Increased cost with more subjects
- Increased cost with each location
- Cannot measure change
- Cannot establish cause and effect

- No control of independent variable
- Difficulty to rule out rival hypothesis
- Static, time bound

Limitations of Descriptive Research Design

- Confidentiality
- Carries observer's paradox
- Errors
- Requires more skill
- Unreliable and unscientific

Significance of Descriptive Research

- Applicable in many areas
- Qualitative and Quantitative
- Provides relevant data
- Hypothesis generation

Experimental Research

It helps in finding out the cause and effect relationship of the phenomenon under study. Two groups are formed. They are "Experimental group" & "Control group". Experimental group is exposed to predesigned procedures while the controlled group is kept constant. At the end two groups are compared to find out the resultant effect of the experiment. The difference between is considered to be produced by causative factors.

Causality in Experimental Research

Before making or assuming causality, 3 conditions is to be satisfied.

1. Concomitant variation

- ❖ Variance between two x & y can be
- ❖ Qualitative or quantitative manner

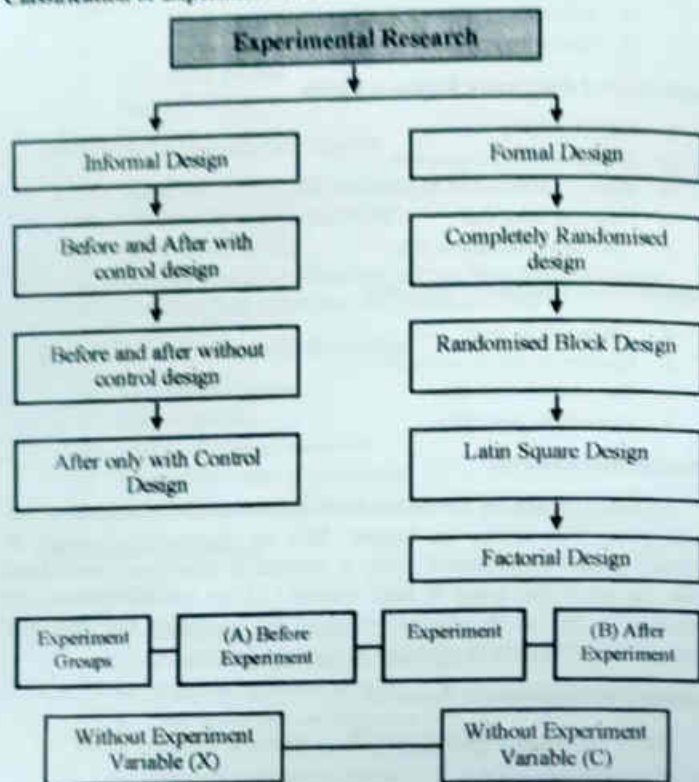
2. Time order of occurrence of variable

- ❖ Customers who shop more is likely to have credit card
- ❖ Customer who has credit card will shop more

3. Elimination of other possible causal factor

- ❖ All other factors affecting changes such as pricing, advertising, level of distribution, product quality, competition etc

Classification of Experimental Research



$$\text{Experiment Variable Effect} = (B - A) - (C - X)$$

Significance of Experimental Research Design

- ❖ Cause and Effect
- ❖ Reliable Result
- ❖ Provides Helpful in Sight
- ❖ Control over Variables

Limitations

- Artificiality
- Biased and unrepresentative
- Manipulation possible
- Not possible to control the variables completely
- Uncertainty of reaction

Measurement

According to **Johan Galtung** "Measurement is the mapping of the values on asset of numbers". (Male - Female - Cinema - % of gender)

Measurement Process

1. Establishing behavioural category
2. Using various methods of calculations
 - i. Frequency Method
 - ii. Duration Method
 - iii. Interval Method
3. Using multiple observers
 - i. Naturalistic observation
 - ii. Participant observation
 - iii. Contrived observation (Setting up the situation).

Errors in Measurement

- ❖ Subject Factor. (tired, sick, angry, irritated)
- ❖ Research Factor. (Dress, personal attitudes.)
- ❖ Environmental Factors. (weather, temperature)
- ❖ Instrumental Factor. (Unclear question etc.)

Need of Measurement

- Facilitates description of social and psychological phenomena
- Provides data for statistical operation.
- Facilitates testing of theories.
- Enables researcher in differentiation.

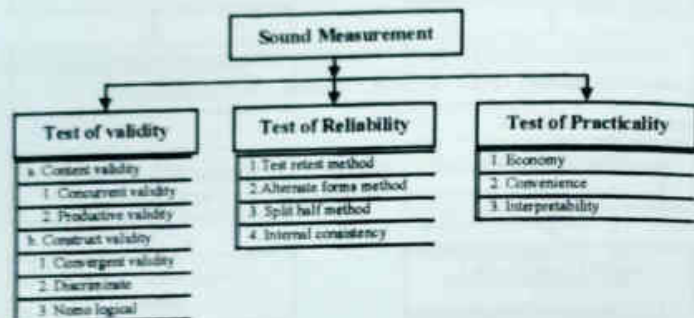
Techniques of Measurement

- ❖ Attitude scales
- ❖ Questionnaire
- ❖ Quantitative
- ❖ Observation

Difficulties in Measurement

- Irrelevant data
- Inaccurate response
- Researcher and analyst suffer the danger field syndrome
- Training in measurement is rare

Types of Sound Measurement



SCALING

Meaning

- Extension of measurement
- Procedure for assigning numbers to various degrees of opinion, attitude and other concepts.
- Associated with qualitative and quantitative metric units.
- Containing highest points and lowest points.
- Procedure for assignment of numbers.
- Progressively arranging series of items according to value or magnitude into which an item can be placed accordingly to its qualification

Common scales used in Business Research are Shown

Nominal Scale

- Elementary level of measurement
- Used for identification or classification purpose
- Used in market research

Ratio
Interval
Ordinal
Nominal

Advantages of Nominal Scale (% , Chi-Square, Binominal)

- Convenient way of keeping track
- Describes different between things

	Reason for Purchase by Gender					
	Male		Female		Total	
	No.	%	No.	%	No.	%
Weight	10	20	28	56	38	38
Speed	31	62	10	20	41	41
Miscellaneous	9	18	12	24	21	21
	50	100%	50	100%	100%	100%

Disadvantages

- No natural order
- No logical order
- Lowest form of measurement
- Mean, median mode cannot be calculated

Ordinary scale - ranking scale

Advantages

- Allow easy Ranking of products
- Covers the Whole Information

Disadvantages

- Ranking Based on Perception
- Influence by way of Conducting Survey

INTERNAL SCALE

Advantages

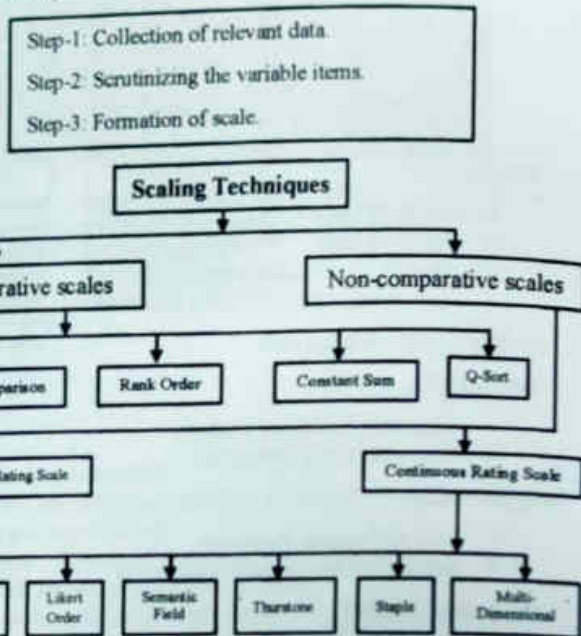
- ◆ Creates standardisation
- ◆ Simple and easy to understand.

Company Name	Less Known	1	2	3	4	5	Well known
Functions	Few	1	2	3	4	5	Many
Price	Low	1	2	3	4	5	High
Design	Poor	1	2	3	4	5	Good
Overall satisfied	Highly Dissatisfied	1	2	3	4	5	Highly Satisfied

Disadvantages

- Lack of true zero
- Tendency of rates to be generous.

Process of Scaling



Scale Classification Basis

- ✓ Subject orientation
- ✓ Response form
- ✓ Degree of subjectivity
- ✓ Scale properties
- ✓ Number of dimensions

Criteria for Good Scale

- Reliability
- Validity

- Practicality
- Sensitivity
- Generalisability
- Economy
- Convenience

RATIO SCALE

- Represents highest form of measurement.
- Provides iconic measurement.
For example: what is your annual income before tax?

Advantages

- Compares relative measurement.
- Shows definitive trend.

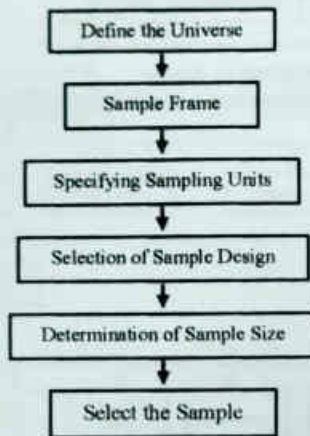
Disadvantages

- Negative value cannot be drawn.
- Difficulty in representing quantified responses.

UNIT - III SAMPLING

- Sampling is essential technique of behavioural research.
- The research work cannot be undertaken without use of sampling.
- The concept of sampling has been introduced with the view to make the research findings economical and accurate.
- DAVIS S. Fox in the social science, it is not possible to collect data from every respondent to our study but only from some fractional part is called sampling.

Steps in Sampling



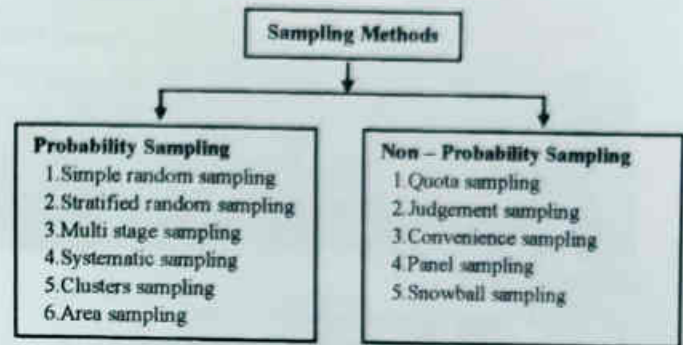
Advantages

- Save time, money, effort
- More effective
- Faster and cheaper
- More accurate
- Give more comprehensive information

Disadvantages

- ❖ Less accuracy

- ❖ Changeability of units
- ❖ Misleading conclusions
- ❖ Need for specialised knowledge



Criteria for Good Sampling

- | | |
|-----------------------|--------------|
| ✓ True representative | ✓ Accurate |
| ✓ Objective | ✓ Economical |
| ✓ Comprehensive | ✓ Good size |
| ✓ Approachable | ✓ Practical |
| ✓ Free from bias | |

DATA COLLECTION

- To gather information about the relevant topic of research
- It is a process of preparing and collecting data
- It is to obtain information, keep record, and make decision



Primary Data

Secondary Data

Tools and Methods for Primary Data Collection

- | | |
|--------------|------------------|
| 1. Interview | 2. Questionnaire |
|--------------|------------------|

3. Schedule (Performance - heading and sub heading)
4. On-line survey
5. Observation
6. Other methods
 - a. Warranty card
 - b. Distributor or store audit
 - c. Pantry audit
 - d. Mechanical devices
 - e. Panel
 - f. Simulation

Advantages \ Significance of Primary Data	Disadvantages of Primary Data
Reliability	Cost
Availability of wide range of techniques	Time consuming
Addresses specific research issues	Not always feasible
Greater control	Large volume of data
Efficient spending for information	Reluctancy of respondents
Proprietary information	

QUESTIONNAIRE

- ✓ Questionnaire is a data of collection instrument
- ✓ It is a list of questions to be asked from respondents.
- ✓ It is a self administrative process.
- ✓ After analysis of questionnaire results are better.

Types of Questionnaire

- ❖ Structured, non-disguised questionnaire
- ❖ Non-structured, non-disguised questionnaire
- ❖ Non-structured, disguised questionnaire
- ❖ Structured, disguised questionnaire

Constructing a Questionnaire

- Determine what information is wanted
- Determine the type of questionnaire to use
- Determine the content individual question
- Determine the type of question to use
- Deciding on wording of questionnaire
- Decide on question sequence
- Decide the length of questionnaire
- Decide on layout and reproduction
- Pre-test
- Revision and final draft

Types of Questionnaire

1. Open ended questions
2. Closed ended questions
3. Leading questions
4. Important questions
5. Likert questions
6. Dichotomous questions
7. Bipolar questions
8. Rating scale questions
9. Buying propensity questions
10. Contingency questions

Guidelines for Preparation of Questionnaire

1. Questionnaire should be brief
2. Simple, clear, unambiguous questions
3. Use proper words in questions
4. Instructions for filling the questionnaire
5. Question should be easily answerable
6. Questions capable of objective answers
7. Should not affect pride and sentiment
8. Some kind of questions to be avoided
9. Sequence of questions
10. Setting of questionnaire
11. To test accuracy
12. Questions to be
 - a. Simple alternative
 - b. MLQ
 - c. Open questions
 - d. Specific information questions

Advantages (Significance) of Questionnaire

- Economical
- Accessibility to diverse respondents
- Time saving
- Free from bias
- Greater anonymity
- Respondent's convenience
- Standardised wordings

Limitations

- ❖ Unwillingness of respondents to provide information
- ❖ Inability of respondent to provide information
- ❖ Influence of questioning process
- ❖ Questionnaire can administrate to respondents

- ◆ It is expensive & dependent
- ◆ Disruptive measurement of process
- ◆ Non-representative & very high

QUANTITATIVE - CASE STUDY

Secondary Data

1. Sales analysis	1. Libraries
2. Income analysis	2. Literature
3. Accounting records	3. Periodicals
	4. Trade associations
	5. Census and registration data
	6. Government department
	7. Private sources
	8. Commercial data
	9. Statistical data
	10. International organizations
	11. Reference and bibliography
	12. Value of statistics
	13. Advertising agencies
	14. Other sources

Advantages of Secondary Data	Limitations of Secondary Data
economy	Relevance
quickness	Accuracy
quality	Excessiveness of obsolete information
No need of measuring instruments	Non-disclosure of research finding
availability	Selection catering to the need
ease of comparison	Difficulties in identifying the source
Useful in exploring research	Errors may be recording / transferring
Generates feasible alternatives	Original data may be questionable

CASE STUDY

According to H. Odum, "The case study method is a technique by which individual facts whether it be an institution or just an episode in the life of

an individual or a group is analyzed in its relationship to any other in the group."

Features of Case Study

- ◆ Increase of knowledge
- ◆ Development of hypothesis
- ◆ Flexibility
- ◆ Application of troubled situations

Developing a Case Study

- Examining present status
- Gathering background information
- Testing suggested hypothesis
- Initiating remedial action

Helps in understanding behavioural pattern	Non-comparable
Helps in identifying inner motivation	False generalization
Enables generalised knowledge	Time taking
Facilitates study of social units	Money consuming
Helps in constructing questionnaire	Based on unrealistic assumption
Different method can be used	Applied only in a limited sphere
Beneficial	
Capable of historical analysis	
Enhancing analysing ability to skill	

Data Preprocessing



Editing

1. Essentials of editing

- 1) Completeness
- 2) Accuracy
- 3) Uniformity

b. Stages of coding

- 1) Field Editing
- 2) Office / Central Editing

CODING OF DATA

Procedure of coding

- ❖ Axial coding
- ❖ Identification of open coding
- ❖ Selective coding

Essentials of Coding

- ✓ Appropriate to the research problem
- ✓ Exhaustive
- ✓ Mutually exclusive
- ✓ Single dimension
- ✓ Code sheet
 - ❖ Heading
 - ❖ Column identification
 - ❖ Coding instruction
 - ❖ Special instruction

CLASSIFICATION OF DATA

Types of Classification

- 1) Classification according to attributes
 - a. Simple classification
 - b. Manifold classification
- 2) Classification according to class interval

Principles of Classification

- Should not be ambiguous
- Should be mutually exhaustive
- Should be action oriented
- Should be pertinent to market research project
- Should be on basis of single classification principle

Tabulation of Data

Simplifies facts	No Description
Economy	Difficult for Layman
Helpful in Comparison	Lack of Precision
Facilitates Computation	
Helps Classification	
Helps in Reference	
Helps in Interpretation	
Helps in Presentation	

Importance of Data Processing

- Checks the data for accuracy
- Provides better understanding
- Puts into a suitable form
- Helps in decision making
- Makes data transferable
- Readability

Problems in Data Processing

- ✓ Data entry errors
- ✓ Data editing errors
- ✓ Structural errors
- ✓ Logical errors
- ✓ Data coding errors
- ✓ Error in tabulation
- ✓ Error in assignment of survey weights

UNIT IV PARAMETRIC AND NON - PARAMETRIC

Introduction

Hypothesis, example: let the average life of a bulb, manufactured by old process, in 200 hours, and average life in 300 hours, when the bulb is manufactured by new process. In this problem we can set up 3 hypotheses

1. New process is better than old method
2. Old process is better than new method
3. There is no difference between these processes

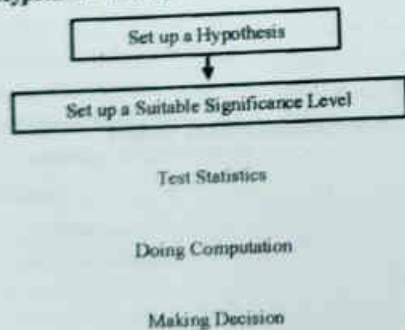
Characteristics of Hypothesis

- ❖ Clear and precise
- ❖ Limited in scope
- ❖ Logical
- ❖ Amenable (reasonable time)
- ❖ State the relationship between variables
- ❖ Simple
- ❖ Consistent
- ❖ Subjectivity

Hypothesis Decision Table

Decision	Null Hypothesis	
Accept H_0	Correct decision	Type 2 error
Reject H_0	Type 1 error	Correct decision

Procedure for Hypothesis Testing



Null Hypothesis: A statistical hypothesis which is stated for the purpose of possible acceptance is called null hypothesis. It is denoted by symbol H_0 .

Example: a grocery store is considering to introduce internet shopping service. The new service will be introduced if more than 40% of the internet users shop via the internet.

The appropriate way to formulate the hypothesis is $(H_0, p \leq 0.40)$
 $(H_1, p > 0.40)$

According to Professor R. A. Fisher, "Null hypothesis is a hypothesis which is tested for possible rejection under the assumption that it is true".

Alternative Hypothesis: Any hypothesis which is complementary to the null hypothesis is called as alternative hypothesis and is generally denoted by H_1 or H_a .

Example: if we want to test the null hypothesis that the average height of soldiers is 162 cm

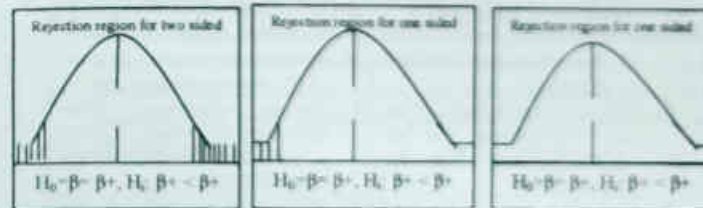
$H_0: \mu = 162 \text{ cm} = \mu$, then the alternative hypothesis is

$H_1: \mu \neq \mu$

$H_1: \mu > \mu$

$H_1: \mu < \mu$

Rejection Region: Rejection region or critical region associated with statistical test is a subset of sample space. Such that one rejects the null hypothesis in favour of alternatives, if and only if, the observed area falls within this.

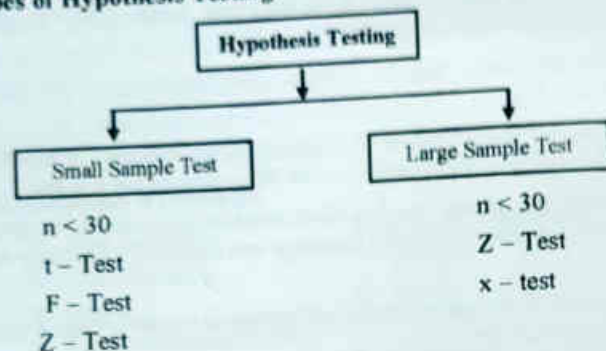


Errors in Hypothesis Testing

Type 1 Error : Rejecting a null hypothesis when it is true

- α : Probability of type 1 error
- Type 2 Error** : Accepting a null hypothesis when it is false
- β : Probability of type 2 error

Types of Hypothesis Testing



Non-Parametric Tests

One sample test	Two sample test	K - sample test
One sample Sign Test Chi - Square Test	Two Sample Design Median Test	Median test Kruskal - Wallis test (H - TEST)
Kolmogorov smirnov test Run test randomness	Mann - whitney Rank Sum Test (U - test) Will Loxon Signed Rank	

PARAMETRIC TEST	NON - PARAMETRIC TEST
❖ Parametric test do not utilise all the information provided by sample	❖ To utilize all the information provided by sample, the size of the sample must be more.
❖ Serious, the efficiency of the non - parametric test are remarkable less than the parametric test	❖ Serious departure from normality will render the non - parametric method much more efficient
❖ Parametric test can be used even slight departures from normality particularly when sample size is large	❖ The sample size is small, non - parametric test are preferred.

DATA ANALYSIS

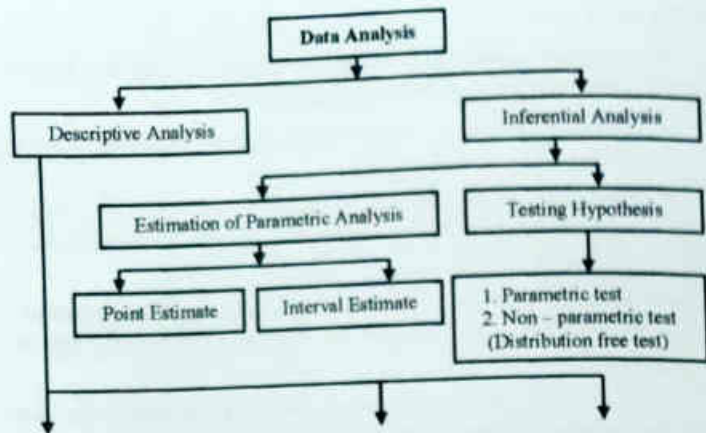
It is important to understand that the raw data has no usage in marketing research. Hence appropriate analytical tool must be used.

- ✓ The most elementary is the arithmetic analysis using percentile and ratios.
- ✓ Statistical analysis like mean, median, method, mode, percentages, standard deviations and co - efficient of correlation should be used wherever applicable.
- ✓ Advanced statistical tools like test of significance, factor analysis, multiple discriminate analysis and regression analysis may also be used.

Data analysis is a process of gathering, modelling and transforming data with the goal of highlighting useful information, suggesting conclusions and supporting decision making.

Types of Data Analysis

1. **Descriptive Analysis:** It summarise the population of data by describing what was observed in the sampling numerically or graphically. The analysis of variables may be treated one at a time, two at a time, or more than two at a time.
 - Univariate Analysis
 - Bivariate Analysis
 - Multivariate Analysis
2. **Inferential Analysis:** It is used to generate the result obtained from a random sample back to the population from which the sample size was drawn. This analysis is required when sample is drawn by random procedure and the response rate is very high. Hence this type is not appropriate for non - probability method of selection, are used, the response rate is low.



a) Uni-variate analysis	b) Bi-variate analysis	c) Multi-variated analysis
Measure of Central Tendency	Simple regression and simple correlation	Multiple regression / multiple correlation
Measure of Dispersion	Association of attributes	Multiple discriminates
Measure of Skewness.	Association of analysis	Multi Anova
One-way Anova,	Two-way Anova	Canonical analysis
Index Numbers,		Other types of analysis
Time Series Analysis.		
Regression and Correlation,		
Classification of Paired Data		

UNIT - 5

SPSS AND RESEARCH

SPSS stands for Statistical Package for Social Sciences. It was developed in 1968, by 3 young men. Norman H. Nie, C. Hadlai (Tex) Hull and Dale H. Bent. The initial work was done at Stanford university with an intend to make it only available locally. The primary use of SPSS in education settings is for data analysing about people, their attributes, and behaviours. SPSS mainly used by political science, communication, sociology, social work and psychology departments.

1. It seems to be the easiest to use for the most statistical technique.
2. One can use it either a windows point and click approach.
3. Easiest method to translate data into SPSS.
4. It has less control over statistical output.
5. It is user friendly for mobile users.
6. One has to learn the techniques to use SPSS.
7. SPSS has problems with data manipulation.

Overall SPSS is a good first statistical package for people wanting to perform quantitative research.

SPSS Windows and Files

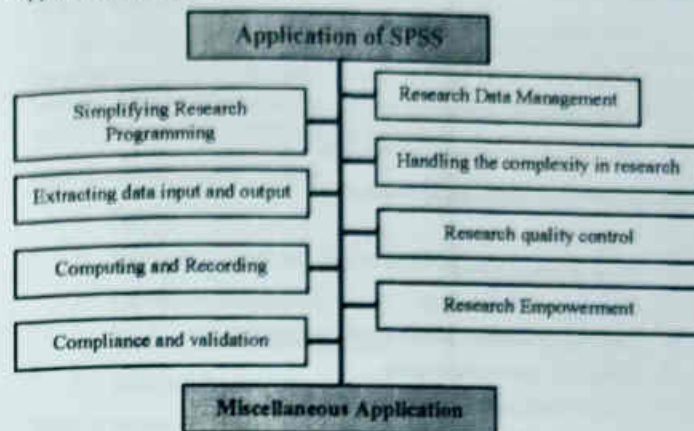
Windows	File Suffix	Function
Editor	.sav	Used to define, enter and edit the data and to run statistical test.
Output	.spo	Contains the results of statistical procedure.
Syntax	.sps	The window is activated when you click of the paste function and records a record of the operation that are "pasted". Although that is beyond the goals of these lessons, you may want to know that SPSS commands can actually be run from this window.

Entering data, computing descriptive statistics, transforming and selecting data

Person	Gender	Age	Siblings	Health score	Personality score	Activity score
1	M	76	0	16.64	15	-4
2	F	28	3	60.83	22	4
3	M	39	0	44.25	18	2
4	F	56	0	30.67	25	-1
5	M	47	1	49.13	36	0
6	F	61	0	29.37	20	-3
7	M	59	0	32.53	28	1
8	F	48	1	47.25	34	0
SO	Male	59	0	38.5	25	-1

- ❖ Create separate line for each case, which in this particular example in each person.
- ❖ Create a column for each variable of interest.
- ❖ E.g.) 7 columns have been used. 1)person, 2)gender, 3)age, 4)number of siblings, 5)health score, 6)personality score, 7)activity score.
- ❖ It may not be essential to create a column for a person identification number, but we will have to create it to identify the data easily.
- ❖ Develop numerical code for a gender variable.
 - For female
 - For male

Application of SPSS in research



DATA INTERPRETATION AND RESEARCH REPORT

Data interpretation can be defined as the application of statistical procedure to analyse specific observed or assumed facts from a particular study.

Need for Data Interpretation

- Understanding abstract principle
- Establishing explanatory concepts
- Making others understand
- Establishing hypothesis

Process of Data Interpretation

- ❖ Assemble the needed information
- ❖ Develop finding
- ❖ Develop conclusion
- ❖ Develop recommendation

Guidelines for Making valid Interpretation

1. Data should be homogeneous
2. Data should be adequate
3. Data should be appropriate
4. Data should be statistically analysed

Source of Errors in Data Interpretation

- ✓ Personal bias
- ✓ Type of average used
- ✓ Drawing wrong inference
- ✓ Drawing unwanted / unwarranted conclusions
- ✓ Misuse of statistical concepts
- ✓ Use of percentage
- ✓ False generalisation

Research Report: *Lancaster* says "A report is a statement of collected and considered facts, so drawn – up as to give clear and concise information to a person who is not already in possession of the full facts of the subject matter of the report".

Characteristics of Good Research Report

- | | |
|----------------|---------------------|
| ✓ Accuracy | ✓ Simplicity |
| ✓ Clarity | ✓ Brevity |
| ✓ Completeness | ✓ Economy |
| ✓ Appearance | ✓ Logical content |
| ✓ Reliability | ✓ Comprehensibility |
| ✓ Timeliness | ✓ Readability |

Types of Report

- ❖ Technical Report
- ❖ Popular Report
- ❖ Interim Report
- ❖ Summary Report

Report Writing

Research report is the written way of communicating the results of an investigation. It is a document which reflects about how the research is conducted, the care that has been extracted and exercised throughout the study and the findings in a manner that can be utilised for decision making.

Significance of Report Writing

- Provide Details
- Source of Concise and Organised Data
- Reflects Final Research
- Tools of Evaluating Researcher
- Bibliography Evidence

Steps in Report Writing

1. Investigating the source of information
2. Taking notes
3. Analysing the data
4. Making an outline
5. Writing the report

Layout of the Report

1. Title page
2. Table of Content
3. Forward
4. Statement of Objectives
5. Methodology
 - a. Research Design
 - b. Data Collection Methods
 - c. Sampling
 - d. Field Work
 - e. Analysing and Interpretation
6. Limitations

7. Findings
8. Conclusions and recommendations
9. Annexure
10. Bibliography and references

Precautions for Writing Good Research Report:

- ❖ Concise and complete
- ❖ Maintain interest
- ❖ Avoid technical jargons
- ❖ Explanatory
- ❖ Objectory layout
- ❖ Free from bias and errors
- ❖ Logical presentation
- ❖ Original and specific
- ❖ Recommendations for follow up
- ❖ Incorporate technical appendices
- ❖ Bibliography
- ❖ Proper indexing
- ❖ Enticing appearance
- ❖ Mention limits and constraints
- ❖ Reflect the research duties

TABLES

A table is a means of arranging data in rows and columns. The use of tables is pervasive throughout all communication, research and data analysis.

Types of Table

Simple and Complex Table	General and Specific Table
1) Simple Table or One Way Table	1) Purpose Table
2) Two Way Table	
3) High Order Table	

Norms for Using Table

- ✓ Table number
- ✓ Title
- ✓ Number of rows and columns

- ✓ Captions and stubs
- ✓ Ruling and spacing
- ✓ Size of columns
- ✓ Arrangement of items
- ✓ Units and derivatives
- ✓ Explanatory notes
- ✓ Sources
- ✓ Totals

General Norms to be followed:

- ❖ Attractive shape
- ❖ Simplicity
- ❖ Place of approximation
- ❖ Free from irrelevant data
- ❖ Use of circle or box etc
- ❖ Miscellaneous columns
- ❖ Non availability of data

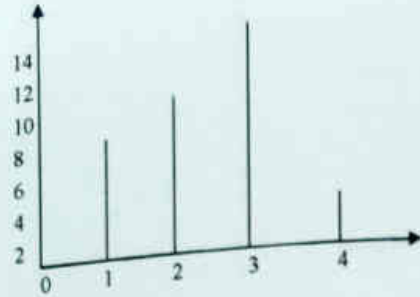
CHARTS AND DIAGRAMS

- The choice of chart and diagram depends on the nature of data.
- Diagram is a visual form of presentation of data.
- More appropriate for quantitatively comparison of data.
- Diagrams / charts refers to various forms such as,
 - ✓ Bar diagrams
 - ✓ Circle
 - ✓ Map
 - ✓ Pictorial
 - ✓ Cartograms etc.,

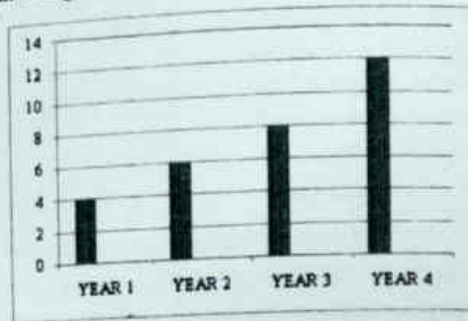
Types of Charts / Diagrams

1. Line diagram
2. Simple Bar Diagram
3. Multiple Bar Diagram
4. Sub Divided Bar Diagram
5. Percentage Bar Diagram
6. Rectangles
7. Squares
8. Pie Diagram/Circular Diagram

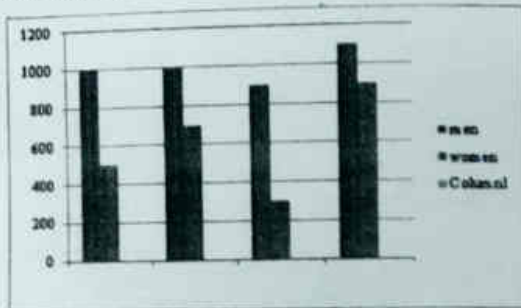
Line Diagram



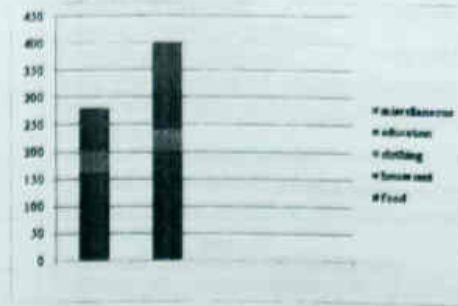
Simple Bar Diagram



Multiple Bar Diagram



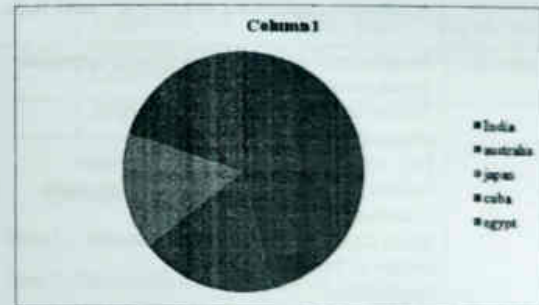
Sub - Divided Bar Diagram



Sub Dividend Percentage Bar Diagram



Pie Diagram



Types of Graphs

1. Histogram
2. Frequency curve
3. Frequency polygon
4. Commulative frequency curve
5. Table of contents

Content		Page No.
	Acknowledgement List of tables List of figures List of charts	
Chapter - 1	INTRODUCTION	05
Chapter - 2	Interrelationship of small units with large scale units - a theoretical analysis. Pattern and development of small and large scale units Need for interrelation. Industrial estate. Ancillarisation. Japanese experience.	28
Chapter - 3	Review of progress of small industry and engineering industry. Small scale industry - historical setting. Small scale industry in Tamil Nadu. Small scale engineering industry in Tamil Nadu.	82
Chapter - 4	Sample small scale units - a general appraisal. Introduction. Year of establishment. Ownership pattern. Pre - entry background of entrepreneurs. Factory motivating to start small scale units. Location of small scale units. Initial capital employed. Source of borrowed funds. Registration. Capacity utilisation. Assistance to star new small scale units.	90

	Industries association Training of unskilled workers Research and development Some special features of sample units summary	
Chapter - 5	Extent and variation of interrelationship. Introduction. Approach to interrelationship. Yardsticks of interrelationship. Variation in the extent of interrelationship by components. Extent and variation in interrelationship. Estimate of interrelationship in Coimbatore region. Summary.	120
Chapter - 6	INTERRELATIONSHIP vis a vis factor Introduction. Technical qualification Previous employment of entrepreneurs scale units. Nearness to large scale units. Nature of product of small scale units. Personal interaction with large scale units. School / college peer group. Social relationship of entrepreneurs. Training facilities. Summary	130
Chapter - 7	Findings, suggestions for achieving higher interrelation. Summary and findings. Suggestion for achieving higher degree of interrelationship.	182
	Conclusion	190
	APPENDICES	

INDEX: Process of Preparing Index

- Step 1: Understand the purpose of index.
- Step 2: Begin with a completed text.
- Step 3: Review the entire text, mark key words.

Step 4: Assign heading for each key concept

Step 5: Consider the likely reader and the purpose of index.

Step 6: Organise the heading in alphabetic order

Step 7: Nest sub - heading under main heading.

Step 8: List of pages

Norms of Using an Index:

1. Things to be included
2. Reason to be included
3. When to be included
4. Space to be provided

Norms for Using Bibliography:

1. Always be consistent
2. Writing a reference list or bibliography
3. Collecting a information to use in the report
4. Placing of bibliography

Oral Presentation of Report

1. PRESENTER

- a) Identify your purpose - achieve
- b) Analyse your audience
- c) Identify your need
- d) Collate your information
- e) Design your communication
- f) Time your presentation
- g) Decide your visual aids to be used
- h) Study your location of presentation