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**UTTARAKHAND OPEN UNIVERSITY**  
Teenpani Bypass road, Behind Transport Nagar, Haldwani  
Haldwani -263139, Nainital ( Uttarakhand)  
Phone : 05946-261122, 261123 Fax No. - 05946-264232  
www.uou.ac.in e-mail:- info@uou.ac.in  
Toll Free No. - 1800 180 4025

**MS-501 (PART-I)**

School of Management Studies and Commerce  
**Marketing Research**



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School of Management Studies and Commerce  
**Marketing Research**



**DEPARTMENT OF MANAGEMENT STUDIES**  
**Block I Introduction to Marketing Research**  
**Block II Research Design and Formulation**

## Marketing Research



### Block – I

**Block Title- Introduction to Marketing Research**

### Block – II

**Block Title- Research Design and Formulation**

**UTTARAKHAND OPEN UNIVERSITY  
SCHOOL OF MANAGEMENT STUDIES AND COMMERCE  
University Road, Teenpani By pass, Behind Transport Nagar,  
Haldwani- 263 139**

**Phone No: (05946)-261122, 261123, 286055**

**Toll Free No.: 1800 180 4025**

**Fax No.: (05946)-264232, e-mail: [info@uou.ac.in](mailto:info@uou.ac.in), [som@uou.ac.in](mailto:som@uou.ac.in)**

**Website: <http://www.uou.ac.in>**

**Blog Address: [www.blogsomcuou.wordpress.com](http://www.blogsomcuou.wordpress.com)**

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Uttarakhand Open University

Haldwani

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Department of Management Studies

Uttarakhand Open University, Haldwani

**Dr. Gagan Singh**

Department of Commerce

Uttarakhand Open University, Haldwani

**Dr. Sumit Prasad**

Department of Management Studies

Uttarakhand Open University, Haldwani

---

**Programme Coordinator and Editor**

---

**Dr. Manjari Agarwal**

Assistant Professor, Department of Management Studies

Uttarakhand Open University, Haldwani

---

**Units Written by**

---

**Unit No.**

---

**Dr. Sumit Prasad**

**Assistant Professor,**

**School of Management Studies and Commerce,**

**Uttarakhand Open University**

1, 2 &4

**Dr. Vaishali Agarwal**

**Associate Professor**

**Indus Business Academy, Bangalore**

3,5, 10

& 11

**Dr. Namita Soni**

**Professor and Dean**

**Mahakal Institute of Management, Ujjain**

6,7,8

& 9

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## Cover Design

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Dr. Manjari Agarwal

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# **Course Contents**

**Course Name: Marketing Research**

**Course Code-MS 501**

**Course Objective:** The course is designed to inculcate the analytical abilities and research skills among the students in the field of marketing.

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**Unit I Introduction to Marketing Research**

**Unit II Types of Marketing Research**

**Unit III Marketing Research Industry in India**

**Unit IV Marketing Research Process**

**Unit V Marketing Research Problem**

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**Unit XX Research Report Preparation & Presentation-I**

**Unit XXI Research Report Preparation & Presentation-II**

**Unit XXII International Marketing Research**

**Unit XXIII Ethics in Marketing Research**

**Suggested Readings:**

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## **Block I**

# **Introduction to Marketing Research**

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# UNIT 1 INTRODUCTION TO MARKETING RESEARCH

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- 1.1 Introduction**
- 1.2 Objectives**
- 1.3. Meaning and Definition**
- 1.4 Nature of Marketing Research**
- 1.5 Role of Marketing Research**
- 1.6 Scope of Marketing Research**
- 1.7 Significance of Marketing Research**
- 1.8 Limitation of Marketing Research**
- 1.9 Summary**
- 1.10 Glossary**
- 1.11 Answer to Check Your Progress**
- 1.12 Reference/ Bibliography**
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## 1.1 INTRODUCTION

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Marketing research is a rapidly growing area of expertise that includes the design, collection, analysis and reporting of information that can explain or predict social or corporate challenges. Market research and marketing research are often confused. 'Market Research' is simply a research into a specific market. It is a very narrow concept. 'Marketing Research' is much broader. It not only includes 'market research', but also areas such as research into new products, or modes of distribution such as via the internet.

Marketing Research can be understood as, the process or set or processes that links the consumers, customers, and end users to the marketer through information- information used to identify and define marketing opportunities and problems; generate, refine and evaluate marketing actions; monitor marketing performance; and improve understanding of marketing as a process. Marketing research specifies the information required to address these issues, designs the methods for collecting information, manages and implements the data collection process, analyses the results, and communicates the findings and their implications.

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## 1.2 OBJECTIVES

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After reading this unit you will be able to;

- Define marketing research.
- Describe the meaning, nature scope and significance of marketing research
- State the limitations of Marketing Research.

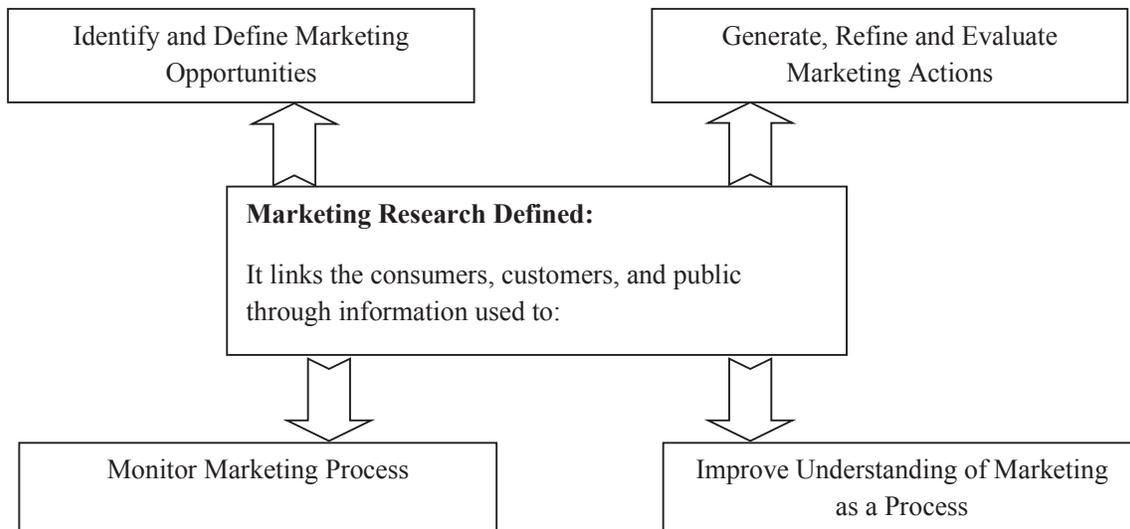
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## 1.3 MEANING AND DEFINITION

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According to American Marketing Association, “Marketing Research is the function that links the consumer, customer and public to the marketer through information- information used to identify and define marketing opportunities and problems, generate, refine and evaluate marketing actions; monitor marketing performance; and improve understanding of marketing as a process”.

Marketing research is a systematic problems analysis, model building and fact finding for the purpose of important decision making and control in the marketing of goods and services. It is a well-planned, systematic process which implies that it needs planning at all the stages. It uses scientific methods. It is an objective process as it attempts to provide accurate authentic information. Marketing research is sometimes defines as application of scientific methods in the solution of marketing problems.



**Figure 1.1: Marketing Research Defined**

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## 1.4 NATURE OF MARKETING RESEARCH

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Marketing Research is a systematic and objective collection of data, its analysis and evaluation, helps in decision making in respect of specific aspects of a marketing problem.

### *Marketing Research and Market Research*

The nature of marketing research cannot be properly understood without knowing the meaning of market research. Market research is the gathering, recording and analysis of market data to identify the present and potential customers and their motives and buying habits. It is the discovery of the capacity of the market to absorb the products of a firm. It is a part of the marketing research. It is worthwhile to quote Richard D. Crips to identify clearly the scope of marketing research and market research, 'Marketing Research is the systematic, objective and exhaustive search for the study of the facts relevant to any problem in the field of marketing. Market research is restricted to the study of actual and potential buyers, their locations, their actual and potential values of purchases and their motives and habits'.

Market research may be conducted for the following reasons:

- To identify the present and potential customers and their needs.
- To forecast the demand of a product.
- To determine customers preferences with regard to packaging, design, size price and other features of a product.
- To locate the demand for products with regards to time and place, such as festival demand.
- To explore new markets for existing products.



### *Check Your Progress- A*

---

#### **Fill in the blanks.**

1. ....is a systematic problem analysis, model building and fact finding for the purpose of important decision making and control in the marketing of goods and services.
2. .... is the gathering, recording and analysis of market data to identify the present and potential customers and their motives and buying behaviour.
3. .... is restricted to the study of actual and potential buyers, their locations their actual and potential value of purchase and their motives and habits.

4. Marketing research is sometimes defined as the application of ..... in the solution to marketing problems.

---

## 1.5 ROLE OF MARKETING RESEARCH

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Marketing Research plays a very significant role in identifying the needs of customers and meeting them in the best possible ways. The main task of marketing research is systematic gathering and analysis of information.

Before proceeding further, it is important to understand the relationship between Marketing Research and Management Information System (MIS). Whatever, information are generated by Marketing Research from internal sources, external sources, marketing intelligence agencies- consists the part of MIS.

MIS is a set of formalized procedures for generating, analysing, storing and distributing information to marketing decision makers on an ongoing basis.

- While marketing research is done with a specific purpose in mind with information being generated when it is conducted, MIS information is generated continuously.
- MIS is a continuous entity while marketing research is an ad-hoc system.
- While in Marketing Research information is for specific purpose, so it is not rigid; in MIS information is more rigid and structured.

Marketing research is essential for strategic market planning and decision making. It helps a firm in identifying the market opportunities and constraints, in developing and implementing market strategies, and in evaluating the effectiveness of marketing plans.

Marketing research is a growing and widely used business activity as the producers and sellers need to know more about their final consumers but are generally widely separated from those consumers. Marketing research is a necessary link between marketing decision makers and the markets in which they operates.

Marketing research includes various important principles for generating information which is useful to managers. These principles relates to the timeliness and importance of data, the significance of defining objectives cautiously and clearly, and the need to avoid conducting research to support decisions already made.

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## 1.6 SCOPE OF MARKETING RESEARCH

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Marketing research covers different aspects of marketing of goods, services and ideas. There are many areas of marketing where marketing research has special branches:

1. **Product Research:** Product Research is associated with the conversion of customer needs into tangible product offers. This includes development and testing of new products, improving the existing products and a tab on the changing customer

preferences, habits, tastes etc. Packaging design, branding and labelling decisions are also included here.

2. **Customer Research:** This research type includes investigation into the customer buying behaviour- the economic, social, cultural, personal and psychological influences.
3. **Sales Research:** Sales research involves decisions concerning selection of store locations, channels, territories, Salesforce motivation and compensation, etc. The purpose is to reach the target customer more effectively and efficiently in time.
4. **Promotion Research:** Promotion Research encompasses all efforts by the marketers to communicate the company's offer. This includes advertising, publicity, public relations, sales promotion, etc.

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## 1.7 SIGNIFICANCE OF MARKETING RESEARCH

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Marketing is one of the most important areas of any business enterprises. Making of right type of decision in this determines the success of the enterprise. Correct and sound marketing decision can be made only if right type of information is available to the management. The required information can be made available by conducting marketing research. The significance of marketing research has increased because of severe competition in the market, frequent technological changes, and the emergence of buyer's market. Marketing research is of great value to management.

A business enterprise can derive the following benefits by conducting marketing research:

- **Forecasting:** Marketing Research facilitates forecasting of demand for the products of the firm. This will help in adjusting the production schedules accordingly.
- **Assessing Product Acceptance:** Marketing research helps in knowing the probability of acceptance of the product in its present form. Such type of research may lead to alterations in design colour and other features of the product to make it more acceptable by the consumers.
- **Rightful Promotion:** It reduces the wasteful expenditure on production and advertisement. It tells in advance the products and services which are required by the customers.
- **Understanding New Markets:** Marketing research helps in discovering new markets and in understanding the behaviour of various types of customers.
- **Suitability of Channels:** Marketing research can be used to study the effectiveness of existing channels of distribution, advertising, sales promotion and other marketing activities.
- **Overall Business Directions:** Marketing Research provides invaluable information which not only affects the working of the marketing department, but has an important

impact on the functioning of other departments of the enterprise, particularly production and purchase department.

- **Assessment of Middlemen:** Marketing Research helps in knowing the reaction of the middlemen in regard to the company's marketing policies. This may lead to the discovery of the new lines of production which can be taken up along with the existing products.



### ***Check Your Progress- B***

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#### **Write True or False.**

1. MIS is the set of formalized procedures for generating, analysing, storing and distributing information to marketing decision makers on an ongoing basis.
2. Customer research includes development and testing of new products, improving the existing products and a tab on the changing customer preferences, habits, tastes, etc.
3. The purpose of sales research is to reach the target customers more effectively, efficiently and timely.
4. Marketing research reduces wasteful expenditure on production and advertisement.

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## **1.8 LIMITATION OF MARKETING RESEARCH**

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Following are the main limitations of Marketing Research:

- Inappropriate training to researchers can lead to misapprehensions of questions to be asked for data collections.
- Many business executives and researchers have ambiguity about the research problem and its objectives. They have limited experience of the notion of the decision-making process. This leads to carelessness in research and researchers are not able to do anything real.
- Marketing Research is not an exact science though it uses the techniques of science. Thus the results and conclusions drawn upon by using Marketing Research are not very accurate.
- The results of Marketing Research are very vague as Marketing Research is carried out on consumers, suppliers, intermediaries, etc. who are humans. Humans have a tendency to behave artificially when they know that they are being observed. Thus, the consumers and respondents upon whom the research is carried out behave artificially when they are aware that their attitudes, beliefs views etc., are being observed.

- Marketing Research is not a complete solution to any marketing issue as there are many dominant variables between research conclusion and market response.
- Marketing Research is not free from bias. The research conclusion cannot be verified. The reproduction of the same project on the same class of respondents may produce different research results.
- There is a less interaction between the Marketing Research department and the main research executives. The research department is in segregation. This all makes research ineffective.
- Marketing Research faces time constraints. The firms are required to maintain a balance between the requirements for having a broader perspective of customer needs and the need for quick decision making so as to have competitive advantage.
- Huge cost is involved in Marketing Research as collection and processing of data can be costly. Many firms do not have the proficiency to carry wide survey for collecting primary data and might not also be able to hire specialized market experts and research agencies to collect primary data. Thus, in that case, they go for obtaining secondary data that is cheaper to obtain.
- Marketing Research is conducted in open marketplace where numerous variables act on research settings.

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## 1.9 SUMMARY

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- Marketing Research and Market Research are often confused. ‘Market Research’ is simply research into specific market. It is a narrow concept. Whereas, ‘Marketing Research’ is a much broader concept.
- Marketing research specifies the information required to address these issues, design the method for collecting information, manages and implements the data collection process, analyse the results, and communicates the findings and their implications.
- Market research is the gathering, recording and analysis of market data to identify the present and potential customers and their motives and buying habits. It is the discovery of the capacity of the market to absorb the products of a firm.
- Marketing Research plays a very significant role in identifying the needs of customers and meeting them in a best possible way. The main task of Marketing Research is systematic gathering and analysis of information.
- Product research is associated with the conversion of customer needs into tangible product offers. This includes development and testing of new products, improving the existing products, and a tab on the changing customer preferences, habits, tastes etc.
- Sales research involves decision concerning selection of store locations, channels, territories, Salesforce motivation and compensation etc.

- Promotion research encompasses all efforts by the marketers to communicate the company's offer.
- The significance of marketing research has increased because of severe competition in the market, frequent technological changes, and the emergency of buyer's market. Marketing Research is of great value to management.



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## 1.10 GLOSSARY

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**Marketing Research:** It specifies the information required to address the issues, designs the methods for collecting information, manages and implements the data collection process, analyzes the results, and communicates the findings and their implications.

**Market Research:** Market Research is the gathering, recording and analysis of market data to identify the present and potential customers and their motives and buying habits. It is the discovery of the capacity of the market to absorb the product of a firm.

**Product Research:** It is associated with the conversion of customer needs into tangible product offer.

**Sales Research:** It involves decision concerning section of store locations, channels, territories and Salesforce motivation and compensation etc.

**Promotion Research:** It encompasses all efforts by the marketers to communicate the company's offer.



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## 1.11 ANSWERS TO CHECK YOUR PROGRESS

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### Check Your Progress –A

1. Marketing Research.
2. Market Research.
3. Market Research.
4. Scientific Research.

### Check Your Progress –B

1. True.
2. False.

3. True.
4. True.



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- C Samuel Craig, and Susan p. Douglas (2005), International Marketing Research, 3<sup>rd</sup> Edition, Wiley, Chichester, England.
- Erik Mooi and Marko Sarstedt (2011), A Concise Guide to Market Research, Springer.



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## 1.13 SUGGESTED READINGS

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1. Joseph F. Hair (2008), Marketing Research, 4<sup>th</sup> Edition, Mcgraw Hill Higher Education, International Edition.
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4. Erik Mooi and Marko Sarstedt (2011), A Concise Guide to Market Research, Springer



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## 1.14 TERMINAL QUESTIONS

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- Q1. Define Market and Marketing Research?
- Q2. Explain the role and nature of Marketing Research?
- Q3. Discuss the scope of Marketing Research?
- Q4. What is the significance of Marketing Research?

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## UNIT 2 TYPES OF MARKETING RESEARCH

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### 2.1 Introduction

### 2.2 Objectives

### 2.3 Types of Marketing Research

### 2.4 Ethics in Marketing Research

### 2.5 Difference between Marketing Research and Market Research

### 2.6 Summary

### 2.7 Glossary

### 2.8 Answer to Check Your Progress

### 2.9 Reference/ Bibliography

### 2.10 Suggested Readings

### 2.11 Terminal Questions

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## 2.1 INTRODUCTION

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Marketing Research is usually the first step in the marketing process, after ideas for products are conceived. Small companies conduct marketing research to obtain information from marketplace. They use it to solve problems, obtain information on competitors, and determine the needs and wants of non-paying consumers and customers. Marketers then analyse the data and develop various marketing strategies.

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## 2.2 OBJECTIVE

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After reading this unit you will be able to:

- Explain types of Marketing Research.
- Describe basic and applied Marketing Research
- Know the ethics involved in Marketing Research.
- Differentiate between Market Research and Marketing Research.

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## 2.3 TYPES OF MARKETING RESEARCH

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Research can be categorised wither on the basis of techniques (surveys, experiments, observation studies, *etc.*) or on the basis of purpose. On the basis on purpose, Marketing Research can be categorised into three methods:

1. **Exploratory:** It is the initial exploration done to get an idea and insight about a particular problem. Research is a relatively expensive process; exploratory research ensures that this process is not initiated without a thorough understanding of the problem. This study is qualitative (understanding the concept) rather than quantitative (providing precise measurement). Also, this type of research does not give conclusive evidence and subsequent research needs to be done.

The following purposes justify the use of exploratory research:

- a. **Diagnosing a situation:** Sometimes, companies have a situation at hand, but do not know how to define it clearly. This prohibits action to be taken. One reason for using it is to identify the exact nature of the business problem, but exploratory research is limited only to this. Successive descriptive or experimental research needs to be carried out to craft the action plan.
- b. **Screening Alternatives:** Consider a situation where there are several options, but budget restriction do not allow implementation of all of them. Exploratory research helps choose the best alternatives in this case.
- c. **Uncovering New Ideas:** Many a times, consumer do not know what they need which is especially true in case of technology. Prior to the invention of the first smart phone in the early nineties, an average person did not feel the need for it or understand how persuasive the device would become. Exploratory research is used in cases like this to induce new ideas.

A widely used method for executive exploratory research for this purpose is Concept Testing. Here, target consumers are introduced to an idea and asked how they feel about it, whether they are likely to use it, *etc.* It tests the likeability or acceptability of the new product before investing in its research and development.

2. **Descriptive:** It is used when there is some comprehensions of the problem, objectives are defined, and the research questions are clearly formulated. Contrary to exploratory research, the descriptive research is used for formulating action plans. It helps answer the questions ‘when’, ‘who’, ‘how’, and ‘where’, but not ‘why’.

Descriptive research typically gives a detailed account of the characteristics or behaviour of a population. Hence, the research work usually involves some element of consumer profiling and market segmentation.

3. **Experimental:** They demonstrate the cause and effect relationships. They try to decipher the outcome of marketing actions. For example, it is used when the purpose is to determine the impact of increase in price on usage.

This is used in succession to exploratory and descriptive research and hence sufficient knowledge is gained on the topic by then. Experimental research is also popularly known as casual research.

### ***Basic and Applied Marketing Research***

Research can either be fundamental (or basic or pure) or applied (or action) in nature. Applied research aims at finding a solution to an immediate problem facing a society or an industrial/business organization, whereas fundamental research is mainly concerned with generalization and with the formulation of a theory.

Research concerning some natural phenomenon or relating to pure mathematics is an example of fundamental research. Similarly, research studies, concerning human behaviour are also an example of fundamental research. However, research aimed at certain conclusions facing a concrete social or business problem is an example of applied research. Research to identify social, economic and political trends that may affect a particular institution, or copy research or the marketing research are examples of applied research. Thus, the central aim of applied research is to discover a solution to some pressing partial problems. Whereas, basic research is directed towards finding information that has a broad base of application and thus, adds to the already existing organized body of scientific knowledge.



### ***Check Your Progress- A***

---

#### **Fill in the blanks.**

1. .... is usually the first step in the marketing process, after the idea for product is conceived.
2. .... is the initial exploration done to get an idea and insights into the problem.
3. .... typically gives a detailed account of the characteristics or behaviour of a population.
4. .... studies demonstrate cause and effect relationships.

---

## 2.4 ETHICS IN MARKETING RESEARCH

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Several aspects of marketing research have strong ethical implication. Marketing research is generally conducted by commercial (i.e. for profit) firms that are either independent research organizations (external suppliers) or departments within corporations (internal suppliers). Most marketing research is conducted for clients representing commercial firms. The profit motive may occasionally cause researchers or clients to compromise the objectivity or professionalism associated with the marketing research process.

Marketing research has often been described as having four stakeholders:

- a) The marketing researcher,
- b) The clients,
- c) The respondents, and
- d) The public.

These stakeholders have certain responsibilities to one another and to the research projects. Ethical issues arise when the interests of these stakeholders are in conflict and when one or more of the stakeholders are lacking in their responsibilities. For example, if the researcher does not follow appropriate marketing procedure, or if the client misinterprets the findings in the company's advertising, ethical norms are violated. Ethical issues can arise at each step of the marketing research process. Ethical issues are best resolved by the stakeholders behaving honourably. Codes of conduct such as Marketing Association code of ethics, are available to guide behaviour and help resolve ethical dilemmas.

### An Overview of Ethical Issues in the Marketing and Research Process

#### 1. Problem Definition:

- a. Using survey as a guide for selling or fundraising.
- b. Personal agendas of the researcher or clients.
- c. Conducting unnecessary research.

#### 2. Developing an Approach:

- a. Using findings and models developed for specific clients or projects for other needs.
- b. Soliciting proposals to gain research expertise without pay.

#### 3. Research Design:

- a. Formulating a research design more suited to the researcher's rather than the client's needs.
- b. Using secondary data that are not applicable or have been gathered through questionable means.
- c. Disguising the purpose of research.

- d. Soliciting unfair concessions from the researchers.
- e. Not maintaining anonymity from the researcher.
- f. Disrespecting privacy of the respondents.
- g. Misleading respondents.
- h. Disguising observation of respondents.
- i. Embarrassing or putting stress on respondents.
- j. Using measurement scales of questionable reliability and validity.
- k. Designing overly long questionnaire, overly sensitive questions, piggybacking.
- l. Using inappropriate sampling procedure and sample size.

**4. Field work:**

- a. Increasing (dis)comfort level of the respondents.
- b. Following (un)acceptable fieldwork procedures.

**5. Data Preparation and Analysis:**

- a. Identifying and discarding unsatisfactory respondents.
- b. Using statistical techniques when the underlying assumptions are violated.
- c. Interpreting the results and making incorrect conclusions and recommendations.

**6. Report Preparation and Presentations:**

- a. Incomplete reporting.
- b. Biased reporting.
- c. Inaccurate reporting.

Marketing research experience resurgence with the widespread use of the Internet and the popularity of social networking. It is easier than ever before for companies to connect directly with customers and collect individual information that goes into a computer database to be matched with other pieces of data collected during unrelated transactions. The way a company conduct its market research these days can have serious ethical repercussions, impacting the lives of consumers in ways that have yet to be fully understood. Further, companies can be faced with a public backlash if their market research practices are perceived as unethical.

i. ***Deceptive Practices:***

The ease with which a company can access and gather data about its customers can lead to deceptive practices and dishonesty in the company's research methods. This type of ethical problem can run the gamut- from not telling customer that information is being collected when they visit a website to misrepresenting research results by

changing database numbers. Any action that use lies and deception to find out or establish information about customers, falls under this category.

ii. ***Invasion of Privacy:***

One of the most ethical consideration involved in marketing research is invasion of privacy. Companies have an unprecedented ability to collect, store and match information relating to customers that can infringe on a person's right to privacy. In many instances, the customer does not know or understand the extent of the company's infiltration into his life. The company uses this information to reach the customer with targeted advertising, but the process of targeting can have a chilling effect in personal freedom.

iii. ***Breach of Confidentiality:***

Companies regularly share information about customers with partners and affiliates, requiring the customers to opt-out of the sharing if he doesn't want to be involved. Some companies sell information they have gathered on customers to outside companies. Ethically, any unauthorized disclosure of customer information is problematic.

iv. ***Objectivity:***

Marketing and advertising have a significant impact on public perception. Market research have an ethical obligation to conduct research objectively, so that available data allows for the development of a balanced or reality-based picture. Researcher who allows their own prejudices to skew their work tend to contribute to the perpetuation of stereotypes in advertising, the development of destructive social constructs and the enabling of unjust profiting from poverty. For example, a market researcher with a one-dimensional view of minorities could do a fair amount of harm if allowed to shape an advertising campaign based on skewed data collection.

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## 2.5 DIFFERENCE BETWEEN MARKETING RESEARCH AND MARKET RESEARCH

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Most of the times these terms are often used as interchangeably, but technically there is a difference between them. The nature of marketing research cannot be understood properly without knowing the meaning of market research. Market research is the gathering, recording and analysing of market data to identify the present and potential customers and their motives and buying habits. It is the discovery of the capacity of the markets to absorb the products of firms. It is a part of marketing research.

Difference between Market Research and Marketing Research:

Basis	Market Research	Marketing Research
Branch of	Marketing Research	Marketing Information

		System
Scope	Limited	Wide
Nature	Specific	Generic
Meaning	A study undertaken to collect information about the market statistics, is known as market research.	Marketing research is the systematic and objective study, analysis and interpretation of problem related to marketing activities.
Involvement	Research of marketplace and the buyer's behaviour within that market.	Research of all the aspects of marketing.
Dependency	Dependent	Independent
Purpose	To check the viability of the product in the target market.	To make effective decisions regarding marketing activities and to keep control on the marketing of economic output.



### *Check Your Progress- B*

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#### **Write True or False.**

1. Marketing Research has experienced resurgences with the widespread use of the Internet and the popularity of social networking.
2. Marketing and Advertising have a significant impact on public perceptions.
3. Marketing research is a part of the market research.
4. Market research is restricted to the study of actual and potential buyers, their locations, their actual and potential values of purchases and their motives and habits.

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## 2.6 SUMMARY

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- Research can be categorised on the basis of techniques (survey, experiments, observations studies *etc.*) or on the basis of purpose.
- Exploratory research is the initial exploration done to get an idea and insight into the problem.
- Descriptive research typically gives a detailed account of the characteristics or behaviour of a population. Hence the research work usually involves some elements of consumer profiling and market segmentation.
- Experimental studies demonstrate cause and effect relationships. They try to decipher the outcome marketing actions might have. For example, it is used when the purpose is to determine the impact of increase in price on usage.
- The central aim of applied research is to discover a solution to some pressing practical problems. Whereas basic research is directed towards finding information that has a broad base of application and thus, adds to the already existing organized body of scientific knowledge.
- The way a company conducts its market research these days can have serious ethical repercussions, impacting the lives of consumers in ways that have yet to be fully understood.
- One of the most serious ethical considerations involved in market research is invasion of privacy. Companies have an unprecedented ability to collect, store and match information relating to customers that can infringe on a person's right to privacy.
- Market research is the gathering, recording and analysis of market data to identify the present and potential customers and their motives and buying habits. It is the discovery of the capacity of the market to absorb the products of a firm. It is a part of marketing research.



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## 2.7 GLOSSARY

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**Exploratory Research:** It is the initial exploration done to get an idea and insight about a problem.

**Descriptive Research:** It gives a detailed account of the characteristics of behaviour of a population. Hence, the research work usually involves some element of consumer profiling and market segmentation.

**Experimental Studies:** They demonstrate cause and effect relationship. They try to decipher the outcome of marketing actions.

**Market Research:** It is the gathering, recording and analysis of market data to identify the present and potential customers and their motives and buying habits. It is

the discovery of the capacity of the market to absorb the products of a firm. It is a part of marketing research.



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## 2.8 ANSWERS TO CHECK YOUR PROGRESS

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### Check Your Progress –A

1. Marketing Research.
2. Exploratory Research.
3. Descriptive Research.
4. Experimental.

### Check Your Progress –B

1. True.
2. True.
3. False.
4. True.



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## 2.9 REFERENCES/ BIBLIOGRAPHY

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- C Samuel Craig, and Susan p. Douglas (2005), International Marketing Research, 3<sup>rd</sup> Edition, Wiley, Chichester, England.
- Erik Mooi and Marko Sarstedt (2011), A Concise Guide to Market Research, Springer.



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## 2.10 SUGGESTED READINGS

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1. Joseph F. Hair (2008), Marketing Research, 4<sup>th</sup> Edition, Mcgraw Hill Higher Education, International Edition.
2. Paul Baines and Bal Chansarkar (2002), Introducing Marketing Research, Wiley, New York.
3. C Samuel Craig, and Susan p. Douglas (2005), International Marketing Research, 3<sup>rd</sup> Edition, Wiley, Chichester, England.
4. Erik Mooi and Marko Sarstedt (2011), A Concise Guide to Market Research, Springer



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## 2.11 TERMINAL QUESTIONS

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- Q1. What are the different types of marketing research and their application?
- Q2. Discuss the purpose of conducting exploratory research.
- Q3. Write a note on basic and applied marketing research.
- Q4. Discuss the need of ethics in marketing research.
- Q5. What are the key differences between marketing research and market research?

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## **UNIT 3 MARKETING RESEARCH INDUSTRY IN INDIA**

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- 3.1 Introduction**
- 3.2 Objectives**
- 3.3 Current Status of Marketing Research**
- 3.4 Factors for Growth of Marketing Research**
- 3.5 Global and Indian Marketing Research Industry**
- 3.6 Indian Marketing Research Agencies**
- 3.7 Skills for an Evolving Industry**
- 3.8 Ethics in Marketing Research**
- 3.9 Summary**
- 3.10 Glossary**
- 3.11 Answer to Check Your Progress**
- 3.12 Reference/ Bibliography**
- 3.13 Suggested Readings**
- 3.14 Terminal & Model Questions**

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### **3.1 INTRODUCTION**

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We have already studied the objectives, scope and process of marketing research in our earlier units. So now you know that marketing research is crucial for the successful marketing planning and to compete in the market. We have understood that the companies that match their strategies to the current environmental factors achieve success. The companies which anticipate consumers' tastes, preferences, and wants emerge as the market leaders.

Akin to global markets, Indian market is also evolving at a rapid pace and it has become imperative for both Indian and Multi-national companies to use their resources effectively to capture consumers in this market. Thus, in this unit you will study about the current marketing research scenario in India, the challenges and opportunities for research firms, the type of research firms operating here and the leading marketing research agencies in the Indian market.

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## 3.2 OBJECTIVES

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This unit will help you to:

- Understand the current scenario for marketing research in India.
- Explain the reasons for the growing marketing research spend.
- Explore the market research agencies in India.
- Know about the types of market research firms operating in market.
- Identify the challenges and opportunities for marketing research industry

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## 3.3 CURRENT STATUS OF MARKETING RESEARCH

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The marketing research in India is comparatively a two decade old phenomenon as compared to the global markets. The marketers had no or a very limited focus on the likes, dislikes and desires of their potential customers. The Indian market was not much competitive couple of decades back and thus sales were assured as consumers don't have much choices to make. Thus marketing research didn't appear in the agenda of most of the firms. However, growing globalisation and privatisation changed the rules of the game and marketers could realise the need to understand the consumers and their demand pattern. Marketing research enables economic and business development and help to generate profit for the country. The research process helps in gaining insight about the different verticals of marketing such as: product design, development, pricing, distribution, promotion of product and services. To achieve marketing goals it is essential to conduct research.

The current developments in the Indian market have made the market more competitive and the sole determinant of success here is to serve happiness to the customers. The present scenario witnesses unsuccessful product launches, faulty positioning of products, unsuitable distribution system, improper pricing in the absence of appropriate marketing research and marketing planning. Thus Indian corporate planners have now understood the relevance of data based marketing decision making instead of following their guts and intuition alone. Hence, in the process of developing an edge over the competition in current dynamic market conditions, any marketer finds it crucial to develop marketing programmes grounded on proper marketing research.

The opportunities and challenges defining marketing research scenario in India:

Changing aspects of market: At present there are multitude of factors that drive market research in India. You should understand that the market today is an evolving like never before, driven by variety of factors. The factors such as role of social media, diversified markets, need to have customized options and so on have changed the market arena. Marketing research has got much specialized now, it includes developing product prototypes, finding the right retail mix, carrying out well planned audits, creating brand image, concept development and much more. These various factors have meant a rapid rise in market research in India. Indian firms are now at par with the best of international firms. A good

number of marketing research agencies from India are capable of handling research assignments of global companies.

The marketing research agencies come across numerous challenges with the unforeseen changes in social, technological, and economic environment in which business operates. For example due to growth of internet and information technology, the marketing professionals have realized the importance of reaching their target market through social media. And at the same time they need to create brand awareness about their brands across different channels and this calls for marketing research at different channel levels.

The other major challenges in the way of marketing research agencies in the present time are:

**New marketing trends:** A large number of new trends and technologies are evolving in the field of marketing research. The research agencies need to adapt themselves to the changing technologies and trends to meet the research requirements of their clients. As we discussed the role of internet and IT in marketing, a good number of the marketers are relying upon the use of content marketing across the social media channels not only to build their brands but also as a medium to record consumer insights. Marketing research agencies can play an important role by enabling the brand to rise above the competition on these social channels and give it the ability to be heard among the clutter. This is possible if the agencies are equipped with the latest tools and techniques to understand and develop consumer profiles which are comprehensive and also provide the marketers with the deep insights regarding the consumer preferences with respect to the content relevant to them.

A few marketing research agencies can gain and sustain a competitive edge by developing new abilities and techniques of performing research work within the given timelines and budgets. One such technique, Application Programming Interface (API) enables direct communication between research agency systems and its several vendor platforms. Thus, this integration helps the agency to streamline the process of developing research panels and to obtain consumer insights from its target market for future content.

**Increased competition in the marketing research industry:** Marketing research industry has become competitive like never before. There is an abundant growth in the number of smaller agencies which are known for their innovative and creative practices. These small and innovative agencies are capable of providing consumer insights and consultation to the marketing companies' at the most competitive prices possible. The reduced costs and radical technology and tools used by these non-traditional agencies has given a tough competition to the industry leaders of past. The relevance of using similar techniques with respect to survey of respondents is integral to the research agencies to remain competitive in the market. The ability to design careful survey and to add real value in terms of offering engaging content is critical for the marketing research agencies.

We have witnessed in the growth of a large number of online panel communities with the innovations in survey and panel management. These communities need to screen for their quality and reliability of results as they are not created through a rigorous screening procedures. The research agencies which are new to the area of marketing research may be

unaware of the range of research tools and sampling methods. This lack of awareness may cost to the researcher in terms of inadequate panelists selection.

The limitation on the part of these new agencies provide an edge to the established marketing research agencies to create distinction in terms of reliability and trustworthiness of their research results and in building strong relationships with the clients. Let us consider an example of an established agency which has been working with FMCG brand for a decade, it will not only capable of providing proper consumer panels, it will also know the ways and channels to reach for any additional respondent as and when required.

The final process is to create the link between the consumer panels, marketers' brands, and marketing research firms in order to collect data and information, test quality of data collected, and to streamline same. The new breed of agencies which have entered the marketing research space can also be benefited by collaborating with the established agencies and this collaboration will ultimately be beneficial for the clients.

Targeting strategies: Marketing research project starts with the identification of target audience to be reached and finding out the ways to reach them effectively. The availability of multiple channels has reduced the attention span of the consumers. The growth of multiple channels have made the marketing research agencies to realize that how their clients can be benefited if they use a multi-channel approach to reach their target respondents.

There are technologies available in the market which enables a marketing research firms to measure and record the consumer responses in terms of their gesture or facial expressions; movement of eye-ball with the help of eye-tracking software. These technologies offer accurate consumer insights to the researcher regarding the consumer responses towards a campaign or even at the point of purchase while buying a product or service.

With the continuous growth of marketing research industry due to innovative technologies, the quality of online panel communities is very important for the marketing research agencies to use to gain meaningful consumer insights. Further, marketing researchers can ensure that they are leading the game in managing successful research campaigns for their clients provided they are: effective in audience targeting, moving towards collaboration from competition and capable of adopting latest marketing trends.

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### **3.4 FACTORS FOR GROWTH OF MARKETING RESEARCH**

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Globalisation is the major force behind the sudden rise of marketing research in India. The entry of international and global firms in the Indian market made the domestic companies to

realise their limitations in terms of product and marketing development. These global firms has the advantage of huge R&D departments. They were arriving from intensely competitive markets, where only the marketer who was fit and prepared can survive. Their products mostly offered superior value and their marketing approach was aggressive. Actually, you should know that it was because of the need of these companies' to gain local knowledge which resulted in the growth of marketing research consulting in India. The domestic players from the Indian market were also not far behind. Hence, there was a thriving force in marketing research with new players emerging over the years. At present you can say that marketing research area is much organized, highly professional and fiercely competitive. The reasons for rise of marketing research could be summarized as:

- Intense competition: Competitive intensity has increased like never before. The times when the consumers were willing to wait for long for getting a product delivered, or they have only limited choices available or too high prices were charged for poor quality products have gone a long back. The growing consumer demands and competitive intensity has brought the marketers on their feet and so is the reason for growth of marketing research.
- Consumer preferences and tastes: The marketers are serving to consumers who represent a heterogeneous mass in terms of preferences, tastes, needs and requirements. It is very important for the marketers to make effort to know and understand their consumers to be relevant to them.
- Socio-economic evolution of the consumers: The socio-cultural changes such as working women, nuclear families, rise in middle income group customers, growing education level has brought radical changes in the consumer behavior. The consumer goods producer need to understand this evolved consumer behavior to be successful.
- The availability of new communication channels both in terms of traditional and digital have open the doors for new possibilities to reach and advertise to the consumers.
- More discretionary income: The present day consumer is in a fix at one hand he/ she is having access to more discretionary income and at the same time what matters to him/ her is the value he gets against the money he spends.
- Liberalised economy: The introduction of Industrial Policy, 1991 has made the economy more liberal and global which has resulted in the growth of organizations manufacturing and providing services to the consumers.
- The marketers and companies have both a large number and a variety of challenges to tackle on an everyday basis.

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## **3.5 GLOBAL AND INDIAN MARKETING RESEARCH INDUSTRY**

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Growth of sectors like Telecom, Insurance, Digital Media, Automobile, Service etc. has generated immense potential for marketing research industry both domestically in India and globally. The players in the industry look for the ways to know their consumer insights and to meet their needs. The marketing research industry is divided into two broad categories:

Full service research agencies which offer entire range of marketing research functions; and Knowledge Process Outsourcing (KPO) services which offer analysis and reporting.

In last few years, this industry has experienced a consolidation among the agencies in terms of their scale of operations and data analysis services. Most of the MNC based research agencies consider India as the most favourable market both in terms of its population size and an opportunity to tap the untapped potential.

In past, marketing research team was restricted only to be a part of an advertising agencies, gradually from there it started making sense for the companies dealing in consumer durables and FMCG and by now marketing research has made its relevance felt in each and every sector of the industry. And this is the reason, why this industry has witnessed strong growth over the number of years.

The global turnover for marketing research industry is reaching new heights with every passing year. Europe enjoys the largest share of the market, followed by North America, Asia Pacific, Central and Latin America, and the Middle East and S Africa. The fact that Europe nearly has huge global marketing research turnover is because of: the fierce competition in various sectors, and the cultural diversity among European countries. This compels the companies interested in the European market to conduct marketing research in order to have an accurate and comprehensive understanding of the competition they face and the consumers they target.

Some of the leading marketing research companies operating in the global market are: TNS, Ipsos MORI, Gfk (including NOP), Information Resources, Lumina, ORC International, Flamingo International, Lorien Research, Marketing Sciences, Quaestor, ESA Market Research, Nunwood, BDRC Group, RONIN Corporation, Conquest Research, RDSi (including Field Initiatives), Mruk, Accent, Maven Management and Perspective.

### **3.5.1 MARKET RESEARCH FIRMS**

There are different types of research firms which offer research and consulting services. These marketing research firms can be classified based on their source of origin, the type of research services offered by them and in terms of their operations and scope.

**Classification based on source of origin:**

*Internal research providers:* These are usually part of the organizations and they reside within a company. There are number of benefits which are provided by an internal marketing research, these benefits are: consistency in research method used, easy sharing of information across the departments, reduced research spending, and it provides more specific and actionable research output relevant to the problem faced by the organization.

*External research firms:* The companies who are not big enough often take help of external marketing research agencies or firms. External research firms are those who conduct the total research process for a client against a pre-agree amount. They perform all the research activities such as designing the research plan and study, questionnaire design, data collection, and data analysis and finally they prepare and submit the report to client. The clients looking forward to hire an external agency calls for research proposals from different agencies and evaluate them in terms of their services and fees charged by them.

The advantage of using external research firms are:

Firstly, being an external party these firms are more objective in their approach and their objectivity is not affected by the internal politics of an organization.

Secondly, being an expert in their area, the external agencies can provide better talent for the same cost as compared to the in house department.

And finally, the marketers are free to choose different agencies on a study by study basis, this offers them more flexibility both in terms of scheduling these research studies and in terms of expertise required to complete a specific research project.

**Classification based on type of services offered:** Marketing research firms also can be considered customized or standardized.

*Customized research firms:* As the name suggests these firms are known for providing specific tailor made services to their clients. The customized research firms often operate in a limited area. They conduct researches pertaining to the areas such as testing brand name, test marketing, new product development, price-promotion testing studies etc.

**Examples of customized research firms:**

Name stormers assists companies in brand name selection and recognition, Survey Sampling International concentrates on sampling development for client companies, and Uni-score conducts studies designed around retail scanning data. Television.

*Standardized research firms:* Unlike customized research firms they are known for providing more generic solutions to the firms in the industry. These research firms make use of standardized research designs to conduct marketing research and the results obtained thereafter can be used for variety of purposes. The use of standardized/ common research designs results in savings for these firms in terms of time and costs. These research firms can extend the generic results of a study conducted for one client to meet the requirements of other clients as well. A large number of standardized research firms are known for offering syndicated business services. These kind of services include advertising recall data, data collected regarding consumer purchases from diary panels and store audits etc.

**Examples of standardized research firms:**

Advertising recall studies: Burke Market Research

Store audits for retail firms: AC Nielsen (separate from Nielsen Media)

Primary data collection regarding commercial: Arbitron Ratings

Leading research agency, AC Nielsen has created a database with the help of optical scanner method. This database operates through the Scantrack system and it provides volumes of data for a large number of grocery brands by tracking the sales of these brands/ products at retail counter. The agency can further customize this data to serve the research need of several industries such as confectionery, beverage, etc. This database will provide information regarding volume sales by channel, region or period of time in a given industry. The box given below illustrates further the Scantrack system and an example of results that it produces.

### Scantrack: Scanning and Tracking UK Grocery Brands

Scantrack uses the retail optical scanner method to monitor weekly sales from a nationwide network of EPoS checkout scanners. Coverage includes grocery multiples, co-ops, multiple off-licences, independents, symbol groups and multiple forecourts, who will be sent back the Scantrack data for their category planning and marketing strategy purposes. Scantrack accounts for more than 80% of every £1 spent in UK grocery with full scanning inputs. Therefore, the information of the top 100 UK grocery brands (the following lists the top 30) compiled from the store audit data by Scantrack can be regarded as highly reliable.

Top 30 Grocery Brands in the UK		
Brand	2006 Sales (£'000)	Year on Year Change
1. Coca Cola	942,391	5.0
2. Warburtons	514,341	17.7
3. Walkers	424,002	4.0
4. Hovis	403,126	16.1
5. Cadbury Dairy Milk	361,503	-2.5
6. Nescafe	331,265	-0.8
7. Andrex	326,646	5.2
8. Lucozade	296,216	16.5
9. Kingsmill	282,318	-4.9
10. Robinsons	277,285	4.6
11. Tropicana	222,471	27.4
12. Persil Laundry	217,010	-0.4
13. Pepsi	216,343	-4.8
14. Whiskas	216,126	9.8
15. Pedigree	191,990	2.5
16. Flora Spreads	185,237	3.4
17. Müller Corner	183,161	3.0
18. McCann Frozen Chips	182,249	7.3
19. Lurpak Spreads	175,838	6.8
20. Heinz Baked Beans	175,222	3.3
21. Ariel	174,211	-5.9
22. Bernard Matthews Cooked Meat	173,598	-6.5
23. Wrigley's Extra	169,397	2.0
24. Bold	166,915	10.2
25. Felix	161,476	-5.3
26. Galaxy	159,157	11.7
27. Birds Eye Frozen Fish	158,755	14.1
28. Heinz Soups	156,535	-2.4
29. Ribena	153,046	0.3
30. Volvic	148,214	13.1

Source: Adapted with permission from Nielsen, which owns Scantrack.

### Exhibit 3.1 Scantrack: Scanning and Tracking UK Grocery Brands

### Classification based on operations and scope:

*Brokers:* These are the firms that which support the ancillary tasks that complement many marketing research studies. For example, marketing research suppliers and clients who do not have the resources for data entry, tabulation, or analysis will typically use a broker service to facilitate the data management process. Brokers usually offer specialized programming, canned statistical packages, and other data management tools at low cost.

*Facilitators:* These firms provide marketing research functions as a supplement to a broader marketing research project. Advertising agencies, field service providers and independent consultants are usually classified as facilitators because they help companies' complete broader marketing projects.

*Advertising agencies:* The firms in the business of designing, implementing, and evaluating advertising campaigns for individual clients. Many agencies use their own research services to guide the development of the campaign and test for effectiveness. In this instance, the advertising agency provides marketing research to facilitate the advertising campaign process.

*Field service providers:* The primary responsibilities of field service providers are to schedule, supervise, and complete a field work study by executing chosen methods such as focus groups, depth interviews and questionnaire survey. In essence, they perform primary data collection services required for a specific marketing research project.

*Independent consultants:* These are usually hired ad hoc by client companies to complement strategic planning activities for clients. Many consultants, offering unique and specialized research skills, are assigned the tasks to facilitate a total quality management programme, develop a marketing information system, or train employees in the procedures of marketing research.



#### *Check Your Progress- A*

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#### **Q1. What is the present scenario of Marketing Research in India?**

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**Q2. What are the different types of marketing research firms available in the market?**

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**Q3. True or False**

- i. Customized research firms provide specialized, highly tailored services to the client.
- ii. The marketing research is growing as consumers, by and large, are found to have limited discretionary income.

**Q4. Fill in the Blanks**

- i. \_\_\_\_\_ perform primary data collection services required for a specific marketing research project.
- ii. Research firms which offer syndicated business services, such as store audits, consumer purchase diary, data on advertising recall etc. are known as \_\_\_\_\_.

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### **3.6 INDIAN MARKETING RESEARCH AGENCIES**

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Marketing research as a function has evolved in a major way in terms of using technology for data collection like machine based methods to observe and record interviews, online survey and mobile phones against the paper based questionnaires. It has become more generic and its ability to create distinctive value for the end consumer is limited. Most of the research projects are focussed on the urban cities and very narrow focus is made on the rural India where the next big opportunities for the companies exist. Majority of the marketing research projects conducted today are mechanical in nature instead of being problem specific. The industry is also facing the challenge of having adequate quality and quantity of skilled researchers. Marketing research industry in India is fragmented on the basis of cost rather in terms of the differentiation in service offered by the firms. Thus, this has resulted in the growth of research firms which operates on an assignment basis such as data collection or analysis alone.

At the same time, Indian and international market is having a series of research and consulting agencies which are capable of not only providing in-depth consumer understanding and research reports but also provide consulting to the clients in improving their profitability. One of the leading marketing research agency in India is IMRB International. The names of some of the other popular marketing research agencies operating in the Indian market are Delphi Research services, ORG-MARG, MART, Nielson India,

MRUC and TNS. All the major areas of marketing such as B2B and industrial marketing research, media research, consumer research, social research, brand research, distribution channel and retail research, product packaging and designing research, and pricing research etc. are covered by the marketing research agencies.

The growth of smaller firms in this industry has made the clients' price sensitive and a large number of established agencies find it difficult to strike a balance between talent and price. The large agencies like Nielsen, TNS, Synovate have started their training centres to develop the research skillset among the freshly graduated college students. This will provide them with a pool of talent resources to conduct meaningful and differentiated research.

The growth of technology has led to the emergence of different agencies like Absolute data systems, Datamation etc. in the area of data warehousing, data analytics and data mining. In the beginning these agencies were operating as the backend service providers i.e. knowledge process outsourcing supplier for global clients but now they have penetrated in the domestic market to cater the local demand. The market has not just become competitive with the data firms, rather the computer giants such as IBM and HP are also operating in this market with their decision analytics arms known as HP Decision Analytics and IBM Business Decision Centre. Apart from this the global consultancy giant McKinsey has also started offering research based services to its parent companies under its strategic research division. Other IT and consulting giants like Microsoft, Oracle, PWC, KPMG, Delloitte have also joined the league by offering research support to their clients and partners in strategic group. They offer complete end to end solution consisting of market insights to the final conceptualization of idea's to product designing to their clients. The entry of these new players have made it much more difficult for the full service research firms to operate in this market.

As discussed in the above section that not all the organization depend upon their internal research team, they have no option but to look for an external marketing research agency. In fact even if the company has a well-established marketing research department still it may find it relevant to hire an external agency for getting quick and detailed results at an economical cost. If you decide to hire an external agency, there are number of considerations to be made.

**Considerations for hiring External Agencies:** There are multiple dimensions which an organization has to consider while hiring an external agency to deliver a marketing research project. These considerations may be enumerated as below:

1. *Technical Expertise:* The technical ability and proficiency of the research team in conducting the research should be verified before making the selection. Some of the external agencies are good in handling simple basic studies but they cannot deliver result for complex research problems. Further, some of the agencies don't provide report as per the deadline as they may have shortage of field and office staff.

2. *Objectivity:* We hire external agency to obtain objective and accurate results. It must be checked that the external agency is having the reputation of handling the research project in an objective manner without bias.

3. *Confidentiality*: Think of a situation when you are hiring an external agency to conduct marketing research for a new product launch, the most important criteria of choosing an agency will be its ability to maintain confidentiality. In other marketing research studies also the confidentiality is a very crucial factor.

4. *Economic Factors*: The ability to provide research in an economic manner is also important for agency selection. At times the research agencies feel that it is the client money and they become wasteful in their efforts thus you should consider the fact that some agencies are very effective and they provide quality at an economical cost.

5. *Timely submission of reports*: The ability of an external agency in meeting the deadlines and completing the report in stipulated time is a very important factor to be considered while selecting an external agency. You need to collect the feedback and review about the agency past performance from its previous clients. Often external agencies are quick in taking up assignments from clients but when it comes to delivery of result they show a laid back attitude.

6. *Supplier Experience*: The experience of the agency in conducting similar nature of research projects and its reputation and standing in the market must be evaluated while hiring.

7. *Reputation of the agency*: Overall reputation of the agency in terms of cost, timelines, research expertise, confidentiality should be considered while hiring it. A good external research agency also extends its reputation to the research credibility

As we know that not a particular research agency is likely to rank number one on all these considerations, thus it is very crucial for the marketer to develop an evaluation criteria based on which agency selection should take place.

Rank	Company	Headquarters	Parent Country
1	The Nielsen Company	Haarlem, New York, NY	USA
2	IMS Health Inc.	Norwalk, CT	USA
3	Taylor Nelson Sofres Plc.	London	UK
4	GfK AG	Nuremberg	Germany
5	The Kantar Group	Fairfield, CT, London	UK
6	Ipsos Group S.A.	Paris	France
7	Synovate	Chicago	USA
8	Information Resources Inc.	London	UK
9	Westat Inc.	Rockville, MD	USA
10	Arbitron Inc.	New York, NY	USA
11	INTAGE Inc.	Tokyo	Japan
12	J.D. Power and Associates	Fenton, NJ, Westlake Village, CA	USA
13	Harris Interactive Inc.	Westlake Village, CA, Rochester, NY	USA
14	Maritz Research	Rochester, NY, Fenton, NJ	USA
15	The NPD Group Inc.	Omaha, Nebraska, Port Washington, NY	USA
16	Opinion Research/Guideline Corp.	Tokyo, Princeton, NJ	USA
17	Video Research Ltd.	Tokyo, Port Washington, NY	Japan
18	IBOPE Group	São Paulo	Brazil
19	Lieberman Research Worldwide	Los Angeles, CA	USA
20	comScore Inc.	Reston, VA	USA
21	Cello Research & Consulting	London	UK
22	Market Strategies International	Los Angeles, CA	USA
23	BVA Group.	Paris	France
24	OTX	Los Angeles, CA	USA
25	Dentsu Research Inc.	Tokyo	Japan

**Exhibit 3.2 Top 25 Global Marketing Research Agencies**

### 3.7 SKILLS FOR AN EVOLVING INDUSTRY

After reading this unit so far, you should have understood that it is very difficult for a marketing research team member to operate in the market which is diversified in terms of consumer personalities, needs, technology and culture. Thus, any marketing research company which looks forward to expand its services from one part of the world such as UK or Europe will need to change its requirement and execution for better results. However, the fundamental skills required to conduct the research may remain same but the researcher should be acquainted with the diverse skillset to cope up the need of new and unique research circumstances.

As per a survey conducted for 100 marketing research companies, the fundamental business skills essential for a marketing research are: verbal and written communication, his/ her

ability to work with others commonly known as interpersonal skills and ability to analyse i.e. statistical skills.

As per this survey, the most crucial skills solicited by a marketing research company while hiring an individual are:

1. The ability to understand and interpret secondary data
2. Presentation skills
3. Foreign language competency
4. Negotiation skills, and
5. Computer proficiency

This survey also reveals that now the companies look for the execution skills of a candidate over his analytical skills.

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### **3.8 ETHICS IN MARKETING RESEARCH**

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The marketing research process can come across variety of opportunities for both ethical and unethical behaviours. There are three key groups which are responsible for ethical dilemmas in marketing research: the research provider (e.g. researcher, research organization, or its representatives); the research user (e.g. client company, decision maker); and the respondents (e.g. subjects under investigation).

*Unethical Activities by the Research User:* The practices and decisions of the research users present opportunities for unethical behaviour. One of the common unethical practice which is observed in the market is that, a company will solicit several research proposal for different firms, however, it will not select any and will use the methods suggested by different firms in their proposals on its own. At times, this practice can go to an extent where these companies may even call for the first drafts of research instruments such as interview guide or questionnaires, data collection process from several competing research firms. They use this information unethically either to conduct research on their own or to negotiate prices with the research firms. Sometimes these companies also lure research firms by promising them long-term future deals which never happen to negotiate hard on the prices.

#### *Unethical Activities by the Research Provider*

While there might be numerous opportunities for the researcher provider (the researcher, the research organization, or its representatives) to act unethically in the process of conducting a study, there are different sources of unethical activities that can originate within the research organization. A policy of unethical pricing practices is a common source of conflict. In some

cases, research providers may hide other relevant research cost items such as respondents' incentives, travelling expenses etc. in the research quotation to win the project.

### *Unethical Activities by the Respondent*

Most common unethical practice often conducted by the respondents is not being genuine in their responses. The respondents provide wrong answers and at times they even fake behaviour. The research usually expect that the respondent has consented to participate in the process thus, they will provide truthful responses, but truthfulness might be more difficult to achieve than one thinks. Some procedures are available to researchers to help evaluate the honesty of respondents' answers or actions. For example, bipolar questioning is used as a consistency check in surveys. Here the first question is framed in a positive way and the second question is framed in a negative way. The respondent's answers, if consistent, would be inversely related.



### ***Check Your Progress- B***

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**Q1. What are the factors to be considered while hiring an outside marketing research agency?**

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**Q2. Discuss the changing skill set in marketing research industry.**

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**Q3. Compare and contrast between the unethical activities by a research provider and research user.**

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 -----  
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**Q4. True or False**

- i. Presentation skills are not relevant for a marketing researcher.
- ii. Truthfulness of the respondents is one of the expectations during research process.

**Q5. Fill in the blanks**

- i. \_\_\_\_\_ questioning is used as a consistency check in surveys.
- ii. \_\_\_\_\_, data mining or warehousing are the new set of players in industry.
- iii. The three group of players involve in marketing research are research user, research provider and \_\_\_\_\_.

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## 3.9 SUMMARY

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This unit throws light on the changing scenario of marketing research industry in India. The different challenges like intense competition, changing consumer preferences, liberalized economy, and growing discretionary income are discussed in this unit.

The different types of marketing research firms are: internal, external, customized, standardized and they can work as brokers or facilitators.

The unit also covers the different kind of marketing research agencies operating in India and abroad. The criteria for hiring an outside agency are: technical expertise, objectivity, confidentiality, economic factors, timely submission of reports, and experience of the supplier and reputation of the agency.

The various skills essential for a marketing research are: verbal and written communication, his/ her ability to work with others commonly known as interpersonal skills and ability to analyse i.e. statistical skills.

The unethical activities done by the research user, research provider and respondents are explained.




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## 3.10 GLOSSARY

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**Customized research firms** provide specialized, highly tailored services to the client.

**Standardized research firms** also provide syndicated business services, which include audits, purchase diary panels, and advertising recall data made or developed from a common data pool or database.

**Brokers** Businesses that provide ancillary tasks to complement a specific marketing research study.

**Facilitators** Businesses that perform marketing research functions as a supplement to a broader marketing research project.

**Advertising agencies** Businesses that design, implement and evaluate advertising campaigns for individual clients; many of them use their own marketing research services to accomplish the advertising tasks assigned by clients.

**Field service providers** Businesses that schedule, supervise and complete field work studies assigned by individual clients.

**Independent consultants** Businesses that are usually hired ad hoc by client companies to complement strategy planning activities for their clients.



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## 3.11 ANSWERS TO CHECK YOUR PROGRESS

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### Check Your Progress –A

Q3. True or False

- i. True
- ii. False

Q4. Fill in the Blanks with appropriate word or words.

- i. developed from a common data pool or database.

### Check Your Progress –B

Q4. True or False

- i. False
- ii. True

Q5. Fill in the blanks

- i. Bi-polar questioning is used as a consistency check in surveys.
- ii. Analytics, data mining or warehousing are the new set of players in industry.
- iii. The three group of players involve in marketing research are research user, research provider and respondents.




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### 3.12 REFERENCES

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4. Philip Kotler , Marketing Management, 2008.



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## 3.14 TERMINAL QUESTIONS

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- Q1. What are the various types of marketing research firms? How are they different from one another?
- Q2. Enlist the popular marketing research agencies operating in India.
- Q3. What are the advantages and disadvantages for companies maintaining an internal marketing research department? What advantages and disadvantages can be attributed to the hiring of an external marketing research supplier?
- Q4. As the marketing research industry expands in the new century, what skills will future executives need to possess? How do these skills differ from those currently needed to function successfully in the marketing research field?
- Q5. Identify and explain four potential unethical practices within the marketing research process and their contribution to 'deceptive research results.'

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## **UNIT 4 MARKETING RESEARCH PROCESS**

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### **4.1 Introduction**

### **4.2 Objectives**

### **4.3 Problem Definition**

### **4.4 Research Objectives**

### **4.5 Research Design**

### **4.6 Sources of Data**

### **4.7 Data Collection**

### **4.8 Data Analysis**

### **4.9 Report and Presentation**

### **4.10 Summary**

### **4.11 Glossary**

### **4.12 Answer to Check Your Progress**

### **4.13 Reference/ Bibliography**

### **4.14 Suggested Readings**

### **4.15 Terminal Questions**

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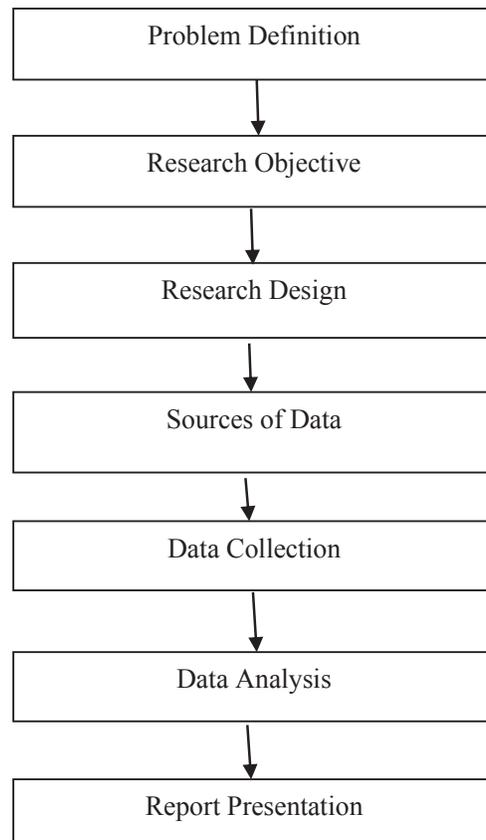
## **4.1 INTRODUCTION**

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Marketing Research is a key to the evolution of successful marketing strategies and programmes. It is an important tool to study the buyer's behaviour, change in consumer's lifestyle, and consumption patterns, brand loyalty, and forecast market changes. Research is also used to study competition and analyse the competitor product's positioning and how to gain competitive advantages. Recently, marketing research is being used to help create and enhance brand equity.

According to Philip Kotler, Marketing Research is a systematic problem analysis, model building and fact finding for the purposes of important decision making and control in the marketing of goods and services.

The marketing research process is a seven-stage process. The various stages in this process are:



**Fig 3.1: Process of Marketing Research**

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## 4.2 OBJECTIVES

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After reading this unit you will be able to:

- Describe the key elements of marketing research process.

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## 4.3 PROBLEM DEFINITION

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The decision problem faced by management must be translated into a market research problem in the form of questions that define the information that is required to make the decision and how this information can be obtained. Thus, the decision problem is translated into a research problem. For example, a decision problem may be whether to launch a new product. The corresponding research problem might be to assess whether the market would accept the new product.

The objective of the research should be defined clearly. To ensure that the true decision problem is addressed, it is useful for the researcher to outline possible scenarios of research

results and then for the decision maker to formulate plans of action under each scenario. The use of such scenario can ensure that the purpose of the research is agreed upon before it commences.

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## 4.4 RESEARCH OBJECTIVES

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Once the problem is defined, the next logical step is to state what the researcher wants to achieve. This statement is called objectives. To be meaningful and help focus the researcher's attention, these objectives should be specific, attainable and measurable. The purpose of these objectives is to act as a guide to the researcher and help him/her in maintaining a focus all through the research.

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## 4.5 RESEARCH DESIGN

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Marketing Research may be classified in one of the three categories:

- Exploratory Research.
- Descriptive Research.
- Causal Research.

These classifications are made according to the objectives of the research. In some cases the research will fall into one of these categories, but in other cases different phases of the same research project will fall into different categories.

### ***Exploratory Research***

Exploratory research has the goal of formulating problems more precisely, clarifying concepts, gathering explanations, gaining insights, eliminating impractical ideas, and formulating hypothesis. Exploratory research can be performed using a literature search, surveying certain people about their experiences, focus groups and case studies. While surveying people, exploratory research studies would not try to acquire a representative sample, but rather, seek to interview those who are knowledgeable and who might be able to provide insight concerning the relationships among the variables. Case studies can include contrasting situations or benchmarking against an organization known for its excellence. Exploratory research may develop hypotheses, but it does not seek to test them. Exploratory research is characterized by its flexibility.

### ***Descriptive Research***

It is more rigid than exploratory research and seeks to describe users of a product, determine the proportion of the population that uses a product, or predicts future demand for a product. As opposed to exploratory research, descriptive research should define questions, people surveyed, and the method of analysis prior to beginning data collection. In other words, the who, what, where, when, why and how aspects of the research should be defined. Such

preparation allows one of the opportunity to make any required changes before the costly process of data collection begins.

There are two basic types of descriptive research: Longitudinal Studies and Cross-Sectional Studies. Longitudinal studies are time series analyses that make repeated measurement of the same individuals, thus allowing one to monitor behaviour, such as brand switching. However, longitudinal studies are not necessarily representative since many people may refuse to participate because of the commitment required. Cross-sectional studies sample the population to make measurement at a specific point in time. A special type of cross-sectional analysis is a cohort analysis, which tracks an aggregate of individuals who experience the same event within the same time interval over time. Cohort analysis are useful for long-term forecasting of product demand.

### ***Causal Research***

Causal research seeks to find cause and effect relationship between variables. It accomplishes this goal through laboratory and field experiments.

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## **4.6 SOURCES OF DATA**

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Once the research design has been designed upon, the next stage is that of selecting the sources of data. Essentially there are two sources of data or information *i.e.*, Secondary and Primary.

### ***Secondary***

Before proceeding with the time and expenditure involved in collecting primary data, one should check for secondary data that previously may have been collected for other purposes but that can be used in the immediate study. Secondary data may be internal to the firm, such as sales invoices and warranty cards, or may be external to the firm such as published data or commercially available data. The government census is a valuable sources of secondary data.

Secondary data has the advantage of saving time and reducing data gathering costs. The disadvantages are that the data may not fit the problem perfectly and that the accuracy may be more difficult to verify for secondary data than for primary data.

Some secondary data is republished by organizations other than the original source. Because errors can occur and important explanations may be missing in republished data, one should obtain secondary data directly from its sources. One also should consider who the source is and whether the results may be biased.

There are several criteria that one should use to evaluate secondary data:

- Whether the data is useful in the research study.
- How current the data is and whether it applies to time period of interest.
- Error and accuracy- whether the data is dependable and can be verified.
- Presence of bias in the data.

- Specifications and methodologies used, including data collection methods, response rate, quality and analysis of the data, sample size and sampling technique and questionnaire design.
- Objective of the original data collection.
- Nature of the data, including definition of variables, units of measure, categories used and relationships examined.

### ***Primary Data***

Often, secondary data must be supplemented with primary data originated specifically for the study at hand. Some common types of primary data are:

- Demographic and socio-economic characteristics.
- Psychological and lifestyle characteristics.
- Awareness and knowledge- for example brand awareness.
- Intentions- for example, purchase intentions. While useful, intentions, are not a reliable indication of actual future behaviour.
- Motivation- a person's motive are more stable than his/her behaviour, so motive is a better predictor of future behaviour than is past behaviour.
- Behaviour.

Primary data can be obtained by communication or by observation. Communication involves questioning respondents either verbally or writing. This method is versatile, since one needs only to ask for the information; however, the response may not be accurate. Communication usually is quicker and cheaper than observation. Observation involves the recording of actions and is performed by either a person or some mechanical or electrical device. Observation is less versatile than communication since some attributes of a person may not be readily observable, such as attitude, awareness, knowledge, intentions and motivation. Observation also might take longer since observers may have to wait for appropriate event to occur, though observation using scanner data might be quicker and more cost effective. Observation typically is more accurate than communication.

Personal interviews have an interviewer bias that mail-in questionnaires do not have. For example, in a personal interview the respondent's perception of the interviewer may affect the responses.



### *Check Your Progress- A*

---

#### **Fill in the blanks.**

1. Marketing Research is being used to help create and enhance .....
2. .... can include contrasting situations or benchmarking against an organization known for its excellence. Exploratory research may develop hypotheses, but it does not seek to test them.
3. .... should define questions, people surveyed, and the method of analysis prior to beginning data collection.
4. .... has the advantage of saving time and reducing data gathering costs.

---

## **4.7 DATA COLLECTION**

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The researcher is now ready to take the plunge. But still he or she needs to be clear about the following;

### ***Procedure for Data Collection***

Data can be collected through any or combination of the following technique.

- **Observation:** This technique involves observing how a consumer behaves in the shopping area, how he or she dresses up and what the customer says when he or she sees the product.
- **Experimentation:** This is a technique that involves experimenting new product ideas, advertising copies and campaigning, sales promotion ideas, and even pricing and distribution strategies with the target customer group. These experiments can be conducted in an uncontrolled environment or in a controlled and simulated market environment.

### ***Tools for Data Collection***

The researcher has to decide on the appropriate tool for data collection. These tools are:

- **Questionnaire-** used for survey methods.
- **Interview schedules-** used mainly for exploratory research.
- **Association test-** primarily used in qualitative research, also called TAT (Thematic Appreciation Test)

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## 4.8 DATA ANALYSIS

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Before performing data analysis, raw data must be transformed into the right format. First, it must be edited so that errors can be corrected or omitted. The data must be coded; this procedure converts the edited raw data into numbers or symbols. A codebook is created to document how the data was coded. Finally, the data is tabulated to count the number of samples falling into various categories. Simple tabulation counts the occurrences of each variable independently of the other variables. Cross-tabulation also known as contingency tables or cross tabs, treat two or more variable simultaneously. However, since the variable are in a two-dimensional table, cross tabbing more than two variables is difficult to visualize since more than two dimensions would be required. Cross tabulation can be performed for nominal and ordinal variables.

Cross tabulation is the most commonly utilized data analysis method in marketing research. Many studies take the analysis no further than cross tabulation. This technique divides the sample into subgroups to show how the dependent variable varies from one subgroup to another. A third variable can be introduced to uncover a relationship that initially was not evident.

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## 4.9 REPORT AND PRESENTATION

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The last stage is that of writing of a report and making a presentation to the Decision-makers. It is important that the report has summary, called the executive summary, giving a bird's eye view of the research work. This is because most senior managers have little time for going through the entire report in depth. The executive summary can direct the reader's attention to specific issues by turning to the relevant sections in the report. It should not exceed thousand words.

The report should be structured properly and pages must be chronologically numbered. Generally, the structure of a good report is somewhat like the following:

- Introduction to the problem.
- Marketing Research Findings or survey findings.
- Interpretations of research findings.
- Policy implications.



### ***Check Your Progress- B***

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#### **Write True or False.**

1. Association test- primarily used in qualitative research, also called as TAT (Thematic Aptitude Test).
2. Cross tabulation is the most commonly utilized data analysis method in marketing research.
3. The executive summary can direct the reader's attention to specific issues by turning to the relevant sections in the report and should not exceed thousand words.

---

## **4.10 SUMMARY**

---

- Marketing research is the key to evolution of the successful marketing strategies and programmes. It is an important tool to study buyer behaviour, changes in consumer lifestyles and consumption patterns, brand loyalty and forecast market changes.
- According to Phillip Kotler, Marketing Research is a systematic problem analysis, model building and facts finding for the purpose of important decision making and control on the marketing of goods and services.
- The decision problem faced by management must be translated into a market research problem in the form of questions that define the information that is required to make the decision and how this information can be obtained.
- Once the problem is defined, the next logical step is to state what the researcher wants to achieve. This statement is called objectives.
- Exploratory research has the goal of formulating problems more precisely, clarifying concepts, gathering explanations, gaining insights, eliminating impractical ideas, and forming hypotheses.
- Descriptive research is more rigid than exploratory research and seeks to describe users of a product, determine the proportion of the population that uses a product, or predict future demand of a product.
- Once the research design has been decided upon, the next stage is that of selecting the sources of data. Essentially there are two sources of data or information- secondary and primary.

- Secondary data may be internal to the firm, such as sales invoices and warranty cards, or may be external to the firms, such as published data or commercially available data. The government census is a valuable source of secondary data.
- Primary data can be obtained by communication or by observation. Communication involves questioning respondents either verbally or in writing.



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## 4.11 GLOSSARY

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**Marketing Research:** Marketing Research is the systematic problem analysis, model building and fact finding for the purpose of important decision making and control in the marketing of goods and services.

**Exploratory Research:** It has the goal of formulating problems more precisely, clarifying concepts, gathering explanations, gaining insights, eliminating impractical ideas, and forming hypotheses.

**Descriptive Research:** It is more rigid than exploratory research and seeks to describe users of a product, determine the proportion of the population that uses a product, or predicts future demand for a product.

**Secondary Data:** It may be internal to the firm, such as sales invoices and warranty cards, or may be external to the firms such as published data or commercially available data. The data provided by government census is a valuable source of secondary data.

**Primary Data:** It can be obtained by communication or by observation. Communication involves questioning respondents either verbally or in writing.



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## 4.12 ANSWERS TO CHECK YOUR PROGRESS

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### Check Your Progress –A

1. Brand Equity.
2. Case Studies.
3. Descriptive Research.

4. Secondary Data.

### **Check Your Progress –B**

5. True.
6. True.
7. True.



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## **4.13 REFERENCE/ BIBLIOGRAPHY**

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## **4.14 SUGGESTED READINGS**

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4. Erik Mooi and Marko Sarstedt (2011), A Concise Guide to Market Research, Springer.



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## 4.15 TERMINAL QUESTIONS

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- Q1. Define Marketing Research.
- Q2. Discuss the process of Marketing Research.
- Q3. What are the different types of Marketing Research?
- Q4. What are the different sources of collecting data?
- Q5. Discuss the procedure and tools of data collection.
- Q6. How will you prepare a good report structure?

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## **UNIT 5 MARKETING RESEARCH PROBLEM**

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### **5.1 Introduction**

### **5.2 Objectives**

### **5.3 Marketing Research**

### **5.4 Scope**

### **5.5 Marketing Research Process**

### **5.6 Significance in Marketing Planning**

### **5.7 Limitations**

### **5.8 Summary**

### **5.9 Glossary**

### **5.10 Answer to Check Your Progress**

### **5.11 Reference/ Bibliography**

### **5.12 Suggested Readings**

### **5.13 Terminal & Model Questions**

### **5.14 Case Let**

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## **5.1 INTRODUCTION**

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You would have covered the basic course on marketing management in the year one of your course and by now you must be aware about the various aspect of marketing strategies and planning. By now, you would have covered a basic course on research methodology and you will be aware of different types of research such as exploratory, descriptive and causal. In this unit, you will understand what marketing research is, why it is important for the marketers to conduct marketing research, how the data collected in the process of research can be used, and where a marketer can apply marketing research to take adequate decisions. This unit will provide an understanding of marketing research, characteristics and classification of research types, scope and application, the series of steps used to conduct research process, relevance in market planning and limitations.

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## 5.2 OBJECTIVES

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After reading this unit you will be able to:

- Understand the meaning of marketing research
- Classify marketing research in to various types
- Understand the application area of marketing research
- Describe the marketing research process
- Appreciate its relevance in market planning
- Identify the limitations associated and the methods to overcome them
- Understand emerging trends in the area of marketing research

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## 5.3 MARKETING RESEARCH

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The primary task of the marketer is to meet the expectations of the consumers. Thus, it is very important for them to understand what the consumers want; how they make different purchase decisions; or how their purchases are influenced. Marketing research is the area which gives required information about the consumer to the marketer. This process can further enable an organisation to discover new opportunities in the market; evaluate and monitor its marketing actions; and in general, to develop superior marketing strategies and plans to serve the consumer better. Hence, you can say that marketing research acts as an interface between the consumer and the marketer.

### 5.3.1 MEANING AND TYPES

Research, in general refers to ‘a search for knowledge’. In more specific terms research is known as ‘a *scientific and systematic search*’ for generating meaningful information and knowledge on a particular topic or problem in hand.

Marketing on the other hand is the function which deals with planning and execution of product, price, promotion and distribution strategies to stimulate sales and to satisfy needs of the consumers profitably. The aim of the marketing function is to deliver customer satisfaction by generating profits for the organization. The customer satisfaction can be delivered, only if the marketer is externally focussed on consumer needs and wants, changing consumer preferences and growing competition.

Thus, an effective marketer should try to gain information on consumer needs and collect market intelligence to understand and satisfy consumers’ needs effectively and efficiently. The best suitable answer to understand consumers is research.

“Research encompasses understanding problems and re-defining them, formulation of hypothesis and suggesting solutions; making assumptions and reaching conclusions; and finally testing the conclusions to find if they fit the hypothesis formulated in the beginning of the process” (Shodhganga).

Further, American Marketing Association (AMA) defines marketing research as ‘The systematic gathering, recording, and analyzing of data about problems relating to the marketing of goods and services.’

Thus, we can say that it is a process which enables marketers to collect data and convert it in to meaningful information in order to detect opportunities and threats in the market, this process also help a marketer to develop, improve and evaluate its marketing strategies over a period of time. Marketers can monitor and regulate their marketing actions to outplay their competitors and to better understand their market. This is the function which brings customer and the marketer together with the help of relevant information. The information is used:

- For identification of marketing opportunities and threats,
- to develop, improvise and evaluate marketing strategies,
- for monitoring marketing actions and performance; and
- to ensure better understanding of marketing as a process.

The marketing research process help the marketers to identify the problems which needs to be resolved urgently, to look for the ways to collect required information; designing the methods of collecting data; analysing and interpreting data; and finally the report on findings is presented to the decision maker to enable decision making.

The marketing research function could be enumerated as a systematic method of:

- Articulating the marketing problem(s) in hand
- Hypothesis formulation
- Data collection
- Data analysis and interpretation and
- Conclusion and recommendations to solve the problem or resulting in theoretical formulation.

### **Marketing Research Classification**

Marketing Research can be classified in to different types depending upon: methodology of research, data collection method and purpose/objective or research. Each research type has its own significance in meeting the requirements of a marketer.

#### **Marketing research types based on methodology:**

**Qualitative Research:** You can use qualitative research to explore deep insights in vague research questions which are not pre-defined. The methodologies used to conduct qualitative research are focus groups, in-depth interviews, observation, etc. For example, a car manufacturer wants to understand the consumer preferences and trends in automobiles for

hybrid fuel cars. The marketer can conduct focus group study with 8-10 participants in each focus group representing customers, car dealers, and government officials.

The characteristics of qualitative research are:

Sample size used in this research is small (i.e. < 30 respondents)

In case of qualitative research, researcher needs to collect data from those respondents who are willing to participate and contribute in the research process. Given this, the sample selection is generally done with the help of non-probability/ judgemental sampling methods.

Research tools used are open-ended and non-structured interview/ moderation guides or observation techniques

The length of interview is long enough to explore attitudes, preferences and perceptions

Results of qualitative research cannot be generalized larger group or population

**Quantitative Research:** The researches aiming to find answers for more specific questions or descriptive in nature uses quantitative research tools. The methodologies adopted in this case are survey (telephone, mail, internet or in-person).

The characteristics of quantitative research are:

Sample sizes of 100 or more respondents

Use of probability or random sampling methods

Research tools used are close-ended/ structured questionnaire or schedules

Results can be generalized to a larger group or population

### **Marketing research types based on data collection method:**

**Primary Research or Custom Research:** The research conducted for the very first time for the problem in hand for a specific client is known as primary research. Since it is for a particular client thus it is also called custom research. This type of research is beneficial as the marketer/ researcher can customize the research tool and has proprietary right over the findings. However, it is an expensive proposition.

**Secondary Research:** The research conducted by using data which has been widely published and freely available or available for a fee in the form of reports from industry source. If an organization use the information from the Indian Census survey report, it is an example of this kind of research.

**Syndicated Research:** This is the kind of research in which several organizations come together and they share the cost. The challenge of using syndicated research is that no particular organization has the freedom to formulate the research questions specific to its individual research objectives. The popular examples of research agencies conducting syndicated research and publishing reports are: CMIE (Centre for monitoring Indian Economy) to measure overall industry trends, ORG MARG, AC Nielson etc. There are several research agencies which operate by collecting and tabulating data and market findings on an ongoing basis. They publish research finding in the report form on a weekly, bi-monthly, monthly or quarterly basis. ORG Retail Audit agency provides these kinds of reports on consumer goods movement across the retail channel. Thompson Indices is one such agency which publish reports on television viewership in terms of TRP (Television Rating Points) for different television programs and for print media it publishes NRS (Newspaper & Magazine Readership), and market potential assessment for cities above 1 lakh population.

#### **Marketing research types based on objective/ purpose of research:**

**Basic research:** The research conducted with the objective of modification/ addition or creation of new theory is known as pure or basic research. Its purpose of this type of research is to develop new frontier of knowledge and it may not aim at finding solution for practical problems in hand. The essence of this type of research is to focus on identifying answers of fundamental questions. The academicians and research scholars are often involved in basic research. The examples of basic research are consumer behaviour theories.

**Applied research:** This is the research in which objective is to find the answers for the pragmatic problem in hand. This is different from basic research as it is conducted and promoted by the marketing practitioners

It can be further divided into two categories:-

**Problem solving research:** This kind of research is specific to a particular organization and it is undertaken to solve a particular problem faced by it. Given the nature of this research, it is either conducted by the firm itself or it is managed by an outside research and consultancy agency.

**Problem oriented research:** Unlike problem solving research, this type of research is focussed on the issues or marketing challenges which are common in nature and a large number of firms are facing these issues. This research is generally conceptual in its orientation; however the output of this research can also be oriented towards applied problem.

### 5.3.2 NATURE

The characteristics of marketing research are:

- The marketing research is a systematic approach in which each step must be planned in a manner that it leads to next step on its own. A well planned research helps in saving your time and money.
- The research should be guided by an objective so that it attempts to provide an unbiased answer to the problem in hand.
- The process should be reproducible so that another competent researcher can reuse it to find suitable answers without re-inventing it completely.
- The use of specific information about data collection methods, sample, and analysis should be made. It should provide relevant information about the major tasks so that time and money can be saved from collecting irrelevant information. It empowers the research to monitor if the research is proceeding in the right direction. It is capable of controlling the extraneous factors which are affecting the process.

### 5.3.3 OBJECTIVES

Marketing research applications can be divided into following two areas:

**Strategic Application:** The strategic application areas of marketing research are- forecasting of demand and sales, segmentation studies, target markets and positioning identification for a given product.

**Tactical application:** The marketers make use of marketing research to solve their tactical issues such as product, price, or promotional campaign testing, to measure advertising effectiveness and to assess distribution channels and logistics. You can understand these tactical issues in terms of marketing mix decisions a marketer is supposed to take on a continuous basis. These marketing mix decisions are such as packaging decision, determining the price to sell a particular product; developing suitable channel of distribution, time for launching and offering a product or service and other decision regarding consumer satisfaction. Most of the time the marketer will be conducting marketing research to address these tactical issues rather strategic issues because the research findings are of great help in fine-tuning the marketing mix elements. And we also know that strategic changes are always going to be much less in number when compare to the tactical changes. Hence we can say that, the need for information would be in proportion to the frequency of changes. The common objectives of marketing research are:

- Target Customer Characteristic
- Demand Factors
- Projected Sales
- Product Performance
- Product Usage pattern
- Price Sensitivity of the Customer
- Response Of Marketing Channels
- Product awareness
- Customer Reactions
- Information About Competitors

**Example of Marketing Research conducted in India:**

1. Consumer Preference and Buying Habit Study for Detergents-frequency, pack size, effect of promotion, brand loyalty and so forth.
2. Market Potential Study for ready-to-eat chapattis in Mumbai City.
3. Toilet Soap Ingredients Study- tulsi, coconut oil or neem, what will consumer like to have in toilet soap?

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## **5.4 SCOPE**

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In this section, you can understand the various possible areas where marketing research can be applied in a business organization. A large number of marketing research studies are conducted to identify consumer needs and wants. Another good number of studies have taken place to assess the impact of marketing strategies implemented in past.

There is plenty of research available on consumer wants and needs. Enough marketing research has taken place to measure the impact of past marketing strategies.

The different areas in the field of marketing where marketing research is conducted are:

### ***Analysis of Sales***

The different researches undertaken in the area of sales analysis are:

Market potential and demand projection measurement

Understanding characteristics of the market to be served  
Market share and business trends estimation studies  
Understanding consumers that create the potential market  
Market size determination studies  
Growth rate of market  
Competitive position and strategies of competitors  
Consumer behaviour and habits of targeted segments

The topics mentioned above are not exhaustive in nature. Research studies are done to understand the psychological factors influencing consumer behaviour such as motivation, perception, attitude, personality etc. The information gained from this research is use to take marketing decisions.

### ***Sales and Distribution Research***

You can also conduct marketing research studies to measure the effectiveness of existing sales and distribution methods. These researches help the sales team in creating and revising sales territories. The research on sales methods and policies also helps in setting of sales quotas, territory designing, and planning compensation packages for sales force and to estimate cost of distribution.

### ***Product Research***

The research conducted to collect and analyse information to introduce a new product or to manage existing ones. This research investigates market feedback about competitive products and services. The research is also conducted to segment the market. Further, researches enable the marketer to diagnose consumers' perception about different brands of a product. These researches help in brand positioning.

Marketers conduct research in the simulated environment to predict the market for new brands to be launched. These researches are known as simulated test marketing (STM).

Pricing studies, packaging research, design or physical characteristics, have also been sometimes conducted.

### ***Advertising Research***

This research is further classified into:

Media research: The research conducted to understand the effectiveness of media options. The common method to measure the media effectiveness is to conduct NRS to estimate the

newspaper readership. Three NRS are conducted in India. The NRS not only provides the readership but also helps in understanding feedback of readers and editorial content.

Not every medium is suitable for every product or communication objective. Thus, use of marketing research helps the marketers to map suitable medium with its product and communication objectives.

Copy research: This research is conducted by the advertising agencies to measure the effectiveness of different advertising copies (theme and creative) before an advertisement is released.

Advertisement effectiveness studies- Advertising agencies measure the effectiveness of their campaigns by conducting research to measure its impact on consumer awareness and purchases.

### ***Corporate Research***

Large corporates make use of extensive research studies to measure their corporate image, knowledge about them and how public perceive their association with sponsorship etc. Companies conduct corporate research on a regular time interval to know the change in their image over a period of time.

### ***Customer service studies***

A large number of service organizations such as banks, airlines, hotels etc. conduct research studies to identify changing consumer needs and business opportunities and threats.



### ***Check Your Progress- A***

#### **Q1. What is Marketing Research?**

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#### **Q2. Briefly describe different types of Marketing Research.**

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**Q3. Describe the scope of Marketing Research with the help of examples.**

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**Q4. MCQs**

- i. \_\_\_\_\_ is the systematic design, collection, analysis, and reporting of data and findings relevant to a specific marketing situation facing the company.
  - a. Competitive intelligence
  - b. Marketing information system
  - c. Marketing research
  - d. Demographics
  
- ii. In \_\_\_\_\_ research data is collected from the sources which already exist somewhere.
  - a. Primary research
  - b. Secondary research
  - c. Tertiary research
  - d. Inordinate
  
- iii. \_\_\_\_\_ consists of measuring and evaluating actual sales in relation to goals.
  - a. ROI analysis
  - b. Demand
  - c. Sales analysis
  - d. Performance reviews

**Q5. True or False**

- i. Research plan is developed once the marketing researcher has defined the research objectives and research problem.
- ii. Exploratory research is the starting point of all kind of research studies.
- iii. When, Mohit conducted a survey among his office colleagues to know their attitudes and opinions about workplace, it was an example of primary research.
- iv. The most common tool used to collect primary research data is the questionnaire.

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**5.5 MARKETING RESEARCH PROCESS**

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The process of marketing research consists of different steps arranged in a sequence. The purpose of these steps is to collect data, analyse it and to report findings for effective decision making. The picture given below illustrates the steps involved in marketing research process.

**Define the Problem**

It is an old saying that if we define a problem properly it becomes very easy to solve it. Thus, first step of research process is to define the problem in simple and small research objectives. The purpose and design of the research process is guided by the problem definition.

**Research Design**

After defining research problem and setting research objectives, the next step is to develop a blue-print for conducting the research. Thus, a research design:

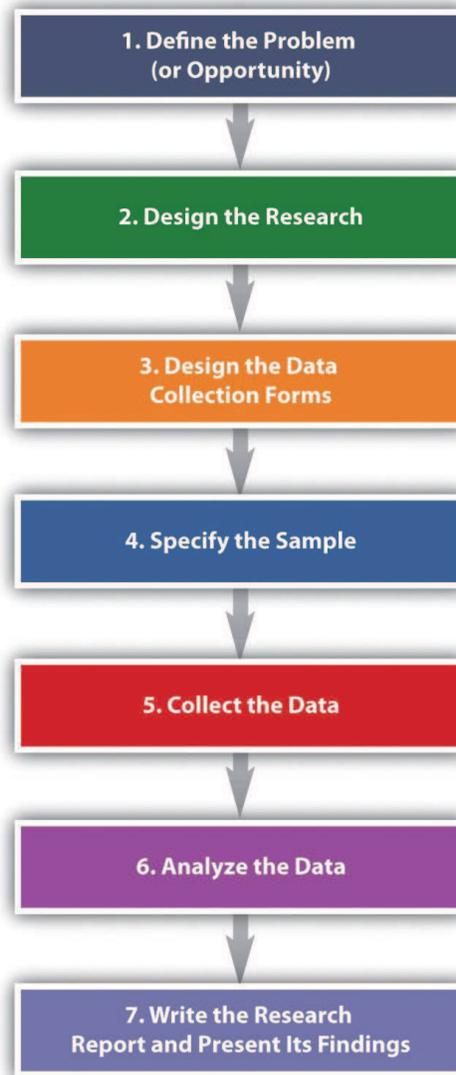
- Acts as a master plan for research
- Determines the kind of research to be conducted: exploratory, descriptive, or causal; quantitative or qualitative research
- Identifies the need for primary versus secondary data
- Develops the data collection tools to be used for collecting primary data: questionnaire, moderation guide etc
- Suggests the tentative cost and time required to conduct the research
- Identifies the sampling method to be used

**Sample Design**

The sample plan is a part of the research design, however some researchers consider actual sampling as a separate stage in the process. This stage involves decision making regarding:

- Sampling methods: probability and non-probability sampling

- Sample size versus population



**Fig 5.1 Sample Design**

Source: Principles of Marketing (John F. Tanner, Jr. and Mary Anne Raymond)

### **Data Collection**

Once the research design and sample plan is prepared the next step in the process is to get into action and collect the data. Data could be secondary or primary, it can be collected using variety of tools such as survey, interview, focus group, observation etc. There are large number of research agencies and freelance executives who provide workforce known as field executives to visit the field and collect primary data.

### **Analyzing Data**

After data collection the data is coded and recorded in the required formats such as MS Excel sheets, SPSS or other analysis softwares. After this data analysis is done with the help of different statistical tools, best suitable to find the answer for research questions.

### **Report Writing**

A good research process comes to an end with the effective interpretation and reporting of findings. The interpretations and findings are presented in a meaningful manner in report writing stage. The reporting should be effective enough to communicate the research findings may not focus upon the complicated statements about the technical aspect of the study and research methods. The executives are to act on research findings and conclusions, thus it is very important of the researchers to achieve the conviction of the decision makers. Researchers, therefore, must make the presentation technically accurate, understandable and useful.

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## **5.6 SIGNIFICANCE IN MARKETING PLANNING**

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The previous sections of this unit have discussed in detail that how marketing research is used by the marketers to identify market opportunities and to solve marketing issues and problems. Hence, it is now clear that role of marketing research is very crucial for a marketer to ensure proper marketing planning. This part of the unit will discuss how marketing planning and research are inter-related.

Marketing as defined by different authors is all about ‘the planning and execution of the pricing, promotion, and distribution of products and services in order to create exchanges that satisfy both the firm and its customers’ (Shodhganga). The firm’s marketing manager is responsible for the process of creating this exchange between the company and customers. The marketing process is supported by the marketers by following various decision criteria. These decision criteria are:

Right goods and services

Making it available at the right time and at the right place

Right prices should be charged

Right means of promoting and communicating with customers

If you adhere to these criteria, you will achieve success in your marketing efforts and actions.

The real challenge which the marketer face while taking above decisions is uncertainty. Marketers has to deals with consumers and it is very difficult to predict their purchase and consumption behaviour. The best possible method to reduce this uncertainty is to know your consumers better. Thus, marketing managers use marketing research to collect relevant information which will help them in decision making.

Marketers can use marketing research to conduct market planning both for short-term and long-term perspective. In case of short-term planning they can focus upon the immediate sales, profit maximisation and market share of their offerings with the help of their marketing actions and strategies. And in case of long-term they can look for their sustainability, competitive edge over a longer time horizon. Use of strategies such as relationship marketing, customer and supplier relationship management, customer life-time value etc. will help them to have long-term outlook.

**Example:** Dell Computers, which serves the global computer market, focuses highly on relationship marketing. Dell sees its customers as individuals with unique desires. Its marketing research programme is directed towards measuring these aspects of the customer, then developing its entire marketing programme around such measures to build long-term relationships with customers.

As given in the example above, relationship marketing has relevance in the present times. Marketers can make effective use of relationship marketing programme if they know their market, develop their employees and teams in a manner to focus upon customer relationships.

The marketing research plays a significant role in marketing planning as it offers:

- Market knowledge: The focal point of relationship building between customer and companies is the knowledge and information about its customers, their buying behavior, patterns and preferences. Marketing research plays an important role in marketing planning as it is the tool which enables an organization to collect and interpret consumer related information to deliver satisfaction to them.

- Employee training programmes: Employees are the building block of excellent consumer relationships. An employee represents the company to the customers and thus it is very important for any forward looking organization to build customer-centric orientation throughout the organization. Leading global companies like McDonald's and Toyota are training their employees on customer relationship on an ongoing basis by providing them courses in their own corporate universities. The employees should motivate customers to

share informal comments, issues regarding competing products, feedback and complaints in general. These are the usual ways in which employees must be trained for collecting relevant data regarding the consumers.

●Employee empowerment and teamwork: The success of the company depends upon its ability to motivate its employees to be proactive when it comes to customer problem solving. An employee is said to be empowered if he/ she has the freedom and ability to solve the customer problem on the spot. A large number of companies are now embracing the concept of cross-functional teams which focusses upon customer satisfaction.

**Example:** In the Jeep Division of Daimler-Chrysler, employees within the marketing research and the engineering functions work together to better understand the requirements of their customers.

The companies can use cross-functional teams and employee empowerment to build successful customer relationships.

Relationship marketing is based on several principles which are centred around marketplace and the consumer. Specifically, these concepts address:

●Knowledge about Customers: Marketing researchers collect customer information from variety of sources or touch-points where a customer comes and interact with the organization. The critical data points to be collected about customers are their demographic information (such as age, gender, income, occupation etc.), psychographic profile (such as personality, lifestyle etc.), history of previous purchases and transactions, detail of past communication between the company and customers such as feedback, complaints etc. Marketers can collect this data both internally with the past record of customer interactions, or externally by conducting marketing research.

●Data integration: The data and customer knowledge which is collected from variety of sources is then compiled and stored in a single shared data source known as data warehouse. This data is shared among the different functional departments involved in interacting and servicing the customers at any point of time, so that they can predict the consumer behavior and can serve them better.

- **Information technology:** Information technology facilitates the integration of data which is collected with the help of marketing research tools. IT tools and techniques helps in data mining, data analysis and data visualization.

- **Creating customer profiles:** Detailed customer profiles are created by the marketers based on the demographic, psychographic and behavioral data by the research process. The marketer or researcher will share these consumer profiles across the different domains such as product development team, marketing communication department etc. to enable better decision making.

These research principles are used for taking several decisions such as introducing new products, developing new market segments, evaluating advertising campaigns etc. The major goal of the research process is to ensure that sufficient data and technology is available to keep a track on changing customer needs and to maintain long-term relationships with them.

<b>Marketing Planning Activities</b>	<b>Marketing Research Activities</b>
<b>Situation Analysis</b>	
Market analysis	Opportunity assessment
Market segmentation	Descriptive studies
	Benefit and lifestyle studies
Competition analysis	Importance-performance analysis
<b>Programme Design</b>	
Target marketing	Target market analysis
Positioning	Positioning
New product planning	Concept and product testing
	Test marketing
<b>Programme Development</b>	
Product portfolio decisions	Customer satisfaction studies
	Service quality studies
Distribution decisions	Cycle time research
	Retailing research
	Logistic assessment
Pricing decisions	Demand analysis
	Sales forecasting
Integrated marketing communication decisions	Advertising effectiveness studies
	Attitudinal research
	Sales tracking
<b>Programme Tracking</b>	
Programme control	Product analysis
	Environmental forecasting
Critical information analysis	Marketing decision support systems

**Exhibit 5.2 Marketing Planning Activities and Marketing Research Activities**

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## 5.7 LIMITATIONS

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The marketing research is not free from limitations. You may feel surprised that how such an important process can have limitations too. Though marketing research is very crucial for any marketing organization, it is relevant to understand that it is subject to certain limitations.

The various limitations are:

**Fragmented:** Marketing research is fragmented in its approach and is not capable enough at times to provide an overall viewpoint regarding the marketing problem under focus.

**Generic:** At times practitioners criticize marketing research as they believe that its findings are too generic and superficial for real time industry application. Despite of the fact that marketing research is based on the scientific principles at times the users of research in the company are not trained enough to understand and appreciate it. The individuals lack the patience and time required to understand and use the detailed investigations and sophisticated techniques.

**Lack of interaction:** A large number of issues emerges in the use of marketing research due to lack of interaction between the departments conducting research and which is going to use this research. Consequently, marketing researchers get diverged from the main stream marketing issues and problems. This denies them any opportunity to test their finding in the practical marketing situation.

**Not an exact science:** There are good number of contradictions which a research has to come across while aiming for accurate results. As in case of consumer behaviour studies, it is an area which is rather elusive and the theory does not go very far in disclosing it very precisely. Analytical tools of marketing research are still deficient and cannot give us a precise idea, especially on the behavioural aspects.



**Check Your Progress- B**

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**Q1. What are the various steps in the marketing research process?**

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**Q2. What are the possible ways in which following organizations can use marketing research for their benefit?**

- a) A retail shop
- b) A bank
- c) A service business

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**Q3. What are the major weaknesses of marketing research?**

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**Q4. Multiple Choice Questions-**

- i. The first step in the marketing research process is to \_\_\_\_\_.
  - a. develop a research plan

- b. define the problem and research objectives
  - c. analyze the internal environment
  - d. contact a professional consultant
- ii. What is the third step of a typical marketing research process?
- a. Define the research problem.
  - b. Select research approach.
  - c. Decide sample plan.
  - d. Analyse data.

**Q5. True or False**

- i. Marketing research is free from any kind of shortcomings.
- ii. The marketing research is an output of marketing planning.

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**5.8 SUMMARY**

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In this unit we have discussed the meaning of marketing research, the classification of marketing research in terms of methodology, data sources and purpose of research such as basic and applied research. Then, we have covered the objective, different applications of marketing research such as strategic and tactical application and scope of marketing research in different areas such as product research, sales and distribution research and advertising research. This unit also covers the steps involved in marketing research process: problem definition, research design, sample design, data collection, data analysis and interpretation and report writing. The significance of marketing research in marketing planning is also explained in this research. The relevance of relationship marketing is discussed in this unit. You have also studied about the limitations of marketing research such as: it is too superficial, it is fragmentary in its approach, and it is not an exact science.



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**5.9 GLOSSARY**

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**Marketing Research:** It is a systematic method of collecting, analysing and interpreting data to solve a marketing problem or to explore an opportunity.

**Exploratory Research:** The research which aims to gain ideas and insights.

**Descriptive Research:** This research explains the frequency with which something occurs, or the covariance between two variables.

**Causal Research:** This research determines the cause-and-effect relationships between different variables.

**Pure Research:** The research done for the purpose of building new academic theory.

**Applied Research:** The research conducted by the practitioners to solve the marketing problem in hand.

**Custom Research:** Research where one client is responsible for the entire cost of their search project, but has final say as to objectives, survey design, methodology and has ownership of all data.

**Panel Research:** In this type of research studies, the research forms a panel of respondents who are recruited and managed over a period of time. It is a cost-effective method to collect attitudes and opinions of a group of individuals over time. Different research methodologies such as mail, telephone, online, focus group, in-person may be used.

**Primary Research:** The research which is done for the first time by a company either internally or by an outside agency.

**Projectable Results:** The results of a research which depicts the attitudes and opinions of an entire population or group based on the study of a sample.

**Qualitative Research:** This kind of research is exploratory in nature and it study the attitudes and preferences of respondents. The finding of this research may not be generalized for an entire population or group.

**Quantitative Research:** This kind of research is based on large sample sizes selected by randomized sampling methods. The finding of this research may be generalized for an entire population or group.

**Secondary Research:** This kind of research studies are conducted by a company for the purpose of selling research reports to potential clients.

**Syndicated Research:** This is the kind of research in which several organizations come together and they share the cost.



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## 5.10 ANSWERS TO CHECK YOUR PROGRESS

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### Check Your Progress –A

Q4. Multiple Choice Questions-

- i. Marketing research
- ii. Secondary research
- iii. Sales analysis

Q5. True or False

- i. False
- ii. False
- iii. True
- iv. False

### Check Your Progress –B

Q4. Multiple Choice Questions-

- i. define the problem and research objectives
- ii. decide sample plan.

Q5. True or False

- i. False
- ii. False



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## 5.11 REFERENCES

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- <http://www.beefresearch.org/CMDocs/BeefResearch/Marketing%20Research%20101.pdf>
- Marketing Research, Rai Technology University

- <http://dl4a.org/uploads/pdf/Unit-1.pdf>
- [http://shodhganga.inflibnet.ac.in/bitstream/10603/7334/10/10\\_chapter%203.pdf](http://shodhganga.inflibnet.ac.in/bitstream/10603/7334/10/10_chapter%203.pdf)



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## 5.12 SUGGESTED READINGS

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2. Basic Marketing Research - Gilbert A. Churchill (Jr.) Hinsdale, Illinois, Dryden Press, Handbook of Marketing Research - Rober Ferber (Ed.) New York, McGraw Hill.
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4. Marketing Research: Applications and Problems - Arun K. Jain, Christian Pinson and Brian T. Rachford, New York, Wiley.
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8. Marketing Research: Meaning, Measurements and Methods-D.S. Tull and D.I. Hawkings New York: Macmillan.
9. Marketing Research: Fundamentals and Dynamics - Cerald Zaltman and P. S. Berger. Hinsdale, Dryden Press.



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## 5.13 TERMINAL QUESTIONS

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- Q1. Suggest some possible areas of application of marketing research.
- Q2. Explain what qualitative research is and why it might be useful to marketers.

- Q3. What are the different characteristics of good marketing research?
- Q4. Enumerate various limitations of Marketing Research.
- Q5. Differentiate between:
- Pure and Applied Research
  - Qualitative and Quantitative Research
  - Primary and Secondary Research
- Q6. Discuss the marketing research process with the help of suitable example.



## 5.14 CASELET

### **Using Marketing Research for Effectively Reaching and Managing Customers – Adidas’s FIFA World Cup Marketing Research Project in France**

As a major sponsor of the 2006 FIFA World Cup, Adidas was embarking on an aggressive marketing research project a year before the kick off. The objective of this project was to measure the effectiveness of an integrated marketing campaign for Adidas in the French market. Through a better understanding of the contributions of different elements of the campaign, a better customer relationship management strategy could be devised. The integrated marketing campaign was aimed at matching the events around the French football team.

The project was a complicated one as it needed to measure twenty different channels of media contact. In order to incorporate all these different media channels in one questionnaire, the number of measurement metrics had to be small and manageable.

To measure the effectiveness of each media channel, the following simple set of metrics was used:

Prompted brand recall in the past seven days;

Promoted recall of the different points of media contact on which consumers were exposed to the brand in the past seven days;

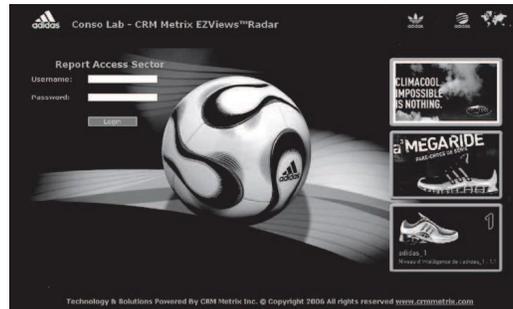
Appreciation of the campaign using a 6-point hedonic scale.

On the other hand, to measure the impact of the different media channels on the brand, the following metrics were used:

- Top of mind and spontaneous awareness of the brand;
- Preferred brand in football;
- Key image items;
- Claimed purchase of different types of Adidas products;
- Intention to recommend the brand;
- Intention to purchase products of the brand.

Respondents to the questionnaire were identified as young males aged 15 to 25 years.

Completed questionnaires were collected from 120 to 150 targeted respondents every week within the 11-month period of the project. To communicate the ongoing results within Adidas's management and to help the company to be even more customer-centric than before, a management dashboard was created (see the Figure 1.1).



Adidas sponsoring FIFA World Cup and other football activities.

A number of insightful findings came with the final stage analysis of the questionnaire data. These findings demonstrate some innovative ideas for developing and implementing a more effective integrated marketing communication campaign, which in turn inform the desirable directions of the management of customer relationship in the future. For example, three major findings that can help managers for marketing communication and customer relationship management purposes are:

- Do your best to better know the best customers in your market. The best customers are those with the highest value and/or the most influential. You should know how they get information about their favourite brands, the types of media channels they use, and how they want to be connected with the brand.
- Create an integrated marketing campaign through which these target customers will have a maximum of opportunities to connect with the brand, preferably whenever and wherever they want.
- In light of the above two findings, increase the number of different media channel contacts to create a global brand experience. This can help to maximize the opportunity to consumers to be able to connect with the brand whenever and wherever they want.

Adapted from a business case written for ESOMAR by Laurent Flores (CEO and Founder of crmmatrix, France), Guillaume Weill (Managing Director of crmmatrix, France), Oliver Heck (Consumer Insight Manager of Adidas, France). Source: <http://www.mheducation.co.uk/he/chapters/9780077117061.pdf>

**Block II**  
**Research Design and Formulation**

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## UNIT 6 RESEARCH DESIGN

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### 6.1 Introduction

### 6.2 Objectives

### 6.3. Concept of Research Design

### 6.4 Need of Research Design

### 6.5 Research Design Characteristics

### 6.6 Key Concepts related to Research Design

### 6.7 Classification of Research Design

### 6.8 Potential Errors Affecting Research Design and Strategies to Handle Those Errors

### 6.9 Summary

### 6.10 Glossary

### 6.11 Answer to Check Your Progress

### 6.12 Reference/ Bibliography

### 6.13 Suggested Readings

### 6.14 Terminal & Model Questions

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## 6.1 INTRODUCTION

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In the previous unit you have learnt the process followed in conduction of research. Based on the research problem a clear conceptual structure should be made for conduction of research.

In this unit, we will discuss the research design in detail. A research design is a conceptual structure for doing any research. Through research design a researcher finds out the answers to questions like what, why, where, when, how much, it also help in identifying the techniques or ways for conducting research. Here, in this unit we will discuss the meaning of research design, need of developing a research design before conduction of research and also the characteristics, and process involved in developing a research design. At the end we will discuss the classification of research design.

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## 6.2 OBJECTIVES

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After reading this unit you will be able to:

- understand the concept of research design.

- learn about the characteristics of research design.
- Understand the process involved in developing a research design .
- Understand the classification of research design .
- Identify the potential sources for error affecting the research design.
- learn about the strategies for handling the potential error in research design

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## 6.3 CONCEPT OF RESEARCH DESIGN

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Research Design is a conceptual structure a researcher sketch before conduction of research for achieving research objectives. It is a plan, a map or a blueprint for collection, measurement and analysis of data and also for presenting the research findings. It is a plan of investigation for getting answer to the research question.

According to Claire Selltitz, “A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure.” the above definition suggests that the researcher while planning research design a he plans for all the tools and techniques required for collections and analysis of data in such an effective manner that research objectives are attained in the most efficient way where in resources are optimally utilized.

According to Kerlinger, “Research design is the plan, structure and strategy of investigation conceived so as to obtain answers to research questions and to control variance” the definition states research design as a plan for conducting the research work, as a structure of identifying the methods of sampling, data collection and analysis of data and as strategy for executing the research process so as to find the answers to the research questions.

According to Green and Tull “A research design is the specification of methods and procedures for acquiring the information needed. It is the overall patterns of framework of the project that stipulates what information is to be collected from which sources by what procedures.” The above definition states that research design is a plan which lays down the method and procedure for the collection of requisite information and its measurement and analysis with a view of arriving at certain meaningful conclusion at the end of the proposed study.

A marketing researcher is interested in knowing the consumer decision making process for high end automobiles so as to segment the market according to the customer demographics. In order to outline what a researcher will do following research design decisions will be taken:-

1. What is the study about?
2. Why the study is being made?
3. Where the study be conducted?
4. What type of data is required?
5. Where can the required data be found?

6. What period of time will the study include?
7. What will be the sample design?
8. What techniques of data collection will be used?
9. How will the data be analysed?
10. In what style will the report be prepared?

Answering the above stated questions in the most precise format will ensure that the researcher will be able to conduct the research in the best manner and would be able to find out the answer to the research problem and fulfil the research objective.

The overall research design can be divided into following parts:

1. Sampling design- In the sampling design researcher decides about selecting the items to be observed and the techniques for selecting such items.
2. Observational design- In the observational design the decision about the techniques of data collection is finalized and the condition under which the observation are to be made.
3. Statistical design- In the statistical design the researcher decides the tools and techniques that would be used for analysis of data that would be required to achieve the research objective.
4. Operational Design- The operational design deals with the techniques by which the procedures related with sampling, statistical, and observational design can be carried out.

#### **Difference between research design and research methodology**

<b>Research design</b>	<b>Research methodology</b>
Focuses on the <b>end-product</b> : What kind of study is being planned and what kind of results are aimed at.  E.g. Historical - comparative study, interpretive approach OR exploratory study, inductive and deductive etc.	Focuses on the <b>research process</b> and the kind of tools and procedures to be used.  E.g. Document analysis, survey methods, analysis of existing (secondary) data/statistics etc)
Point of departure (driven by) = Research problem or question.	Point of departure (driven by) = Specific tasks (data collection or sampling) at hand.
Focuses on the logic of research: What evidence is required to address the question adequately?	Focuses on the individual (not linear) steps in the research process and the most 'objective' (unbiased) procedures to be employed.

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## 6.4 NEED OF RESEARCH DESIGN

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The need of research design is as important as is a map for an engineer who is constructing a house. A good design facilitates easy flow of all the activities conducted during the research process so that the research problem is solved in the most efficient manner yielding maximum information and incurring minimum recourses in terms of time and money. Thus a good research design fulfils the following needs 1) bridging the gap between what is to be done and how is to be done. 2) Understanding the research problem clearly and stating the research objectives precisely. 3) Identifying the tools and techniques for proving the research hypothesis and assumptions. 4) Facilitates in identifying the means for obtaining the information and methods for collecting specific, relevant and efficient data. 5) Choosing the accurate technique for analysis and interpretation of data. 6) Identifying the resources in terms of time and money that would be required during the research process.

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## 6.5 RESEARCH DESIGN CHARACTERISTICS

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A good research design is always objective, flexible, reliable, appropriate, efficient, specific, economical, has minimises bias and is with minimum experimental error. The above characteristics of a good research design ensure that the research objectives are fulfilled and the best results are achieved. Following are the characteristics of a good research design

- 1) Objectivity – A good design should be capable of findings the appropriate method and techniques for data collection, analyzing and interpretation so that the any other researcher conducting the research with the similar data should be able to achieve precisely almost the similar results.
- 2) Flexible - A good design is always framed according to the purpose of the study, with different objectives different research design are to be formulated.
- 3) Reliable – it contains all the information regarding the conduction of research, a researcher while observing a research design can understand the process that will be followed during the course of research.
- 4) Efficient- An efficient research design ensures that research is carried out in the most well organized and skilled manner so as to ensure the best findings.
- 5) Specific – the design is framed in the most detailed form, it involves answering all the questions that a researcher might encounter during the process of research, giving all the information required and also identifying the skills of the researcher that would be required for execution of research.
- 6) Economical- a good design identify in advance the resources in terms of time and money that would be spend while conducting the research and also the methods of minimizing them.
- 7) Minimum bias – A good design ensures minimum bias on the part of the researcher whether it is related with sampling, data collection methods or with use of appropriate statistical tool for data analysis

8) Minimum experimental error – A good research design should ensure minimum experimental error that is there should be minimum difference between an accepted or theoretical value and an experimental value acquired through research.

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## **6.6 KEY CONCEPTS RELATED TO RESEARCH DESIGN**

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Before describing different research design it is important to understand the key concepts related to the research design.

1. Variable – Operationally defined concepts that can take different quantitative values so that empirical research can be conducted in order to achieve reliable results. The variables can be discrete which take specific values and can be expressed in integer value for example number of children etc. and it can be continuous which takes values in decimal points for example height, weight of a person.
2. Dependent and Independent Variable – one variable depends upon or is the consequence of the other variable is the dependent variable and the variable that explains or predicts the dependent variable is the independent variable. For Example – the sales of a product depends on sales promotion expenses incurred by the company; thus the sales is the dependent variable and the sales promotion expenses is the independent variable.
3. Extraneous variable – Independent variable that are not the part of the research study but may affect the dependent variable are extraneous variable for example; sales of the company may also be affected by the sales team effort but it may not be the part of the study.
4. Control – when an effort is made to design a study in such a manner so that the effect of extraneous variable can be reduced to minimum on the dependent variable, term ‘control’ is used.
5. Control Group – while conducting a research, a group is studied under usual condition or it can be said the subjects in an experiment which is not exposed to the experimental stimulus is a control group.
6. Experimental Group – while conducting research a research group exposed to a novel i.e. a specific experimental condition, The experimental group studies the effect of an independent variable on dependent variable.
7. Treatment - the independent variable in an experiment that is manipulated by the researcher to assess its effect on behaviour. For example a researcher is interested in knowing the impact of training on sales force performance thus imparting of training to a group would be treatment.
8. Experiment- it is a controlled method of observation in which the value of any independent variable is deliberately changed in order to find out the effect on the dependent variables.
9. Hypotheses – it is a statement or an assumption a researcher tests to find out the relationship between two or more variables or concepts. For example testing the

assumption that ‘Students who receive counselling will show a greater increase in creativity than students not receiving counselling’.

10. Causality – It describes the cause and effect relationship between variables; it depicts the situation in which the independent variable leads to variation in a dependent variable. For example ‘To see the impact of increasing income on consumption pattern of consumer towards FMCG products’.
11. Field Experiments - experiments conducted in naturally occurring settings as people go about their everyday affairs. For example a study is conducted to understand the association of store layout and consumer purchasing pattern in a particular mall.
12. Laboratory Experiments - experiments conducted in artificial settings constructed in such a way that selected elements of the natural environment are simulated and features of the investigation are controlled. For Example a researcher is interested in knowing the impact of drug on recovery of cancer patient in a hospital.
13. Units of Analysis - the specific objects or elements whose characteristics we wish to describe or explain and about which data are collected. For example the researcher is interested in understanding the behavioural pattern of teenagers while purchasing clothing. Thus the unit of analysis are the teenagers under study.
14. Measures of Association - statistics that describe the strength of relationships between variables. For example a researcher is interested in knowing the ‘whether there exists any relationship between age group and buying pattern of organic products’ and for measuring the association; correlation is used.



### *Check Your Progress- A*

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**Q1. Explain the meaning of research design?**

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**Q2. Explain the need of research design?**

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**Q3. Discuss any two characteristics of research design in detail?**

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**Q4. Define the dependent variables and the independent variables with suitable example.**

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**Q5. State whether the following statement are true (T) or false (F):-**

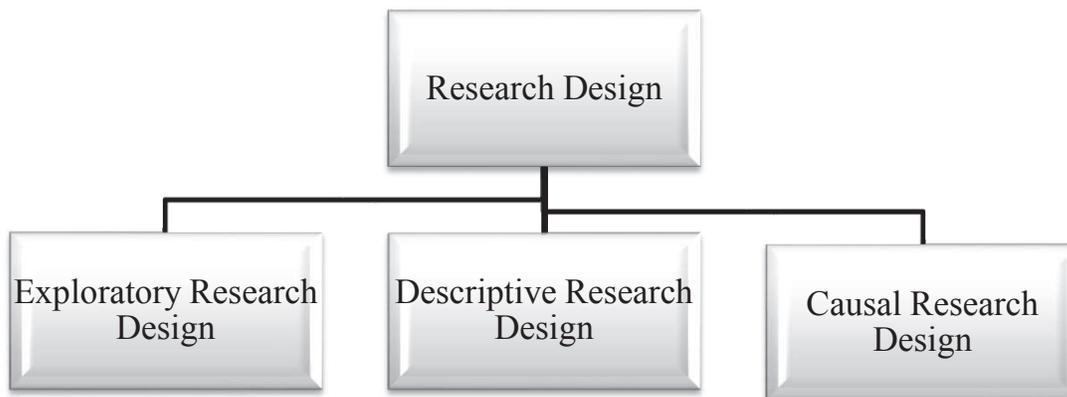
- i. Research design is a blueprint of the research study to be conducted.
- ii. Research design formulation follows the problem definition and the data collection stage.
- iii. Research design is a dynamic process and permits modification and changes during the conduction of any research.

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## **6.7 CLASSIFICATION OF RESEARCH DESIGN**

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We now already know that research design incorporate taking research decisions in advance in order to execute smooth conduction of research. We will now discuss the classification of research design. There are three different categories of research design 1) Exploratory research design, 2) Descriptive research design, 3) Causal research design.



**Fig 6.1: Types of Research Design**

### 6.7.1 EXPLORATORY RESEARCH DESIGN

The objective of exploratory research design is to identify or explore the problem. Exploratory study is concerned with discovering the nature of problem and the variable related to the study. The major emphasis of these studies is on discovering of ideas and insights. For example in a business setting the sales figures are declining from last several months, a marketing manager may conduct research to find out the probable explanation for the same; there might be several reasons for the same such as entry of new competition, inadequate quality of product, inefficient sales-force, insufficient distribution channel etc. the study conducted by him would be an exploratory study where in a possible explanation for the decreasing sales is being found.

The research design for exploratory studies is characterized by flexibility and adaptability. The reason behind is that the researcher is involved in investigating in an area or subject in which he is not having sufficient knowledge about the research problem and is unable to frame specific and detailed research questions. The researcher is unable to frame clear hypothesis about the research problem. Inbuilt flexibility in research design is needed because the research problem, broadly defined initially is transformed into one with more precise meaning in exploratory studies, which may necessitate changes in the research procedure for gathering the relevant data.

A variety of approaches are adapted for exploratory investigations of management or marketing questions:-

1. Interviewing which is more or less in the form of conversation rather than a structured interview.
2. Participants' observation in order to monitor their experience.
3. Case studies for in depth contextual analysis of a few events or conditions.
4. Document analysis for identifying some important information.
5. Films, photographs, videotape in order to capture the life of the group under study.

**Exploratory Research Design tells the researcher about:-**

1. This design is a useful for gaining background information on a particular subject.
2. Exploratory research can answer all types of research questions such as why, what , when, where, how.
3. As exploratory study is conducted to explore new insights about the subject it is flexible in nature.
4. The exploratory research provides a platform for clarifying the existing concepts and even helps in defining new terms and concepts.
5. Formal hypothesis are generated with the help of exploratory research, it even helps in developing precise research problems.

6. Exploratory studies help in establishing research priorities and allocation of resources.

**The exploratory study does not tell the researcher about:-**

1. The exploratory research generally utilizes small sample sizes and, thus, the findings cannot be generalized for a larger population.
2. The exploratory nature of the research restrains the ability of a researcher in making definitive conclusions about the findings. They provide insight but not definitive conclusions.
3. The research process used exploratory studies is flexible but often unstructured, leading only to tentative results that have limited value to the decision-makers.
4. The exploratory design lacks rigorous standards applied to methods of data gathering and analysis because one of the areas for exploration could be to determine what method or methodologies could best fit the research problem.

It is now clear that through exploratory study the researcher is trying to gain familiarity about the research topic or he is trying to get a new insight into the problem situation so that he can develop hypothesis or question for further research. The nature of exploratory study is loosely structured that the researchers' skill is in observing and recording all the possible information and impressions determine the accuracy of the findings. The exploratory research design will be elaborated and discussed in the next unit.

### **6.7.2. DESCRIPTIVE RESEARCH DESIGN**

Descriptive research study as the name suggests, is the study concerned with describing the characteristics of an individual, group, situation, phenomenon, community, outcome or programme. The descriptive research is popularly known in the name of Ex-post facto research as the researcher exerts no control over the variables under study he only reports the event. These studies are undertaken in many situations, when a researcher is interested in knowing the characteristics of certain group such as age, sex, educational level, occupation and income or when the research wants to find out the proportion of people in a given population have behaved in a particular manner, making projections about them. The objective of these studies is to answer the 'who', 'what', 'when', 'where', and 'how' of the subject under investigation.

Briefly descriptive study serves a variety of research objectives

1. Description of phenomenon or characteristics associated with a subject population that is who, what, when, where, and how of a topic.
2. Estimates the frequency of appearance and the proportion of the population that has these characteristics.
3. Discovery of associations among different variables.

For example ‘a marketer who is interested in planning an advertising and sales promotion campaign for the high end automobile cars, would require a complete profile of the population that can buy these high end automobile cars’. One of the best example of descriptive study is the population census conducted by the Government of India for getting the information about the Indian population in order to frame policies and procedure for development of general public.

For conduction of descriptive study a more structured, formal and rigid research design is required. As the objective of any descriptive study is very clearly defined along with the tools and techniques to be used and thus any flexibility would divert the research from getting the right answers to the research questions. Thus a rigid design completes the purpose. Descriptive studies can be complex, demanding high degree of scientific skills on the part of the researcher.

The descriptive research design must focus its attention on:

1. Framing clear research objective of the study.
2. Finalizing the tools and techniques for data collection.
3. Identifying the sampling technique.
4. Finalizing the methods for data analysis and interpretation.
5. Reporting the findings.

#### **Descriptive studies tell the researcher about:-**

1. The subject is being observed in a completely natural and unchanged environment. True experiments, whilst giving analyzable data, often adversely influence the normal behaviour of the subject.
2. Descriptive research is often used as a pre-cursor to more quantitative research designs with the general overview giving some valuable pointers as to what variables are worth testing quantitatively.
3. If the limitations are understood, they can be a useful tool in developing a more focused study.
4. Descriptive studies can yield rich data that lead to important recommendations in practice.
5. In descriptive study a large amount of data is collected for detailed analysis.

#### **Descriptive studies do not tell the researcher about:-**

1. The results from a descriptive research cannot be used to discover a definitive answer or to disprove a hypothesis.
2. Because descriptive designs often utilize observational methods, the results cannot be replicated.

3. The descriptive research heavily depends on instrumentation for measurement and observation.

More clearly and specifically a researcher mentions and the above stated details, more specific and concrete would be the research findings and a rigid and structured research design ensures that the researcher does not drifts away from his research objectives. The descriptive research design will be discussed in detail in the coming units.

### **6.7.3 CAUSAL RESEARCH DESIGN**

The causal design investigates the cause and effect relationship between two or more variables. The causal research is also known as experimental research or hypothesis testing research study. The research design used in these studies is rigid and a stated procedure should be followed while conducting such studies. This can ensure that the reliability of research can be enhanced and the bias can be reduced and still inferences can be drawn about causal relationship between variables. For example a marketer has sold 240 televisions in the month of June and 320 televisions in the month of July. The sale of television in the month of July is much higher than the previous month. During the month, the firm has also launched an advertising campaign for its product. The marketer is interested in knowing whether advertising has caused the increase in the sales in the month of July. Though there could be wide reason for increase in sales other than advertisement such as new sales person, any sales promotion effort by the sales force, problem in competitors product and so on. Therefore it is very important that the marketer understands the condition under which such causal statement can be made.

#### **Causal research studies tell the researcher about:-**

1. Causality research designs assist researchers in understanding the relationship between variables; it does through the process of proving a causal link between variables and by the process of eliminating other possibilities.
2. The study can be replicated, if any other researcher wish to carry out the same research with the same data the research results would be same.
3. There is greater confidence in the study has internal validity due to the systematic subject selection and equity of groups being compared.

#### **Causal research studies don't tell the researcher about:-**

1. Not all relationships are casual! The possibility always exists that, by sheer coincidence, two unrelated events appear to be related.

2. Conclusions about causal relationships are difficult to determine due to a variety of extraneous variables that exist in a social environment. This means causality can only be inferred, never proven.
3. If two variables are correlated, the cause must come before the effect. However, even though two variables might be causally related, the researcher may face the difficulty in determining the order of variables and thus it becomes difficult for him to establish which variable is the actual cause and which is the actual effect.

It is important to understand the necessary conditions for making causal inferences

1) Associated variation:- It shows that the two variables under study are associated with each other and also have a causal relationship that is they are having a cause and effect relationship among them.

2) Time of occurrence of variables:- This condition means that the causal variables must occur prior or simultaneously with the effect variables. The increase in sales should occur after or simultaneous to the advertisement broadcast.

3) Absence of other possible causal factors - the increase in sales of television could have been due to many other factors besides advertisement. There could be a strike at the competitors' plant resulting in an overall reduction in supply, increase in price of competitors' product or any such factor could have affected the sales of television but any such factors should be absent in order to find out the causal relationship among two variables.

#### The difference between exploratory, descriptive and causal research question:-

Types of Question	Form of Question	Examples
<b>Exploratory</b>	Discuss what is the situation? Identify the key factors?	Identify the important factors that lead to the success of a company. Exploring the characteristics of a good leader.
<b>Descriptive</b>	Discuss the number of times any incident occurs. Identify the relationship between variables.	Number of women died during child birth in South Africa last year. Identifying the relationship between teachers' attitude and students' achievement.
<b>Causal</b>	Identify the causes of any happening?	Identify the main causes of inflation in Indian economy.

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## **6.8 POTENTIAL ERRORS AFFECTING RESEARCH DESIGN AND STRATEGIES TO HANDLE THOSE ERRORS**

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### **6.8.1 POTENTIAL ERROR AFFECTING RESEARCH DESIGN**

The research results are affected by a great extent due to various errors that affect the research design. Research design must attempt to reduce the total error, these errors are explained in the following section:-

- 1) Surrogate Information error – it is the error caused by a variation between the information required to solve the problem and the information sought by the researcher. The researchers' perception about the information required can be different from the information really required. For example a researcher is interested in finding out the attitude of customer towards high quality products and in order to collect the information the researcher collect the information of the attitude of customers towards high priced product as researcher considers that a high priced product is a qualitative one.
- 2) Measurement error – It is the error that occurs when there is a gap between desired information and the available information. This error may be caused by respondents not responding correctly or it may be due to wrong instrument being used. For example the respondents may exaggerate their income in order to impress an interviewer.
- 3) Experimental error – the experiments are planned in such a manner that the impact of one or more independent variables can be measured on the dependents variables. Experimental error occur when the effect of the experimental situation itself is measured rather than the effect of the independent variable. For example a marketer is interested in knowing the impact of new sales promotion activity on sales. However competitors activity, previous advertisement, salesman efforts may affect the sales at different point of sales. Thus the experimental results will reflect the impact of variables other than sales promotion.
- 4) Population Specifications Error – it is an error caused by selecting an inappropriate universe or population from which the data is collected. For example in order to identify the criteria for purchase of a luxurious watch brand, it is important to identify the customer from whom the data can be collected. If the data is collected from the customers ignoring their buying capacity of the luxurious watch then population specification error will occur.
- 5) Frame error – the list of members in the population from which the sample units are selected is called a sampling frame. This error occurs when the researcher is unable to choose a representative list from where the sample is to be selected, for example using the telephone directory as a sampling frame will lead to the sampling frame

error as it would ignore all the prospective respondents just because they don't have telephone connection once and for all from the scope of the study.

- 6) Sampling Error – Sampling error is caused when through a probability sampling method a non-representative sample is selected. A random sample of hundred senior managers could produce a sample composed of all male, such a sample would not be representative of the overall senior managers, and thus excluding the whole group of female senior managers.
- 7) Selection error – it is an error that occurs when a non-representative sample is obtained by non-probability sampling methods. For example in a survey a researcher collected the data only from the people living in the places which are easily accessible to him. Such a practice may introduce error into the survey result.
- 8) Non-response error – as the name suggests it is an error caused by non-response from the respondents. It is caused by either failure of the researcher in contacting all members of a sample or it could be due to failure of respondents to respond to all or specific parts of the measurement instrument that is non-response of specific questions. The non-response may occur if respondent is unable to understand the question or respondent is unwillingness to give information.

## **6.8.2 STRATEGIES FOR HANDLING POTENTIAL RESEARCH ERRORS**

As the objective of any research design is to obtain the most accurate and relevant research result and to reduce research error. The below stated are the strategies to deal with the potential errors:-

1) Minimize individual errors – the individual errors could be reduced with the help of cautious effort put in by the researcher while planning and executing the research process. Error such as sampling frame could be eliminated by choosing the sampling frame which includes maximum respondents from the population, sampling error could be reduced by choosing stratified sampling technique at the place of simple random sampling. Measurement error could be reduced by using a most accurate and appropriate tool collecting the data. Thus all the individual error could be reduced with cautious planning at the time of framing the research design.

2) Measuring or estimating the residual error - To eliminate all the errors is very rarely possible. Every study dealing with random samples states the confidence intervals and confidence levels in order to communicate that sampling error might have occurred. Thus a researcher must understand that the errors should be measured and estimated rather than ignoring them. Potential errors should never be completely ignored. Sometimes the net effect of these errors is so small that no specific action is required but in case of large potential error, an explicit and subjective research design should be framed that ensures that the potential error could be minimized and if not, it should be measured. At the

minimum the researcher should explicitly, if subjectively, estimate the extent of each type of potential error.



**Check Your Progress- B**

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**Q1. Discuss the types of research design?**

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**Q2. Write a short note on causal research design.**

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**Q3. What are the potential sources of error in research design?**

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**Q4. Describe the difference between the control and experimental group.**

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**Q5. State whether the following statements are true (T) or false (F):-**

- i. The pre-experimental design is the most loosely structured research design.
- ii. Exploratory designs can help define variables and constructs under study.
- iii. A research study that tracks the profile of a representative social networking user is an example of an exploratory research design.

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## 6.9 SUMMARY

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Research design is a conceptual structure prepared in advance for conducting a research study. It is a plan for conduction of research so as the research objectives could be met within stated resources. Various research designs are available for the researcher to choose from according to the objective of the research study. Through a research design a researcher decides in advance the techniques and the tools he will be using for collection and analysis of data. Every design is unique to the investigated question. The exploratory design for exploratory study is flexible in nature. These studies help the researcher in discovering the general nature of problem and the variable related to the study. The research design for exploratory studies is characterized by flexibility and adaptability. Descriptive research study is conducted in order to find out the ‘who’, ‘why’, ‘when’, ‘where’, ‘what’ and ‘how’ about the population under study. The research designs for these studies are rigid. The causal design investigates the cause and effect relationship between two or more variables. While preparing the research design the researcher should always be cautious about the potential sources of error and should always ensure that these errors should be eliminated or minimized. As it is not always possible to eliminate the errors the researcher should put efforts to measure the estimated error.



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## 6.10 GLOSSARY

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**Causality** – It describes the cause and effect relationship between variables.

**Causal Research-** A research study that try to determine cause and effect relationship among variables.

**Descriptive study** - Descriptive studies, as a research category, use a variety of methods to observe existing natural or man-made phenomena without influencing it. Data are gathered, organized and analyzed to depict and describe “what is”. Descriptive studies can be quantitative and/or qualitative and provide an in-depth look at processes, characteristics and patterns.

**Exploratory Study** –A study conducted to expand the understanding of a topic, provide the insights and possible explanations or discover future research tasks.

**Phenomena** - Any event, circumstance, or experience that is apparent to the senses and that can be scientifically described.

**Research Design** - the blueprint for fulfilling research objectives and answering the research questions.

**Sampling Frame** - A listing that should include all those in the population to be sampled and exclude all those who are not in the population.

**Sample** - The population researched in a particular study. Usually, attempts are made to select a "sample population" that is considered representative of groups of people to whom results will be generalized or transferred.




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## 6.11 ANSWERS TO CHECK YOUR PROGRESS

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### Check Your Progress –A

Q5. Answer

- i. True
- ii. False
- iii. True

### Check Your Progress –B

Q5. Answer

- i. False
- ii. True
- iii. False




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## 6.14 TERMINAL QUESTIONS

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- Q1. Provide the definition of research design and discuss its significant elements.
- Q2. Discuss the criteria for judging a qualitative research design?

- Q3. Discuss the reasons why a structured research design is required for conducting a research study?
- Q4. What are the different parts of research design?
- Q5. How are research design classified? Discuss in detail the difference among research designs. Explain with appropriate examples.
- Q6. Most of the research design are exploratory cum descriptive in nature in marketing research'. How?
- Q7. What are the potential error affecting research design? Discuss the strategies to eliminate such errors while conducting research.
- Q8. Is a research design supposed to include all the procedure for conducting a research project? If yes, tell why. If not, explain and tell whether those details should be on paper – and where.
- Q9. Do you think that marketing research satisfies the characteristics of scientific method? Give reason for your answer.
- Q10. Which design type would be most appropriate to address the following question: “ How satisfied or dissatisfied are customer with the automobile repair service offerings of the dealership from which they purchased their new Maruti Suzuki Breeza?”
- Q11. Design a research proposal that can be used to address the following decision problem; ‘Should the Marriott Hotel in Mumbai, India reduce the quality of its towels and beddings in order to improve the profitability of the hotel’s operations?’
- Q12. The president of a warehouseman’s association hopes to induce methods by which members of the association can reduce costs. What kind of exploratory research might be used for this purpose?

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## **UNIT 7 EXPLORATORY RESEARCH DESIGN**

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### **7.1 Introduction**

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## **7.1 INTRODUCTION**

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In the previous unit we learnt about the classification of research design. In this unit we will study about the exploratory research and its design in detail.

A researcher chooses a research design on the basis of the fundamental objective of the research. Considering their applicability, their strength and their weakness help the marketing researcher in selecting the best suited design for solving the research problem.

Exploratory research studies are also known as formulative research studies. This is the most appropriate research design for those projects that are addressing a subject about which there are high levels of uncertainty and ignorance about the subject, when the problem is not very well understood and very little existing research on the subject matter is executed. We can

say exploratory research studies seek to discover the new relationship. Such research is usually characterized by a high degree of flexibility and lacks a formal structure.

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## 7.2 OBJECTIVES

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After reading this unit you will be able to:

- Explain the concept of exploratory research.
- Understand the stages in exploratory research design.
- Learn about three different exploratory research designs.
- Identify the uses of focus group in exploratory research.
- Describe the case study method, its uses and limitation.
- Understand the in-depth interview methods, its advantages and disadvantages

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## 7.3 CONCEPT OF EXPLORATORY RESEARCH

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An exploratory research focuses on the discovery of new ideas. The basic idea of the study is to explore and obtain clarity about the problem situation on which research is to be conducted, it is generally based on secondary data. It is preliminary investigation which does not have a rigid design. It is flexible in approach and mostly involves a qualitative investigation. This is because researcher engaged in an exploratory study may have to change his focus as a result of new ideas and relationship he finds out during the study among the variables.

**The essential purpose of exploratory study is -**

- Clearly defining the research problem to be investigated.
- Identify the research opportunity.
- Helps in formulation of research hypothesis.
- Identify the characteristics and relationship among variables.
- Identify alternative course of action.
- Helps in exploring the external factors that may affect the research.
- For establishing priorities for further research from an operational point of view.

**Characteristics of Exploratory Research Design -**

- Research is flexible and unstructured.
- Findings are tentative in nature.
- The result area identified through exploratory research act as the building blocks for further research.
- Examples of exploratory research are pilot survey, secondary data, focus group, in-depth interview etc.

The exploratory research aims at generating new ideas thus the respondents should be given sufficient freedom to express themselves. No matter what the scientific orientation and the research objective might be, the researcher can make use of wide variety of established methods and techniques for conducting exploratory research, like secondary data sources, unstructured and structured observation, expert interview and focus group discussion.

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## **7.4 STAGES IN EXPLORATORY RESEARCH DESIGN**

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The exploratory research design is appropriate for the studies that are generally flexible in nature in order to ensure that the researcher has enough opportunity for considering different facets of research problem under study. This design provide opportunity to the researcher for inducing changes in the procedure whether it is while collecting data or while choosing the sample or even while choosing the research tools and techniques for analysis.

We will be discussing stages that are usually included in exploratory research design-

### **7.4.1 SURVEY CONCERNING LITERATURE**

This is the simplest method of conducting an exploratory study. Quick and inexpensive information is available through literature survey. A researcher is involved in identifying ‘How the market can be segmented for the Organic food items produced by a company?’ It is likely that information on such question might already be published. Study already might have been conducted by any other organic food producing company, any marketing research firms or even by any independent researcher.

The literature might not be only available at external sources, the internal company records can also be used. For example a research problem related to identifying the reason for employee turnover can be found in previous reports of the researches conducted earlier whose records are being maintained by the company.

The literature survey leads to precise formulation of research problem or development of hypothesis. The researcher can test the hypothesis already formed by any other researcher or can formulate a new research hypothesis by taking previous research hypothesis as a base.

### **7.4.2 ASKING KNOWLEDGEABLE PERSON**

it is the survey of people having knowledge and practical experience in the field of research problem, who can contribute new ideas and insight in field of study. An unstructured interview is planned by the investigator in order to collect the information and share experiences of expert have in the field of research study. The researcher must be conscious enough in providing flexibility to the respondent so the respondents should be allowed to raise issues and questions which the researcher has not previously considered. In such type of investigation the researcher must be competent, clear and fluent individual so that he can extract the required information from the respondents.

A researcher want to find out ‘what range of clothing should be introduces in the new born baby segment?’ Mothers of new born babies can be considered the most knowledgeable group who shop for their new born babies thus an experience survey conducted on such mother may provide great information about clothing range that should be introduced for the new born babies or to identify the problems that new born babies’ mother face while buying clothes in the segment.

It is often considered that the researcher should pre inform the expert about questions so that he can prepare in advance and can provide fruitful insight on the topic. This survey may provide the practical possibilities to identify solution to the research problem or at least it may help in creating the base for further research.

### **7.4.3 ANALYSIS OF INSIGHT STIMULATING EXAMPLES**

This is also one of the methods used for conducting exploratory research study. This method is generally adopted when there is lack of secondary literature as well as experts in the field are also not readily available. Some insight stimulating instances of the phenomenon that are close to the problem under study can be intensively studied. It can help in studying the nature of the problem and the variables under study. Similar situations consist of case histories and simulations.

Case studies had always been popular methods for marketing research, and simulation is the new technique adopted by the marketing researchers where in a model is constructed representing the situation and then experimenting on the model rather than the actual situation. The researchers’ attitude and his ability define how well he can draw diverse information and can interpret from the available examples and instances. Such studies form the base for formulation of further research studies and hypothesis.

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## **7.5 QUALITATIVE RESEARCH METHODS IN EXPLORATORY RESEARCH DESIGN**

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In the current times the data collection methods are categorized as quantitative and qualitative. Prior to discussing the popular qualitative research design technique used in exploratory research design, we will understand the concept of quantitative research and also identify the difference among two.

Quantitative research is normally associated with surveys or experiments, the research problem in such researches are very clearly defined. The researchers and the decision makers

are clear about information required for the research. The quantitative research is related to descriptive and causal research design. The main goals of such researches is to provide specific facts that decision makers can use to -

1. Predict relationships between market factors and behaviours.
2. Understand the meaningful insight into these relationships.
3. Confirm and validate the relationship among variables.

Qualitative research refers to selected research methods used in exploratory research design. The most important objective of qualitative research is to gain preliminary insights into the decision making research problems and opportunity. In this research the focus is on the collection of detailed amount of primary data from relatively smaller sample by asking unstructured questions or by observing. Qualitative research is used when the researcher is conducting an exploratory study.

### Quantitative Research Methods V/S Qualitative Research Methods

Aspects	Quantitative	Qualitative
Objective	For the purpose of gaining qualitative understanding of the reasons and motivations behind a particular phenomenon	The purpose is to quantify the data and generalize the findings of the research.
Sample	Small numbers of non-representative cases are studied as samples.	In the study large number of representative cases are used as samples
Collection of data	Data collection is done through unstructured questionnaire probed by an experienced interviewer.	Data collection is structured and a lesser experienced researcher can also collect it though a structured questionnaire. .
Data Analysis	Non-statistical	Statistical
Outcome	Develop an initial understanding so that further studies could be conducted.	The research results leads to recommendation of final course of action.

Qualitative research tends to focus on the collection of detailed amounts of primary data from relatively small samples of subjects by asking questions or observing behaviours. Researchers well trained in interpersonal communication and interpretative skills use either open ended questions that allow in depth probing of the subject initial responses or specific observational techniques that allow for analysis of behaviour. It can also rely on secondary data while collecting information about a phenomenon.

In the exploratory research design due to its flexibility approach, a non-structured format of questions and a small sample size is used it limits the researcher's ability to generalize the qualitative data. Qualitative research method has following are the advantages and limitations-

#### **Advantages of Qualitative Research Methods**

- Economical and timely data collection as it uses small sample for conducting the research.
- The unstructured technique of data collection ensures collecting rich and in-depth data required for the study.
- Accuracy of recording marketplace behaviours.
- It can provide the researcher the preliminary insights into building models and scale measurement.

#### **Limitations of Qualitative research Methods**

- As the sample size is under study is small the information generated through qualitative technique cannot be generalized.
- The small data collected under the study does not allow the researcher to evaluate the impact of small differences.
- There always exists difficulty in finding well trained investigators, interviewers, observers for conducting the qualitative research study.



#### ***Check Your Progress- A***

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**Q1. What do you mean by exploratory research?**

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**Q2. Discuss the characteristics of exploratory research design?**

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**Q3. Discuss the stages involved in exploratory research design.**

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**Q4. How the qualitative and quantitative research can be differentiated?**

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**Q5. State whether the following statement are true (T) or false (F):-**

- i. Qualitative research methods are used in exploratory research design.
- ii. Qualitative research predicts relationships between market factors and behaviours.
- iii. Generalization of phenomenon can be easily done in qualitative researches.
- iv. The unstructured techniques of data collection ensures collecting rich and in-depth data required for the study.

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## **7.6 TECHNIQUE USED IN EXPLORATORY RESEARCH DESIGN**

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Exploratory study relies heavily upon qualitative techniques. Widely applicable exploratory techniques for marketing research are:

- Experience Survey
- Focus Group
- Case study Method
- In-depth Interview
- Other techniques – projective technique, protocol technique, role play technique.

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## **7.7 USE OF EXPERIENCE SURVEYS IN EXPLORATORY RESEARCH**

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Experience survey allows the researcher in gaining information from specialists and knowledgeable persons in a field of research problem. It refers to the informally gathered opinions and insights from people who are considered to be knowledgeable. In experience surveys, it is desirable to talk to persons who are well informed in the area being investigated. These people may be company executives or persons outside the organisation. No structured questionnaire is required for collecting such data. The approach adopted in an experience survey should be highly unstructured, so that the respondent can give divergent views. Since the idea of using experience survey is to undertake problem formulation, and not conclusion. For examples a marketer is interested in introducing a food product range of ready to cook items and for such study the experience survey on housewives could be conducted. Broad

open-ended questions could be asked so as to collect large amounts of data that demonstrate the knowledge of the respondents. This would help the researcher in creating survey that is complete in all aspects.

For example, in order to find out the possibilities of book readers switching from reading hardcopy book to softcopy books reading like 'Kindle' for such a study a survey on regular readers could be conducted. Companies like Kellogg used experience survey for developing new flavors and variety in its breakfast cereal range.

### **Advantages of Experience Survey**

- These surveys help the researcher in getting an insight about the problem that he is unable to estimate himself.
- These survey help in collecting maximum information from the expert's memory bank.
- It helps in seeking ideas about important issues or aspects of the subject to discover new ideas and insights about the research problem.
- These surveys help in discarding old notions or information about the practicality of doing the study.
- These surveys may probe and find out what factors are needed to be controlled and how, and who will cooperate in the study.

### **Limitations of Experience Survey**

- There is highly likelihood of opinions and suggestions would differ from the collective opinion of all the experts.
- It depends on the researcher capability to find out the experts who can contribute for fulfilling the research objective, if the individuals from whom the details are collected are not the experts in the field then the research results will not be useful.

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## **7.8 USE OF FOCUS GROUP INTERVIEW IN EXPLORATORY RESEARCH**

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Another widely used technique in exploratory research is the focus group. In a focus group, a small number of individuals usually consumers are brought together to study and talk about some topic of interest. The group usually is of 6 to 12 persons. While selecting these individuals, due care has to be taken to see that they should have a common background and has similar experiences in buying. Many research organizations record the audio and visuals o the group with their permission so that these recording can later be watched to understand the attitude, believes, reaction of consumers.

### **7.8.1 MAIN FOCUS GROUP RESEARCH OBJECTIVE**

- Through focus group research differences between symptoms and root problem can be identified. It provides data for defining and redefining marketing problems.

- In some situations decision makers and researchers are not totally sure what specific types of data or information should be investigated. Focus group can reveal unexpected components of the problem, it identifies specific hidden information requirement.
- A quantitative research sometimes could lead to unexpected results in the hand of the researchers. Focus group can be conducted to help to explain the findings of surveys. It provides data for better understanding of results.
- Focus group interviews provide researchers with excellent opportunities to gain preliminary insights into what consumers really think or feel about the available products and services. It helps in revealing consumers' hidden needs, wants, attitude, feelings, behavior, perception, and motives regarding services, products or practices.
- The objective of focus group is to aid the researcher and the decision makers with information so that they can come up with applicable decisions. Focus group generates interactive discussion about new or existing products and services. The data collected from these interviews and interactions leads to generation of new ideas about products or services.
- A moderator in the focus group interaction can be lead to better understanding about customers experience related to different products and services. These interactions can help in changing consumer preferences.

### **7.8.2 PROCESS OF CONDUCTING A FOCUS GROUP INTERVIEW**

Following steps are followed while conducting a focus group interview 1) Planning the Interview, 2) Conducting the Interview, 3) Analyzing and reporting results.

1) Planning the Interview – The initial step require a clear understanding of the objective of the study. It helps in charting specific data requirement that would ensure a better planning of focus group interview. Key aspects to be answered while planning the focus group -

- The objective with which the study is being conducted.
- Identifying the information needs.
- Identifying the way in which the collected information will be used to arrive at desired results.
- Identify the respondents for the focus group interview. The participant should be the individuals having knowledge about the field of research so that they can contribute fruitfully in the process. It is important to note that the individuals in the focus group should be homogeneous but should have space for enough variation to allow inclusion of important contrasting opinion. A trained and

experienced moderated can lead a willing homogeneous group to contribute towards best research results.

- Identify the individuals who will be selected as the participants in the focus group. Few rules are to be followed while selecting the participants: Along with the decision makers the researcher should identify the desired characteristics of the group that is identifying the factors on which the homogeneity of the group is to be decided. The selected characteristics should be strictly recognized in the group by the researcher, any bias in the process can lead to serious quality deterioration of the research.

Methods of reaching potential participants		
1.	Provided List	The researcher might use the list that is made available to them by the organization. It could a daily mailing list of the company or even a specially planned list for the focus group interaction.
2.	On-location interview	The researchers reach the place where he considers he is going to find out a homogenous group with similar characteristics who can fulfill the research objective.
3.	Snowball sampling	It is a non-probability <i>sampling</i> technique where existing study respondents recruit future respondents from among their acquaintances.

- Focus group size should be from 6 to 12. Any size smaller than six is not going to generate the group dynamics, lesser people would lead to a situation of few members dominating the discussion. Too many participants can limit the opportunity for each individual to contribute.
  - The researcher need to finalize the number of focus group sessions depending on the complexity of the information probed and decision concerning the structures of the target audiences.
  - Find out the location for conducting the focus group interview sessions. A focus group session should last between 90 minutes to two hours. But a lengthy session could lead to exhausted individuals who will be unable to contribute in the focus group interaction.
- 2) Conducting the Interview - A successful focus group interview session relies heavily on the experience and the skill of the moderator who is responsible for asking questions and taking the discussion in the right direction so as the research objectives could be achieved. A moderator is a special person who is trained in interpersonal communication and professional manners. Characteristics and Role of Moderators -

- a) Moderators must be well trained in interpersonal communication
  - b) He must possess excellent listening, observation, and interpretative skills.
  - c) He must have good knowledge about the topic that is to be discussed in the focus group interview.
  - d) The moderator should be well trained in asking follow up probing questions, and must demonstrate respect and sensitivity for the participants' opinions and feelings.
  - e) The moderator should be experienced in focus group interview.
  - f) The moderator must have quick mind capable of getting new ideas that come from the group.
  - g) The role of a moderator is to keep track of the discussion among the group members and ensure that the discussion moves in the result oriented direction.
- The session starts with the small social talk among the individuals so that they become comfortable with each other. The moderator should convey the rules for the session. Then the session starts with an open ended probing question. The introduction session normally begins with ice breaking so that each participant become comfortable with the group and start talking and contributing in the process of building positive group dynamics.
  - The main session would run for more than an hour, if the individuals in the focus group are experienced and have good knowledge in the field, new insights could surface beyond the questions of the moderator.
  - The closing session of the focus group interaction starts when the moderator considers that all the specified topics are covered under the discussion to his complete satisfaction. The participants should be asked an ending question that encourages them to express their final ideas, thoughts, and feelings.
- 3) Analyzing and Reporting the Results - during the analysis process the researcher should conduct the 'Debriefing Analysis', in it the researcher and moderator discuss the responses immediately after the focus group interaction. This ensures that all important information or the research is gathered. In the analysis major ideas, suggestions, thoughts of the session can be discussed.

'Content analysis' is the second stage in analyzing the data in which the researcher considers individual response and group them into categories. Analyzing the data that has been collected could be done by listening to the audios or watching the video or by reading the notes of the moderator.

While writing the report, the researcher must be aware of the basic purpose of the research objective. The report should communicate useful insights and information to the audience. It should be a clear and precise presentation tailored to the individual information need of the specific user.

### **Advantages of Focus Group Interview**

- Generates new ideas.
- Help in identifying the underlying reasons for the behavior of customers.
- Focus group interaction ensures client participation through which their ideas, perceptions, feelings could be easily understood.
- Through the focus group interview unlimited number of topics could be discussed. New product prototype, advertisement copy, improvement in current product design, incorporation of new variants.
- Focus group format allow these hard to interview individuals as opportunity to interact with their peer and compare thoughts and feelings on the common topics and issue of interest.

### **Limitations of Focus Group Interview**

- The result generated through focus group interview cannot be generalized.
- The focus group interview involves a lot of cost as it requires a moderator, a location and individuals for focus group.
- The reliability of the data generated through focus group interview could not be tested.

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## **7.9 USE OF CASE STUDY METHOD IN EXPLORATORY RESEARCH**

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Originally the **case method** was used in medicine. The record of treatment and health conditions maintained by the physician of each patient was known as a 'case'. The physician was aware of the peculiarities and the generalities of all cases.

Case is a basic unit of a **case study** – **it is** one of its kinds. A case may be of a single business unit or of group of business units, or of a single consumer or group of consumers and so on. Such studies by nature are post hoc studies and reports the earlier occurred events. For example Reliance Industries wants to implement a new performance appraisal system and is trying to find out a better appraisal system out of traditional and 360 degree appraisal system. In such a situation case studies on allied association can be studied to find out a better option.

### **CHARACTERISTICS OF CASE STUDY METHOD**

The prime characteristics of the case study method-

1. A unit of study under the case study method can be a single social or business unit or any similar situation.

2. The selected unit is studied in minute details extending over a longer period of time in order to ensure collecting appropriate and accurate information related to all the aspects of the study.
3. Case study method is both qualitative and quantitative in nature. Information related to quantitative aspects such as sales, profitability, expenditure, capital or any other aspect is collected as well as qualitative aspects such as perception, opinion, attitude etc is also collected.

#### **Advantage of Case study Method**

- Inferences are obtained from the study of an entire situation rather than only studying one or several aspects.
- It is a description of a real event or situation.
- More accurate data are obtained, probably as a result of the longer, more intimate association of researcher and respondents.

#### **Limitations of case study method**

- The method involves detailed description of complete situation. Informal methods are used for observing and recording the data, the research result become subjective rather than objective.
- The analysis is done based on the intuition of investigators. This may lead to unwarranted conclusion.
- While analysing the case, investigators tries to generalize, although the case method does not help in generalization as it is one of the technique of exploratory research design.

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## **7.10 USE OF IN-DEPTH INTERVIEWS IN EXPLORATORY RESEARCH**

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A small number of respondents face rigorous one-to-one interview during an in-depth interview. It is a qualitative research technique used for collecting data related perspectives, opinions, ideas on the topic under study. A set of semi-structured questions are asked by an experienced interviewer for collecting the data. In-depth interviews often replace the focus group interviews where the respondents' individual opinions are sorted or when the respondents are not comfortable in talking openly. For example the Management of Taj Hotels wants to understand how to deliver better on-site services to business customers. The researchers can conduct on-site, in-depth interview with the business travellers in order to find out the ways of delivering better services.

### **Process for Conducting In-Depth Interviews**

The steps involved are plan, develop instruments, collect data, analyze data, and disseminate findings.

- Planning – involves identifying the required information needed and its source. Then the respondents are selected. If the interviewer considers he can select additional interviewees during the process. The sampling technique is determined if necessary.
- Develop Instruments - An interview guide is developed in which the lists of questions are identified. It is ensured that the not more than fifteen prime questions are included.
- Collection of Data - After preparing the final set up for the interview, the respondents are re-explained the purpose and the data are collected. The interviewer keeps the information in the form of notes, audios or videos. The data is summarized immediately following the interview.
- Analyzing the Data - the data is firstly transcribed, reviewed and read. Then patterns and themes among the participants response are studied. Then similar patterns are grouped in a meaningful manner.
- Disseminating the Findings - in order to present the results the researcher writes a report. Though a rigid structure is not available for to present the findings of an In-depth interviews but the methodology used should be clearly stated in the report.

### **Advantage of In-depth Interview**

- The in-depth interviews provide detailed and explicit information.
- Researcher can collect data on variety of topics through in-depth interview.
- Researcher can observe the attitude, motivations, feelings and opinions along with the answers of the questions given by the respondents.
- These interviews ensure conducive atmosphere to the respondents where they feel comfortable in expressing their views and opinions.

### **Limitations of In-depth Interview**

- It is a time consuming process, in case of incomplete data the whole process is to be conducted again.
- Lack of a trained and experienced interviewer can lead to collection of either incomplete or inappropriate data.
- Due to the small samples used in the study the results acquired through in-depth interviews cannot be generalized.

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## 7.11 OTHER TECHNIQUES IN EXPLORATORY RESEARCH

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### 1. Protocol Interview

In the protocol interview the research problem focuses on the decision making. The protocol interviewing places a respondent in a specific decision making situation and asks the person to verbally express the process involved in the decision making. For example, the management of Mahindra Club Holidays is eager to find out the decision process that the customers adopt while selecting the holidays online. Protocol interview could be conducted by the asking the recent customers who opted for the Mahindra Club Holidays through an online process about the process and the activities they conducted while selecting the Club Holidays. This can help the researcher in getting the insights and understanding of those factors that affect the decision making process of the respondents and also identify motivation behind the purchasing process. Mahindra Club Holiday group can make use of the research results while finalizing the packages and deals that would be made available to the probable customers.

### 2. Role Play Technique

In role playing technique the participants are asked to take on the identity of third person, such as a specific person and are asked to verbalize how they will act in the situation. For example rather than asking a person why he does not use the Internet more frequently to purchase online consumer product. The researcher would ask ‘Why don’t people use the Internet more often to purchase online consumer products for their home?’

### 3. Projective Technique Interview

Projective techniques are widely used exploratory research design with clients and respondents. The underlying objective is to learn more about the subjects in situations where they might not reveal their true thoughts under a direct questioning process. Considerable care is needed in using the techniques while asking such questions. Projective techniques were developed in psychology. Projective techniques used in research –

1. Word Association Tests – in this interview a respondent is read a selected set of words, one at a time, and asked to respond with the first thing that come across his the mind. Generally this technique is used in advertising research where it is efficiently used in creating an ad copy.
2. Picture test - in this interviewing the respondent is given a picture and is instructed to describe his reaction by writing a short narration. This is generally used by marketers while deciding the package designs and colors.
3. Sentence completion Test –The respondents are asked to complete the given statements in their own words. This test is used by the marketers for choosing the features and characteristics of a product they wish to launch or to find out the preference of a specific market segment.



**Check Your Progress- B**

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**Q1. Discuss the techniques used in Exploratory research design?**

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**Q2. Write a short note on focus group interview?**

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**Q3. What are advantages of In-depth Interview?**

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**Q4. Describe the features of case study method.**

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**Q5. State whether the following statements are true (T) or false (F):-**

- i. Focus group interview involves one-to-one discussion of the interviewer with the respondent.
- ii. Protocol Interview is conducted in a situation where the researcher faces a decision making problem.
- iii. ‘Debriefing Analysis’, is an interaction between the moderator and the researcher on the subject of research.

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## 7.12 SUMMARY

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Exploratory study is concerned with discovering the general nature of problem and the variable related to the study. The exploratory research design study is characterized by flexibility and adaptability. Qualitative methods focus on generating exploratory, preliminary insights into decision problems and opportunities. Qualitative methods focus on collecting detailed amounts of data from relatively a small sample by questioning or observing what people say. Various qualitative techniques are used in exploratory research design such as focus group interview, in-depth interview, case study method, and various other techniques. An in-depth interview is a formalized process of asking respondent semi-structured question in face to face settings. In the focus group interview a small group of respondents interact on a specific topic or a concept. The case study method makes use of cases while finding answer to research problems. Projective technique, role-play technique and protocol interview are also few techniques used in the exploratory research design.




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## 7.13 GLOSSARY

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**Qualitative research method** – it is a method applied in exploratory designs to gain preliminary insights into decision problems and opportunities.

**Projective Interview** – is an indirect questioning method which leads the respondents into expressing his/her covert beliefs and feelings.

**Experience Survey** – semi-structured or unstructured interviews with experts.

**Focus group-** it is an interaction among a small group of participants led by a trained moderator.

**Moderator** – A special person who is well trained in interpersonal communication skills and professional manners.

**In-depth Interview** – in it a respondents in a face to face setting answers few semi-structured questions.




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## 7.14 ANSWERS TO CHECK YOUR PROGRESS

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### Check Your Progress –A

Q5. Answer

- i. True
- ii. False
- iii. False

iv. True

### **Check Your Progress –B**

#### **Q5. Answer**

- i. False
- ii. True
- iii. True




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## 7.16 SUGGESTED READINGS

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5. Zikmund. William G., (1997), '*Business Research Methods*', 5<sup>th</sup> edition. Dryden Press, Harcourt Brace College Publishers.




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## 7.17 TERMINAL QUESTIONS

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- Q1. How would you define an exploratory research design? What are the stages followed while designing an exploratory research study?
- Q2. Qualitative research is used in conducting exploratory study. Discuss the fact in detail
- Q3. Express how qualitative methods and quantitative research methods are different? In which type of research study these methods are applicable. Discuss

- Q4. Discuss various techniques used in exploratory research design?
- Q5. Compare and contrast the unique characteristics, main research objectives and advantages and limitations of the in-depth and focus group interviewing technique.
- Q6. How case study method is applicable while conducting the exploratory research? Discuss it with an example.
- Q7. How projective techniques are useful in finding out creative solution to the research problems?
- Q8. What type of exploratory research design would you suggest for each of the following situation and why?
- The research and development director at Axe suggests new type of cologne for men that could be promoted by a sports celebrity Sachin Tendulkar.
  - The director of on-campus housing of a university proposes some significant changes to the physical configuration of the current campus-on-campus dorm rooms for freshmen and new transfer students.
  - The vice president of marketing in-charge of new store locations for Home depot must decide on the best location for a new store in your hometown.
  - The senior design engineer for TATA motors wishes to identify meaningful design changes to be integrated into 2017 TATA Tiago.
- Q9. Develop a moderator guide that could be used in focus group interview to investigate the following question: Why do 30 percent of Aircel cable subscribers disconnect their cable services after the initial three-month special package offer?
- Q10. You are a research executive with a university offering number of postgraduate courses like M.com, MCA, MBA. You believe that the MBA program will enhance your personality and will help you in getting a good job. What is recommended research design? Justify your selection. What would be the variables, hypothesis and the population under study?

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## **UNIT 8 DESCRIPTIVE RESEARCH DESIGN**

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### **8.1 Introduction**

### **8.2 Objectives**

### **8.3 Concept of Descriptive Research Design**

### **8.4 Quantitative Research Methods in Descriptive Research Design**

### **8.5 Stages in Descriptive Research Design**

### **8.6 Types of Descriptive Research Design**

### **8.7 Categories of Descriptive Research Study**

### **8.8 Descriptive research design methods used in conduction of descriptive studies**

### **8.9 Use of Observation Method in Descriptive Research Design**

### **8.10 Use of Survey Method in Descriptive Research Design**

### **8.11 Use of Interview Method in Descriptive Research Design**

### **8.12 Summary**

### **8.13 Glossary**

### **8.14 Answer to Check Your Progress**

### **8.15 Reference/ Bibliography**

### **8.16 Suggested Readings**

### **8.17 Terminal & Model Questions**

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## **8.1 INTRODUCTION**

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In the previous unit we learned about the exploratory research design. In this unit descriptive research and the descriptive research design is discussed at length. The descriptive research design is more structured and formal in nature. The objective of descriptive study is to provide a detailed and comprehensive explanation of the phenomenon under study. Descriptive study is concerned with describing the characteristics of an individual, group, situation, phenomenon, community or outcome as it exists. In the unit we will discuss about the descriptive research study and the descriptive research design, the objectives for conducting research design, importance of design and the steps involved in conducting the study, and the ways of data collection under descriptive research studies.

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## 8.2 OBJECTIVES

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After reading this unit you will be able to:

- Explain the concept of descriptive research.
- Learn about the descriptive research design.
- Understand the stages in descriptive research design.
- Learn about categories of descriptive research design.
- Learn the methods of data collection for descriptive research design.
- Identify the uses of observation method and the types of observation.
- Learn about the survey method used in descriptive research design.
- Describe the interview method of collecting data.

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## 8.3 CONCEPT OF DESCRIPTIVE RESEARCH DESIGN

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When the initial decision problem situation is either to describe specific characteristics of existing phenomenon or to evaluate current situation the researcher choose to conduct descriptive research study. The descriptive research is popularly known in the name of Ex-post facto research, as the researcher exerts no control over the variables under study he only reports the event. The descriptive research becomes the appropriate choice when the research problem is whether to describe the market phenomenon, or to evaluate current marketing mix strategies of a defined target population or market structure. When a researcher is interested in knowing the characteristics of certain group such as age, sex, educational level, occupation and income or when he is interested in knowing the proportion of people in a given population who behaved in a particular manner and making projections about them, a descriptive study is undertaken. We can say that the objective of such a study is to answer specific questions such as 'who', 'what', 'when', 'where', and 'how' of the population under study or market structure under investigation.

**Descriptive research is appropriate when the research objectives include -**

1. Describing the characteristics of marketing phenomena and to determine the frequency of their occurrence,
2. Determining the degree to which marketing variables are associated with each other, and
3. Making predictions regarding occurrence of marketing phenomenon.

### **Descriptive Research Design**

Descriptive research design adopted for conducting descriptive studies attempts to obtain a complete and accurate description of a situation. When the research problem is precise and specific and the research objectives are clear a formal design is required, it requires a complete description of all the phases that would be executed while conducting the study. It can be <sup>said</sup> that a descriptive research design is systematic; it follows a fixed format and is structured.

#### **Objectives of descriptive research design are -**

1. It helps in creating a detailed sketch or profile of the respondent population under study. A structured approach for data collection is used.
2. The descriptive research design might be temporal in nature that is; it is related to time. The description of any phenomenon might be in a stagnant time period or stretched over a period.
3. This design is used to discover the associations among variables. For example a researcher is interested in finding out the relationship between investors' income and choice of investment alternative should follow a descriptive research design to establish the correlation between the variables under study.

#### **Importance of Descriptive Research Design**

1. Unless the study design provides specified methods for selecting sources of information and for collection of data from particular sources, the information obtained may be inaccurate or inappropriate. Thus rigidity in design is required.
2. With a structured and formal design the ambiguous relationship among variables can be reduced to minimum.
3. All the aspects of the research design should be preplanned and structured so as to ensure real and complete description of the situation can be done without any scope for any modification or bias.

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## **8.4 QUANTITATIVE RESEARCH METHODS IN DESCRIPTIVE RESEARCH DESIGN**

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While conducting descriptive research study, quantitative research methods are adopted. Quantitative research places heavy emphasis on using formalized standard questions for survey and predetermined response options in questionnaires or survey administered to large number of respondents. For example quantitative research is conducted when a nationwide survey is conducted on customer satisfaction among new air conditioners purchasers of Voltas, a consumer electronic company.

As the descriptive research design is systematic, structured and formal so is the quantitative research method. In quantitative research practices, researchers are well trained and are skilled in construct development, scale measurement, questionnaire design, sampling, and statistical data analysis.

### Characteristics of Quantitative Research Method used in Descriptive research studies

- Research Goals – it requires validation of facts, estimates, relationship and predictions.
- Types of questions – structured questions are required to ensure rigidity in design so that specific objectives are achieved.
- Samples – used in the method is generally large, normally they are good representation of target populations.
- Analysis – statistical analysis is done with clearly stated tools and techniques.
- Researchers skills – the skills required for conduction of study are use of scientific and statistical procedure, translation skills and interpretive skills.
- Generalizability of results – as the sample used is large the results can be generalized. Inferences about facts and estimates of relationship can be made with the help of the study.

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## 8.5 STAGES IN DESCRIPTIVE RESEARCH DESIGN

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The descriptive research design is appropriate for the studies that are generally rigid and specific in nature in order to meet specific research objectives. As the researcher has to find specific results, the researcher should follow the plan for research as stated. Following are the steps followed while conducting descriptive research design -

1. The first step is **defining a specific research problem** very specifically and clearly so as to ensure statement of specific research objectives. This in turn ensures collection of appropriate data. A researchers at AT&T Limited, for example wants to know the sales targets achieved by the employees so as to adjust their target load and provide them training for achieving their targets effectively, a descriptive study is conducted.
2. Then the **research questions are clearly stated**, the researchers must identify the respondents who will be studied and then their aspects such as attitudes, perceptions, feelings, beliefs which will be studied. Questions such as ‘Which factors affect the achievement of sales targets by employees of AT&T Limited?’  
Further the additional *sub-questions* can be identified in order to support the research question. For instance, some sub-questions that AT&T researchers could consider as sub questions can be
  - Do the sales executives get assistance from their seniors, bosses etc.?

- What is the environment like in which these executives achieve their sales targets?
  - What are executives' perceptions of the targets?
3. The next step is to **design and develop a survey/questionnaire**. For the descriptive study a structured questionnaire is prepared with specific set of questions, thus a rigid design is used for collecting the data. Researchers must carefully plan while constructing a survey, so as to ensure appropriate and relevant data is collected. While planning a survey –
- Structured questionnaire should be used with more closed ended questions such as scaled items, ranked items, yes/no questions, checklists etc. Unstructured items are often difficult to analyze.
  - The demographic information is the most prominent section in a survey, it is used for comparing and analyzing.
  - All the questions asked in the survey should focus on a single concept.
  - Avoid using ambiguous terms if necessary provide clarification.
  - Ask general question first and then move towards specific questions.
  - Don't ask important questions at the end of the survey.
  - Important instructions that would be followed while answering the survey should be specifically stated.
4. **Send a Cover Letter** along the mailed survey, as it will inform the participant about the purpose of survey. In the letters there should be –
- Objective of the survey,
  - Detail reason for conducting the study.
5. **Select an appropriate sample** which is representative as well as appropriate in size. More representative the sample is more reliable the results are. Thus a researcher generally attempts to collect data from a larger population. Such as all of the sales executives in the region.
6. **Conduct a pilot survey** as the biggest difficulty is that the researcher realizes that the data collected is not appropriate for solving the research problem. So for avoiding such situation a pilot survey can be conducted. It is a survey conducted on a small sample population. Feedback collected from the respondents during pilot testing is used to improve the final survey.
7. The next step is **conducting the Survey**, in this step of descriptive research the researchers decides about the methods though which the surveys will reach the respondents. Face-to-face interview, telephonic interview, sending survey through e-mail, mail, personal administration etc. are the ways though which the respondents can be reached.

8. The last step is **analyzing the Data**, while reporting results the researchers should state the sample size and the response rate. While presenting the results the researchers can compare the responses of various subgroups in the descriptive study. A researcher for instance, may compare the perception of sales executives and senior executives towards sales targets provided by the company.

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## **8.6 TYPES OF DESCRIPTIVE RESEARCH DESIGN**

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To facilitate the discussion on the design of descriptive studies, two types or methods, of study are considered separately – case method and statistical method. While designing the descriptive study these two approaches must be studied differently as structure for analysis would differ in both the situation.

### **8.6.1 CASE METHOD**

Case study method is more appropriate in exploratory research than descriptive study, as discussed in the previous unit. But when the research objectives are very specific and the point of investigation are very descriptively stated then case study method can be used in descriptive research also. The applicability of the results mark the difference in the case study method used in exploratory and descriptive research. If further testing is planned then the work is exploratory. The design used also differs, while case study method in exploratory study the design is flexible but it is rigid in descriptive study.

### **8.6.2 STATISTICAL METHOD**

The statistical method is widely used in descriptive study while conducting marketing research and the method usually implied is a survey method. The statistical techniques are used for analysing the data. The techniques may vary from simple means and percentages to very sophisticated techniques. The statistical method moves away from individual cases and focuses on classes, averages, percentages, measures of dispersion etc.

When a statistical study is purely descriptive, the study design would require specific and clearly defined objectives, rigid pattern for data collection from the representative sample, and precise tool for data analysis. From the descriptive statistics researcher gains the idea about the cause and effect relationship that will help in planning marketing program.



### Check Your Progress- A

**Q1. What do you mean by descriptive research?**

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**Q2. Discuss why descriptive research design is important?**

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**Q3. Discuss the stages involved in descriptive research design.**

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**Q4. What are the types of designs used in descriptive research?**

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**Q5. State whether the following statement are true (T) or false (F):-**

- i. Pilot survey is conducted on a large sample.
- ii. Generalization of phenomenon can be easily done in quantitative researches.
- iii. The design used while using case study method in exploratory study is flexible but the design is rigid when it is descriptive study.

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## **8.7 CATEGORIES OF DESCRIPTIVE RESEARCH STUDY**

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Descriptive research is a framework used for a conclusive research it means that it is usually used by the marketer for decision making. It lacks the precision and accuracy of experimental design, yet it is applicable to a wide spectrum of situations and is more frequently used in business research. Descriptive research can be subdivided into following categories –

### **8.7.1 CROSS SECTIONAL STUDIES**

In a cross-sectional survey data is gathered from a group at a single point of time. These surveys are mainly used for collecting data related to people's opinions, beliefs, perceptions, or practices. Nature of cross sectional survey -

- The survey is carried out at a single point of time and thus the results can be applicable in the similar period of time.
- Secondly, these studies are carried out on a section of respondents only for a stated point of time.
- The similarity of the participants in a cross-sectional survey can only be presumed by the researcher, the reality may be different.

In case the study is conducted on a single population, it is termed as single cross sectional study. When it is done on more than one segment viewed as separate groups is called multiple cross sectional design. This method is used to compare groups on their opinions, beliefs, perceptions, or practices etc. These study are generally carried out in same point of time but there exists possibilities obtain data from different samples. Cohort analysis is a cross sectional survey conducted on different sample group at different time intervals.

### **8.7.2. LONGITUDINAL STUDIES**

In a longitudinal survey the participants are tracked over an extended period of time. ‘A panel of consumers specifically chosen to study their cosmetics purchasing behavior over a period of time’ is an example of longitudinal study design. Changes in respondents’ behavior, attitude, perceptions etc is studied through longitudinal surveys. Following are the characteristics of longitudinal survey –

- The study involves the selection of a group of individuals whose characteristics are same as the population for survey.
- Group is repeatedly surveyed over a fixed period of time so that the change in their behavior, attitude or perception can be studied.
- The number of panel members remains the same once they are selected.
- Either the same group of individuals or different individuals can be surveyed during the course of years.

Through these surveys qualitative and numerical information is collected and this allow the researchers in making inferences related to relationship among variables. Harvard Professor for instance who is interested in finding out the change in the attitude of management graduates while they become professionals or choose to be entrepreneurs over a period after graduating. Thus, he surveys few selected students during the period of their course, than the same group is surveyed after five years and again after ten year. Panel, trend, cohort and follow up survey are longitudinal surveys.

### **8.7.3 PANEL SURVEY**

In a panel survey a researcher surveys a similar group of individuals before and after a particular period of time. Such surveys are useful when the researcher wants to monitor the

changes over a period of time. A marketing researcher for instance is interested in finding out the change in the perception of marketing executives with sales experience of several years. The survey would be administered to them shortly after joining the sales job and again after selling for several years. Finding the similar participants after a stated period of time is the biggest problem faced while conducting a panel survey.

#### **8.7.4 FOLLOW-UP SURVEY**

In follow-up survey the similar group of participants is again surveyed after the second time which is done in the panel survey. It is a next step of the panel survey or we can say it is a third survey after several years later.

#### **8.7.5 TREND SURVEY**

In order to recognize a pattern trend surveys are conducted. The trend survey focuses on the same population of people for collecting information about their attitude, perception, behavior etc. over time. While the population is always the same, trend studies usually select different sample for the survey. For example a researcher is interested in knowing the women fashion trends, similar aged women may be the population but the sample of women chosen for the study may differ. Both long or short duration trend surveys can be conducted.

#### **8.7.6 COHORT SURVEY**

Cohort 'is a group of people with similar characteristics'. In the cohort survey individuals with similar characteristics are identified and then survey is conducted. The participants in the survey may change but the new participants would be again selected by matching the characteristics of the researched group. A marketing consultant would like to study the perception of newly recruited marketing executives' towards company's policies for credit sales. A survey is conducted on the team, then again in the next year a survey would be conducted but the respondents who have newly joined as sales executives.

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### **8.8 DESCRIPTIVE RESEARCH DESIGN METHODS USED IN CONDUCTION OF DESCRIPTIVE STUDIES**

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As it is already discussed earlier in this unit, when the nature of initial decision problem is either to describe specific characteristics of group under study or to define a specific group descriptive research design is selected. If the research question represents management's decision problem about known specific group or any difference or relationship is to be established descriptive research design adopted. The descriptive research design follows

quantitative method that helps the researcher in coming up with inductive logic and inferences.

While applying descriptive research design the next focus is on how the primary data is collected. There are two fundamental approaches used for collecting data, observation and asking questions. For the purpose of asking question two different formats can be applied a survey method or even interviews could also be conducted.

Approaches for data collection under descriptive research design –

- Observation Method
- Asking Questions
  - Survey Methods
  - Interview Method

In the next portion of the unit all these methods will be discussed in detail.

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## **8.9 USE OF OBSERVATION METHOD IN DESCRIPTIVE RESEARCH DESIGN**

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Observation, is a method of collecting data for conducting descriptive as well as causal research. It involves observing behavior and systematically recording the results of those observations. Observations are guided by the research questions, thus they are conscious and planned. Commonly used in behavioral sciences, it is the gathering of primary data by investigator's own direct observation of relevant people, actions and situations with or without the consent from the respondent without directly communicating with them. For example 'A hotel chain asks a researcher to find out the service quality and cleanliness in the hotel coffee shop, thus the researcher chooses an observation method by posing as guests into its coffee shop to check the cleanliness and customer service'. The observation conducted for the research are systematically recorded, often uses an observation check list. The data collected through observation is analyzed with both quantitative and qualitative methods.

### **Advantages of Observation**

- Observation overcomes one of the key disadvantages of interviews and questionnaires, i.e. that the responses provided may not be accurate. Such inaccuracies occur due to the respondents' lack of awareness of their own behavior, lack of an accurate memory of what they did or even due to deliberate lies or desire to tell the researcher what they think the researcher wants to hear.
- Observation can be used where it is not possible to collect data using interviews or questionnaires, such as when the study participants are animals, babies, young

children, persons who do not share a common language, or persons with some forms of disability.

### **Limitations of Observation**

- The result obtained through observation method cannot be generalized.
- Observation of behavior may affect the behavior of individuals the researcher wants to observe, e.g. purchaser may behave differently if there is an observer present while they are purchasing than when there is no observer.
- Events that are unpredictable, so the researcher does not know when and where to be present, e.g. mob riots, mass behavior in situation of crisis.

### **Types of Observation**

- Structured Observation method – it is used for conducting descriptive research, when a researcher is completely aware of the specific behavior that is to be observed a structured observation method is used. In this situation a trained observer ignores all other behavior and only observes the required behavior. Researcher ensures collection of relevant data related to pre-specified behavior or event through a checklist. For example – a marketer is interested in knowing the label checking and package observing behavior of organic food buyers, a structured observation method can be used for collecting such data.
- Unstructured Observation method – it is generally used for exploratory research. It places no restriction over the observer regarding what should be recorded. A trained observer is appointed for the purpose, he is briefed the research problem and information requirement is stated to him and then he is allowed use his discretion for recording the behavior actually required.
- Participant Observation – in it the observer joins the group as a participant and then he observes the individuals in the group.
- Non-participant observation – in it observer observes the group from outside and he does not become the part of group while observing the behavior.
- Disguised observation – in such an observation the observed individuals are not aware of the researchers' observation. Advantage of disguised observation is that the individuals who are being observed reflect natural behavior as they are unaware of such an observation.

There can be two forms of observation 1) human observation – in which the observer himself in a framed setting observe the behavior of the people under study along with the situation. The observer does not send any verbal/non verbal cues to the respondent and remains neutral. The biggest advantage is the observer infers and can record the events but the similar advantage can be considered as a limitation as the inference made by the researcher may lead to bias. 2) Mechanical Observation – in this method the recording is done through electronic

equipments such as cameras, pupilometers – a mechanical instrument used for recording the diameter of subject's pupil, it is normally used for gauging the interest among the people under study, Eye tracking monitors – a device that observes and records a person's unconscious eye movements, galvanic skin device – it is an electronic equipment used to measure subject's involuntary changes in the electronic resistance of his/her skin.

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## **8.10 USE OF SURVEY METHOD IN DESCRIPTIVE RESEARCH DESIGN**

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Survey research method is extensively used in descriptive as well as causal research. Survey method helps in collecting the raw data from large group of people administered through an interview or a questionnaire. The participant answers structured and uniform questions, then the responses are then tabulated in a planned, structured and precise manner. To ensure that reliable and valid data is collected questionnaire should be carefully developed.

Majority of marketing research is conducted through survey method, in these cases the research problem are well defined and data requirement are specifically stated. Survey focuses on collecting standardized raw data that allow the researcher to create information for precisely answering 'how', 'who', 'what', 'where' and 'when' of any of the research questions.

### **Advantages of Survey Method**

- Survey method help the researcher in incorporating large sample sizes at a relatively low cost and it ultimately increases the generalizability of the results obtained by the researcher.
- The method provides the researcher the ability to distinguish small differences among the population under study on the basis of all the demographic factors.
- The survey is easier to implement as no sophisticated devices are needed for conducting the survey, the data can be easily recorded, administered and the answers can be recorded in the uniform manner so as to create an ease in analysis.
- As the data collected through survey are quantitative in nature any statistical analysis could be conducted on the data.
- A survey can help in gathering the data that cannot be collected with the help of observation, for example 'As an observer will observe a choice person make while buying but a survey can ensure collecting the data regarding why that choice is being made'.
- The survey method is quick and low cost as compared to observation and experimental method.

### **Disadvantages of Survey Method**

- The biggest difficulty the survey method face is the development of an appropriate instrument for collection of data, there is likelihood of collecting irrelevant data.
- The survey method face the difficult of non response from the respondents, less than half completely filled questionnaires would be return to the researcher.
- Using survey method in-depth data cannot be collected.
- The major limitation the survey method face is that it presumes the truthfulness of the respondent.

### **Types of Survey Method**

There are probably many ways of collecting primary data nevertheless the survey method can be classified as –

- Person-administered surveys – in this technique presence of a skilled and trained interviewer is required who can ask and record answer of the respondents. These person administered survey can take different forms on the basis of place of interaction of interviewer and the respondent; In-home interview, Mall-intercept interview, Purchase-intercept buying.
- Telephone-administered survey – in today's scenario maximum marketer use telephone administered survey for collecting the data. In the method the question and answer are administered through telephone. Compared to personal interview these method are cheaper, faster and are more suitable when data is to be collected from big number of respondents. In case any information is left or any clarification is required the interviewer can call back respondents. For analysing the data the telephone calls can even be recorded.
- Computer-assisted Telephone Interviewing – Integrated telephone and computer system in which the interviewer reads the questions of a computer screen and enter respondents' answers directly into the computer program. Most research firms have completely computerized the central location telephone interview process. Nowadays more technical methods are being used 'Completely automated telephone survey', in this method a telephone interviewing system is used in which a computer dials a phone number and a recording is used to introduce and administer the survey, leaving the subject to interact with computer directly.
- Self-administered Surveys – it is a data collection technique in which the respondent reads the survey questions and records his or her own answers without the presence of the interviewer. For example 'A self administered survey can be used to find out the reason of purchase or non-purchase of any product. There can be various types of self administered surveys -

- Direct mail Survey - in this a self administered survey is sent to the respondent through mail. The researcher carefully selects a list of target population of interest. It is a cost effective method of collecting the data.
- Mail panel survey- a mail panel survey helps in avoiding the problem of non-response in direct mail survey. In this a questionnaire is sent to a group of individuals who have agreed to participate in the survey. On such panel longitudinal survey could also be conducted.
- Drop-Off Survey – in this the survey are hand delivered to the respondents and after the completion of the survey they are returned by mail or are picked personally. These surveys ensure a good response rate but they might be expensive.
- Online Survey Method – internet allow the researcher in faster data acquisition, analysis and reporting of results. It increases the rate of response by reaching the target audience faster at a very less cost. The researcher can use E-mail for sending the survey. The research can directly use various survey oriented websites where it is supposed that the target audience of the survey normally visits, so that the target audience can be easily approached.

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## **8.11 USE OF INTERVIEW METHOD IN DESCRIPTIVE RESEARCH DESIGN**

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Interview is another way of asking question to the respondents so as to collect the data for the purpose of solving a specific research problem. In the interview method the researcher ask the question and the respondent responds, it is one to one interaction between the interviewer and the interviewee. The purpose of the dialogue is research specific and ranges from completely unstructured to highly structured. For example ‘a marketer is interested in finding out the soft drink consumption pattern of customers’, an interview could be conducted for the purpose of collecting the data.

### **Interview Process**

- Interview Objective – the interviewer should be clear about the research objective so that information need could be clearly specified, On the basis of the skills the interviewer possessed and the research question stated the interview could be structured or unstructured.
- Interaction - a typical interview may take from 20 minutes to an hour. In case of face to face interaction the researcher must identify the place where he can find respondents with homogeneous characteristics or fix the place with the consent of the respondent. A skilled researcher can evaluate the situation and can ask the question according to the interest of the researcher. Open ended or closed ended questions could be asked by the researcher.

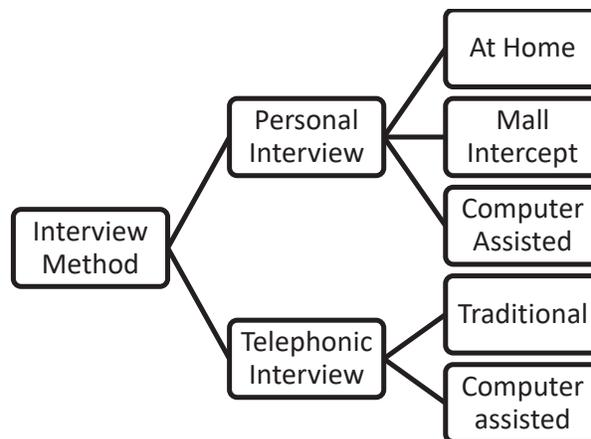
- Recording the responses – the interviewer may take notes or he may even opt for audio or video recording for the purpose of analysing the responses
- Analysis and interpretation – if a structured and a well formatted approach is being used for collecting the data and uniform data is collected from the respondents quantitative analysis could be done but if unstructured data is collected qualitative ways of analysing would be used.

### Types of interview

- Structured Interview – a very specifically defined format is framed while conducting the structured interview. This format has highest reliability and validity. There is considerable structure to the questions and the questioning is also done on the basis of a prescribed sequence. The structured interview method is normally used in descriptive research.
- Semi-Structured Interview – this has a lesser defined format. The research objective is made clear to the interviewer but the questions, sequence, and language are left to the investigator's choice. The subsequent direction of the interview is determined by the response of the respondents. A skilled interviewer is required while conducting such an interview.
- Unstructured Interview – it has no defined guidelines. Usually the method is used in exploratory studies where the interviewer even the researcher is not aware what direction the interview is going to move.

### Category of Interview

There are various kinds of interview methods available to the researcher.



**Figure 8.1 Classification of Interview Method**

- Personal Interview – it is a one to one interaction method where the interviewer and the respondents interact. The interviewer along with asking the questions can probe the clarification of the answers. He can also observe the setting and the behaviour of the respondents in order to generate better understanding of the respondents' responses. It can be further classified as -
  - At home – where the interaction happens at respondents place. In such a situation the interviewer along with the interaction can observe the respondents lifestyle.
  - Mall Intercept – Conducting the interview at a shopping mall, such an interview is conducted to understand the purchasing behaviour of individuals
  - Computer assisted personal Interviewing – in this process the respondent respond to the questionnaire on the computer screen, the interviewer personally monitors the whole process.
- Telephone Method – it replaces the personal interaction by questioning on the telephone set. It is a cost effective as well as less time consuming method. Geographical boundaries are not a constraint in telephonic interview.
  - In the traditional method the interviewer interacts with the interviewee where as in the computer assisted telephone interviewing the interviewer is replaced with the computer.



### ***Check Your Progress- B***

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**Q1. Discuss descriptive research categories.**

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**Q2. Write a short note on observation method for data collection.**

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**Q3. What are advantages of survey method?**

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**Q4. What are the stages involved in the interview process?**

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**5. State whether the following statements are true (T) or false (F):-**

- i. Different groups of people tested over a single stretch of time is a special characteristics of a longitudinal design.
- ii. TRPs (television rating performance) of daily soap on TV are generally based on cross-sectional design.
- iii. 'Descriptive research design does not require quantitative statistical analysis.
- iv. Married couples are the unit of analysis in a cohort analysis.

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**8.12 SUMMARY**

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Descriptive research study is also known as Ex-post facto research, it requires the researcher to reports the event as it. Descriptive research design adopted for conducting descriptive studies is systematic; is structured and it follows a fixed format. While designing the descriptive research case study and the statistical methods are used. Descriptive research can be further divided into cross sectional and longitudinal study. In the cross sectional study a section of population is studied at a single time period and reporting on the occurrence of the variable under study. In longitudinal study a selected sample is studied at different intervals of time to measure the variable under study. The fundamental approaches used for collecting data for conducting descriptive study are observation, survey method and interview method. The observation method is used by the researcher in all types of research design. The major benefits are accuracy of collecting data and detailed behavioral data can also be recorded using observation method. The main advantage of survey method is the ability to accommodate large sample sizes, generalizability of results, ease of administering and recording questions and answer, increased capabilities of using advanced statistical analysis. Another popular method is interview method which involves one to one interaction between the interviewer and the interviewee the interview can be structured, semi-structured and unstructured. It can take personal form or data could be collected with the help of telephonic interview. A descriptive researcher study design is popularly used by the researcher while conducting marketing research.



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## 8.13 GLOSSARY

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**Descriptive Research Design** – provide a comprehensive and detailed explanation of the phenomenon under study. However it lacks the precision and accuracy of experimental design.

**Quantitative Research Method** – Research places heavy emphasis on using formalized standard questions and predetermined response options in questionnaire or surveys administered to a large number of respondents.

**Survey Research Methods**- research procedures for collecting large amounts of raw data using questions and answer formats.

**Person-administered Survey** – Data collection technique that requires the presence of a trained human interviewer who asks questions and records the subjects' answers.

**Observation** – systematic activities of witnessing and recording the behavioral patterns of objects, people and events.

**Human Observation** – in this technique the data is collected by an experienced observer who records text, subjects' action, and behaviors.

**Mechanical Observation** – in this technique mechanical devices are used for collecting data. These devices record human behavior, events, or marketing phenomenon.

**Personal Interview**- it is a research specific one to one interaction between the investigator and the respondent.

**Computer Assisted personal interviewing**- it is called so as there is usually an interviewer present at the time of the respondent's computer assisted interview



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## 8.14 ANSWERS TO CHECK YOUR PROGRESS

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### Check Your Progress –A

Q5. Answer

- i. False
- ii. True

iii. True

### **Check Your Progress –B**

#### **Q5.Answer**

- i. False
- ii. False
- iii. False
- iv. False



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## 8.17 TERMINAL QUESTIONS

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- Q1. 'While designing the descriptive study two approaches must be studied', describe the approaches in detail.
- Q2. Identify and discuss the characteristics of quantitative research while conducting the descriptive research study.
- Q3. Discuss with example where a marketer can use descriptive research. In details state the structure of the design while conducting the study.
- Q4. Majority of the research design are exploratory cum descriptive in nature in business research. How?
- Q5. Distinguish between cross sectional and longitudinal designs. Give example of situations where these design could be used.
- Q6. Define the observation method in detail. Discuss different types of observation methods available to the researcher?
- Q7. Develop as cross table of the factors used to select from person-administered, telephone-administered, self-administered and computer assisted survey design.
- Q8. H&R Robinson Company is facing problems concerning new product introduction since last decade. What would be your suggestion for the company while they plan to conduct a descriptive research?
- Q9. Conduct a structured interview to obtain information about:
- Demographics
  - Lifestyle
  - Role models
  - Friends – the relevance of friendship in his/her life
    - What are the qualities he/she looks for in a friend?
    - Describe his/her friendship group.
    - Analyze himself/herself in terms of kind of friend he/she is?
    - A story he/she associate with friendship.
- Q10. A researcher is interested in 'knowing the brand preference of watch among young students', for the same he chooses observation method. Help him plan the observation design he may follow while conducting the research.

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## UNIT 9 CAUSAL RESEARCH DESIGN

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### 9.1 Introduction

### 9.2 Objectives

### 9.3. Concept of Causal Research

### 9.4 Concept of Causal Research Design

### 9.5 Key Concepts and Types of Variables in Causal/Experimental Design

### 9.6 Experimental Research Design Principles

### 9.7 Experimental Validity

### 9.8 Classification of Experimental Design

### 9.9 Pre Experimental Design

### 9.10 True Experimental Design

### 9.11 Quasi Experimental Design

### 9.12 Statistical Design

### 9.13 Summary

### 9.14 Glossary

### 9.15 Answer to Check Your Progress

### 9.16 Reference/ Bibliography

### 9.17 Suggested Readings

### 9.18 Terminal & Model Questions

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## 9.1 INTRODUCTION

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In the previous unit we learned about the descriptive research design. In this unit we will discuss the causal research design. The causal research design is most structured and formal research design and is used to draw inferences regarding causality. Causal research is also known as hypothesis research design and is popularly known as experimental research design. In these designs the researcher tests the hypothesis of causal relationship between two or more variables. These studies require procedures that would not only decrease bias and

enhance reliability, but also facilitate deriving inferences about the causality. Generally, experiments satisfy such requirements. Hence, when research design is discussed in such studies, it often refers to the design of experiments.

Causality or causal research holds a deterministic philosophy of cause and effect relationship between variables. In unit 6 Research design we have already discussed the concept of variables, independent variables and dependable variables. In the current unit we will discuss the causal research and we will identify several basic experimental designs under the causal research studies.

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## 9.2 OBJECTIVES

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After reading this unit you will be able to:

- Understand the concept of causal research.
- Learn about the causal research design.
- Understand the important concepts of causal research design.
- Understand the Principles of Causal Research Design.
- Describe the concept of experimental validity.
- Learn about classification of causal research design.

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## 9.3 CONCEPT OF CAUSAL RESEARCH

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For establishing cause and effect relationship between variables causal research is carried out, it is a data-based research that leads to results and findings that can be verified through observations or experiments. Experimental research seeks the proof of association of variables. Experiments are much more effective than descriptive research in establishing cause and effect relationship. Experimentation is a powerful tool at the disposal of the marketing research that enables him to establish causal relationship among variables. The concept of causality expresses the relationship between cause and effect, it is the situation in which an independent variable is the factor or is one of several factors that produces variation in a dependent variable.

For example A pharmaceutical company is interested in knowing effectiveness of a innovative medicine for treating diabetes, for launching the drug in the market. For the same an experiment is conducted a group of patients is chosen to whom the medicine is administered for a specific period of time. This group is known as test group. Another group of patients, same as test group is chosen but the medicine is not given is known as control group. Data is collected the recovery results of control group and test group are compared to find out the efficacy of the medicine. The research aims at testing the causal relationship between the use of medicine the independent variable and patient recovery the dependent variable.

According to **Green Wood**, 'Experiment is a means of proving the hypothesis whereby the causal relations between two facts is studied.' As the definition clearly states that the experiment is way through which the researcher sates an assumption that is a hypothesis to be tested in which the cause and effect relationship would be studied among two variables. **Fesinger** states in his definition that 'The essence of an experiment may be described as observing the effect on a dependent variable of the manipulation of an independent variable.'

### Necessary conditions for Making Causal Inferences

- Concomitant variable – it is the extent the which cause X and effect Y occur together. This means that there should be strong association between the variables under study and both of them should occur together. For example- in order to test training programme and its effect on sales both the variables should associated such as the training should be for increase in sales and the sales figures studied should be after the training.
- Time sequence of variables – the causal variables must occur before or at the same time as the effect variable. The sales training should occur before the increased sales figures are studied.
- Absence of other causal factors – it is already studied that while studying the causal relationship among variables, various external variables can effect the results such a increased in sales can be due to other reasons also such as salesperson's experience, competitors strategy etc. those variables should be controlled in an experiment.

Causal research is a scientific method it gives more precise, accurate and reliable results. It is more or less like an observation under controlled conditions. It is a systematic and logical method for answering the questions. In this the researcher seeks to evaluate something new. It leads to contribution to the already acquired fund of knowledge. Essential elements of an experiment are control, manipulation, observation.

### Elements of an experiment

- **Control:** In order to reduce the effect of all the extraneous variables the element of control is used, through this the external variables are controlled. If the effect of such variables cannot be reduced then the effect of these variables is measured. In research on social phenomenon high degree of control is not possible as it is in laboratory situation. For the purpose of controlling the variables related to the independent variable following methods are used for controlling-
  - **Random assignment of subjects to groups** - It means that subjects are assigned in such a way that every member has an equal opportunity of being chosen.

- **Matching subjects with random assignment** – The groups are randomly assigned with the subject to match individual's subjects on as many extraneous variables as the researcher can identify.
- **Random assignment on the basis of homogeneous selection** - It is done to make groups comparable on an extraneous variable so as to select groups those are as homogenous as possible on the variable. The variable may be like socio-economic –status and sex etc.
- **Manipulation** - In the experimental method manipulation is done to create a setting for the happening of the factor whose performance is to be studied under conditions in which all other factors are controlled. Variables which can be manipulated may be personality characteristics, attitudes, teaching methods, type of motivation etc.
- **Observation** - In the experimental method when measurement is not possible the technique of observation is applied.
- **Replication**- Though researcher makes continuous efforts to control extraneous variables, some extraneous variable and some discrepancies remain and influence the results. Repetition of such experiment helps in measuring the effect of such variables.

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## 9.4 CONCEPT OF CAUSAL RESEARCH DESIGN

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### Causal research design

The theory of causal or experimental research design originated in the field of agriculture research, Prof. Fisher is considered as the pioneer of this research design. At Rothamsted Experimental Station in England, a centre for Agricultural Research he did his pioneering work on the experimental research design. Prof. Fisher found that by dividing plots into different 'blocks' and then by conducting experiments in each of these blocks whatever information that were collected and inferences drawn from them happened to be more reliable. This was where he was inspired to develop certain experimental designs for testing hypotheses concerning scientific investigations. Nowadays, the experimental design is used in researches relating to almost every discipline of knowledge. Prof. Fisher laid three principles of experimental designs 1) Replication, 2) Randomization, 3) Local Control, these would be explained in detail in the coming part of the unit.

### Characteristics of Experimental Research Design

- A researcher should develop an assumption, a hypothesis so as to check the results.
- In the experimental design the researcher need to put efforts to get first hand information from appropriate source in order to ensure reliable results.
- The right amount of data is also an important parameter for getting reliable results.
- For coming up with the desired results the researcher creates an experimental set up in which he can control as well as manipulate the variables under study.

- Theories, concepts, laws etc are developed through the experimental design the reason being its precision and definiteness.

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## 9.5 KEY CONCEPTS AND TYPES OF VARIABLES IN CAUSAL/EXPERIMENTAL DESIGN

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All marketing research practices require either manipulation or measurement of variables. We have already discussed all the key concepts related to the research design in details in unit six but in this unit in short we will recapitulate the types of variables used in experimental research design -

- Variable – are the observable and measurable elements of an item or an event. They are the qualities the researcher studies.
- Functional Relationship – it is an observable and measurable systematic change in one variable as another variable changes.
- Dependent Variable – are also called criterion variable. These variables measure the effect of treatment on the test unit.
- Independent Variable – also called predictor or treatment variable. These variables are directly manipulated by the researcher.
- Control Variables – are controlled by the researcher in order to study the functional relationship between dependent and independent variables included in the experiment.
- Extraneous variable – these are uncontrollable variable that are not the part of the research study but may affect the dependent variable.
- Control - the term ‘control’ is used when the study is designed to minimize the affect of extraneous variable.
- Control Group - it is group which is exposed to usual condition no experimental stimulus is induced it is studied in normal conditions.
- Experimental Group - is a group exposed to some experimental condition.
- Treatment – it is an independent variable that is manipulated in the experiment researcher to assess its effect on behaviour.
- Experiment- a controlled method of observation in which the value of one or more independent variables is changed in order to assess its causal effect on one or more dependent variables.
- Hypothesis - testable statements or assumptions of presumed relationships between two or more concepts.
- Units of Analysis - the specific objects or elements whose characteristics we wish to describe or explain and about which data are collected.

The above stated variables are explained with the example of a cosmetic company interested in knowing effectiveness of a new advertisement in changing the brand image of a skin care brand. For the study the *unit of analysis* is the customers who are aware of the brand image of the product of the cosmetic company. An assumption is made that there is no change in the

brand image (*dependent variable*) of the company among customers after watching the new advertisement (*independent variable*). *Experiment* is conducted, a group of customers is chosen to whom the new advertisement would be shown. This group is known as *experimental group*. Another group of customers same as test group is chosen but the new advertisements if not shown to them that group is known as *control group*. The company collects the data, the brand image stated by the customer in control group when compared with the test group will show effectiveness of the advertisement in building a new image of the brand. Various extraneous variables may affect the functional relationship between the dependent and the independent variable such as price of the product or change in the distribution strategy of the company.

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## 9.6 EXPERIMENTAL RESEARCH DESIGN PRINCIPLES

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The experimental designs is based on three important principles of Principle of Replication; Principle of Randomization; and Principle of Local Control.

- 1) ***Principle of Replication*** – the principles relies on the logic of repetition of the experiment more than once. Under this various experimental units get exposed to the treatment and thus it ensured experiments’ statistical accuracy.  
Two varieties of seeds for instance are to be tested so the field is firstly divided into small units and then the first types of seed is administered on few fields and on few fields the second variety is sowed. The yield is then compared and the results show which seed is better.
- 2) ***Principle of Randomization*** - refers to random assignment of test units to experimental groups. . Treatments are also randomly assignment the experimental group which protects the dependent variable from the effect of extraneous factors.  
The variety of seed for instance can be randomly assigned to different parts of the field so that the effect of soil fertility can be easily measured.
- 3) ***Principle of Local Control*** – in it the extraneous factor are varied deliberately by the researcher so that their effect can be measured.  
The field for instances is divided into homogeneous parts, known as blocks. These blocks are further divided into parts equal to the number of treatments. Then the treatments are randomly assigned to these parts of a block. Each block ensures that the level of extraneous factors is fixed.



**Check Your Progress- A**

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**Q1. What do you mean by causal research?**

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**Q2. Discuss the characteristics of causal research design?**

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**Q3. Discuss the types of variables in causal research design?**

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**Q4. Discuss the principle of experimental research design.**

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**Q. 5 State whether the following statement are true (T) or false (F)**

- i. In an experiment one or more variable is manipulated to measure its effect on the dependent variable.
- ii. Treatment is a name given to the Independent variables.
- iii. Principle of replication helps the researcher in randomly assigning the treatment so that the experimental error can be reduced.

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## 9.7 EXPERIMENTAL VALIDITY

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Experimental validity refers to ensuring that the research actually measures what it attempts to measure. Validity suggests that the measuring device is free from errors. The researcher has two goals while conducting an experiment, first, to draw valid conclusion about the effect of independent variable on the dependent variable and secondly, to make generalization of the results to a wider population, thus ensuring the two makes a research valid.

Types of validity –

- **Internal Validity** – tries to examine whether the observed effect on dependent variable is actually caused by the treatments. It is the minimum criterion without which an experiment is useless. It means that some uncontrolled extraneous factors do not affect the dependent variable. Few examples of extraneous factors that are to be controlled for obtaining internal validity are maturation of the subject with the passage of time, experience in pre-test reflecting itself in the post test, change in the calibration of the measuring instruments, tendency for extreme scores to regress towards the mean etc.
- **External Validity** - The crucial point of any experiment is the applicability of its findings. It refers to generalization of results. The researcher needs to identify the population, settings, time, variables on whom the results can be generalized. External validity can be obtained by controlling factors such as selections of homogeneous sample from the population, the effects of experimental procedures etc.

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## 9.8 CLASSIFICATION OF EXPERIMENTAL DESIGN

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Before talking about the classification of causal research design we will talk about the types of experiments a marketing researcher can conduct. Marketing experiments can be conducted in a laboratory or in a field. In laboratory experiment, test subject usually the consumers are brought to a conference room and are exposed to an experimental variable, such as television commercial. In field experiment, the experimental variable is taken to the field for example, a new package is tested in a store or a new product is taken to consumers and they are asked to try it in their homes.

To begin the discussion of specific experimental design it is useful to visualize an experiment in a simplified form. The researcher has a hypothesis that if an experimental variable such as advertising, is applied to an experimental unit such as group of consumers, it will have measureable effect such as number of customers remembering the brand name. A plan is developed for controlling conditions related to the experiment so that the experimental units can be exposed to the experimental variable and the results measured.

The causal design can be classified as pre-experimental, quasi-experimental, true experimental and statistical. The main difference among these groups is the degree of control that the researcher can exercise in the design and execution. Experimental design

involves obtaining the proper information within an acceptable accuracy range for a minimum cost.

- 1) Pre-experimental design
- 2) True experimental design
- 3) Quasi-experimental design
- 4) Statistical design

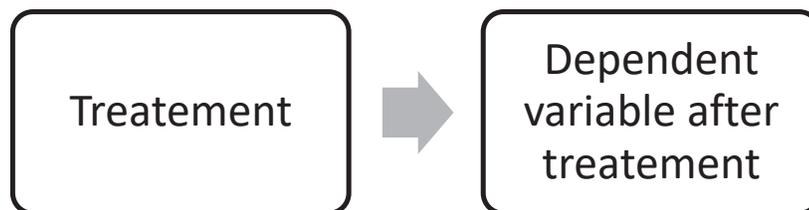
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## 9.9 PRE EXPERIMENTAL DESIGN

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The pre-experimental designs are also known as crude experiments. These designs are characterised by an absence of randomization of test subjects. Their major weakness is the inability to meet internal validity criteria due to lack of equivalent group comparison. The three specific pre-experimental designs available to marketing researcher are –

1. One- shot Study – this design is also known as ‘After Only’ design. As the name suggests, this design consists of applying the experimental variables such as advertising to an experimental group recall of brand name. This design fails to control the effect of extraneous variable.



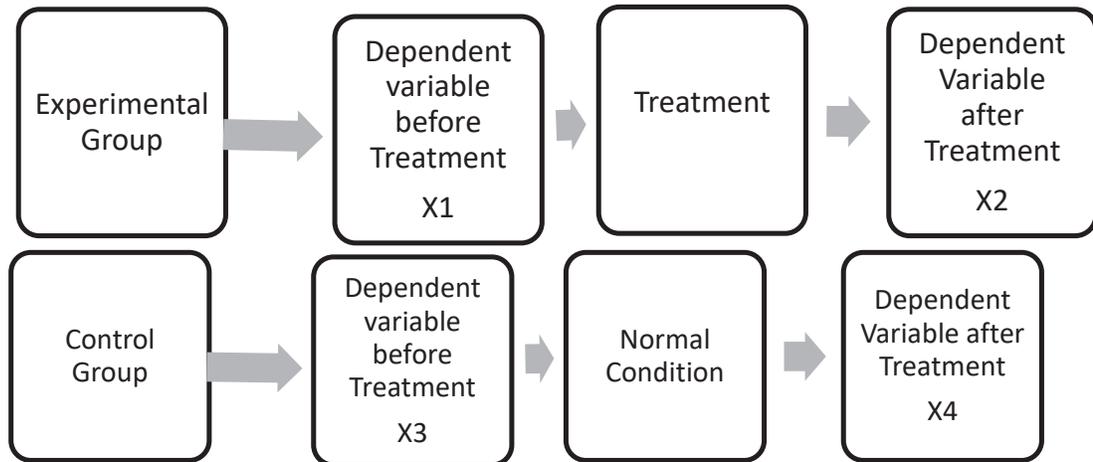
**Fig 9.1 . One shot Study ‘After Only Design**

2. **One Group pre-test-post-test design** - also called ‘Before-After without control group’ design. In this design the researcher measures the dependent variable before exposing the subjects to the experimental variable and again after exposure to the experimental variable. The difference between the two is considered to be a measurement of the effect of the experimental variable. In this only one group is exposed to a treatment that group is the experimental group. The effect of treatment is measured by comparing the experimental group before treatment and after treatment. For example – an advertiser takes a pre test of ad-recall and then the customers are exposed to an ad during a TV program it is the treatment and then a post test is conducted to measure the ad recall.



**Fig9.2. Before and After Without Control Design**

3. **Static Group Comparison** – also known as ‘Before and After with control group’ or two group experimental design. In this design there exists experimental group that is induced with a treatment and a control group that is studied under normal conditions. Groups with similar characteristics are chosen so that they can be interchangeable. Both the groups are measured at the same time, but no experimental variable is introduced. For example a marketing researcher is interested in finding effect on attitude of customer after receiving direct mail advertisement. A group of respondents is selected and a pre-measurement is administered among all of them. Half of the respondents then receive the direct mail advertisement and half receive nothing. One week after the advertisement is delivered both groups of respondent are re-measured.



**Fig. 9.3 Before and After with Control Design**

Firstly, the difference between the after and before measurement of the control group is acquired ( $X4 - X3$ ), it shows the results of uncontrolled variables. Then the after and before measurement of experimental group is obtained ( $X2 - X1$ ), then the final result is obtained by subtracting the difference of the two measurements ( $X4 - X3 - (X2 - X1)$ ).

## 9.10 TRUE EXPERIMENTAL DESIGN

Randomization principle is applied in the true experimental design. Researcher can randomly assign test units and treatment to an experimental group. The researcher with the help of the true experimental design is able to eliminate the effect of extraneous variable from both experimental and control group. There three forms of true experimental design

1. **Pre-test-Post-test, Control Group** – also known as ‘Before and After with control group’. In this design the experimental and control group are selected randomly. Treatment is induced on experimental group and control group is studied under normal condition. The random selection of groups ensures that the effect of all extraneous variables can easily be measured. For example a researcher is interested in finding out the effect of promotional message on automobile knowledge of individuals. A group of customers are randomly selected. Everyone is measured on their automobile knowledge. Then half of them are randomly selected as experimental group and half as control group. Promotional messages are send to the experimental group and then after an acceptable period of time, the ‘automobile knowledge’ would again be administered of all the subjects.

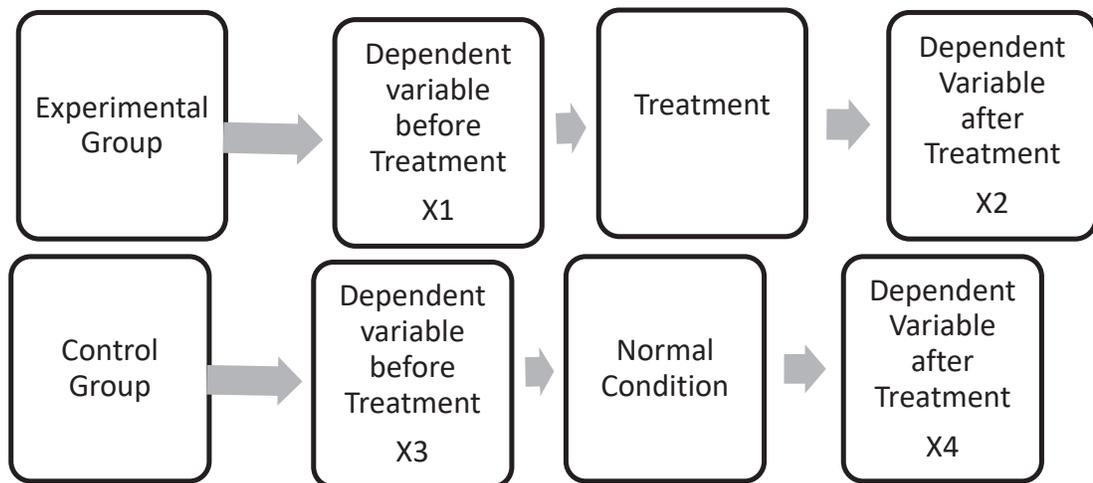
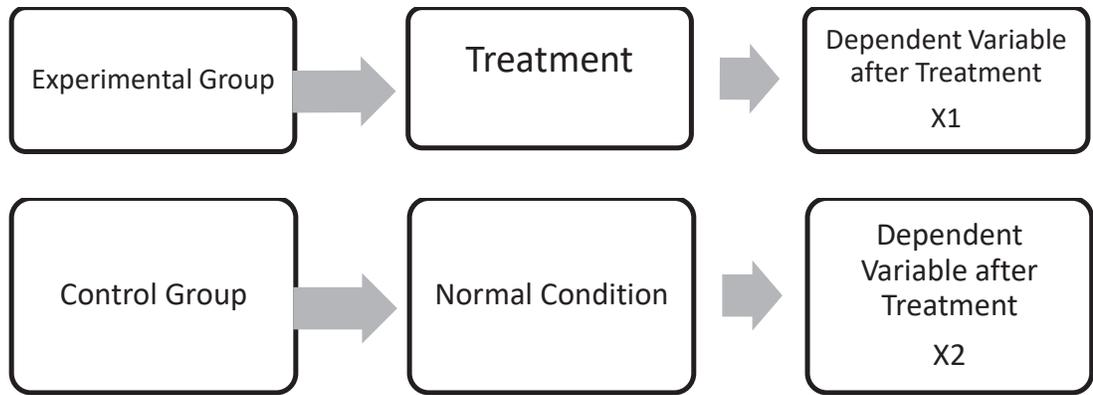


Fig. 9.4 Pre-test- Post-test, Control Design

The effect of treatment is measured by  $(X1-X2) - (X3-X4)$ . The difference among dependent variable between after and before measurement in the experimental group  $(X1-X2)$  shows the effect of treatment and the extraneous variables. The difference between among dependent variable after and before measurement in the control group  $(X3-X4)$  shows the effect of extraneous variable. Thus a researcher an exclusively find the effect of treatment and extraneous variable with the help of such experiment.

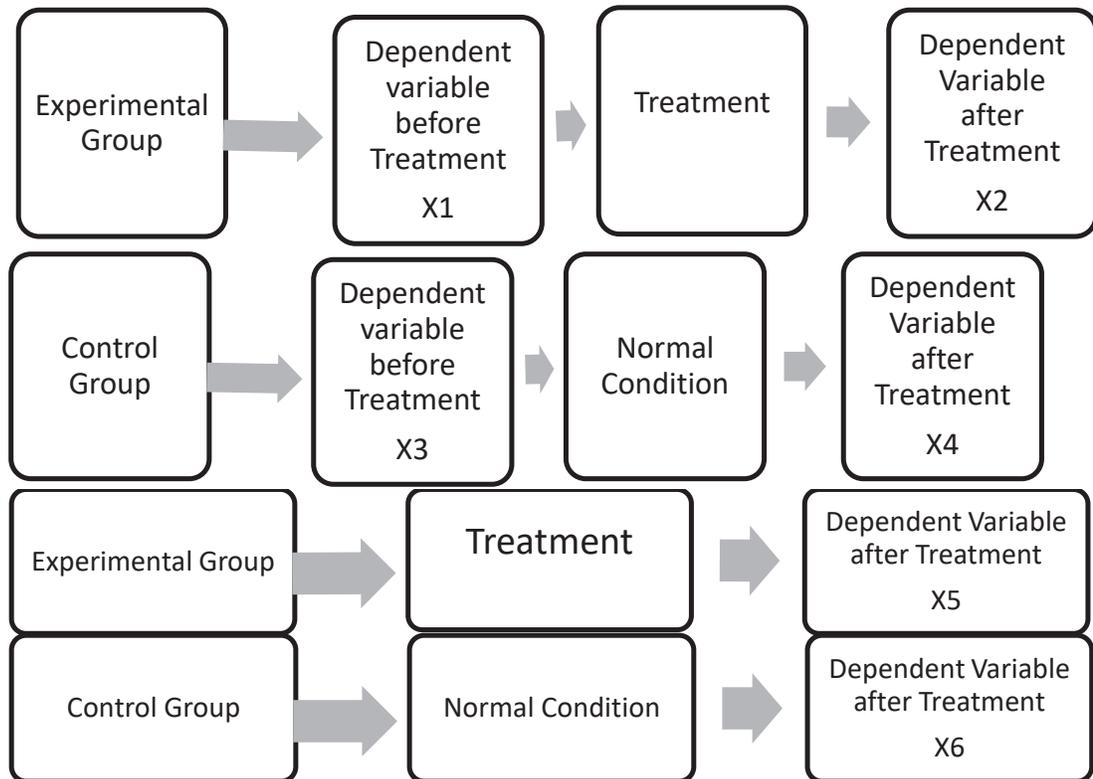
2. **Post-test Only Control Group** – also known as ‘After only with Control group’, it is similar as the previous design but the only difference is that the only post results are measured and the pre test is not conducted. The design ensures the principle of randomization. This design is widely used in marketing research.



**Fig. 9.5 After Only with Control Design**

The result is measured by (X1-X2) which will show the result of the treatment.

3. **Solomon Four Group** - also known as four group six study design. This design helps the researcher in removing the influence of extraneous variable. Through the design the researcher learn more about validity both internal and external. It is a combination of ‘Before and After, control design’ & ‘After only, control group’ design.



**Fig. 9.6 Solomon Four group Design**

The effect of the treatment can be measured in several ways such as  $X_2 - X_1$ ,  $X_4 - X_3$ ,  $X_6 - X_5$ ,  $X_4 - X_3$ , and  $(X_2 - X_1) - (X_4 - X_3)$ . The combined effect of history and maturation may be estimated by  $X_6 - X_1$ ,  $X_6 - X_3$ ,  $X_4 - X_1$ . This design is very useful in establishing cause and effect relationship in businesses.

## 9.11 QUASI EXPERIMENTAL DESIGN

This design lies in between the pre-experimental design which has little or no control and true experimental design which is based on randomization. This design is appropriate when the researcher can control some variables but cannot establish equal experimental and control group based on randomization. Most popular quasi experimental design are-

**1. Non-equivalent Control Group** – as the name suggests the experimental and the control group are not equivalent. For example in a marketing research quasi experiment recruits the experimental group based on subjects' interest or desire to participate, such as selecting the test unit as customers from similar store, whereas control subjects are selected on the basis of their availability.

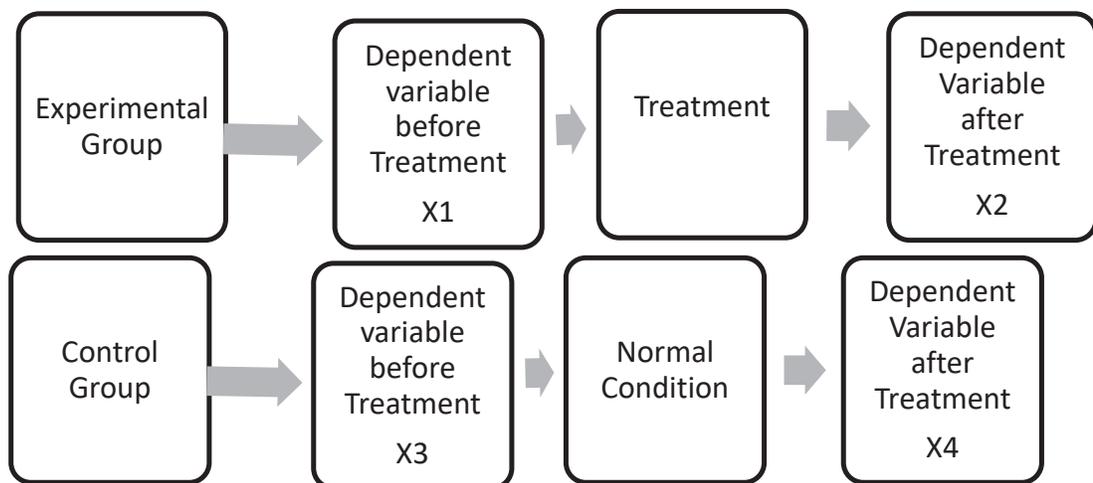


Fig. 9.7 Non equivalent Control Group

$X_3 - X_1$  measures the difference between the experimental and control group.

**2. Separate Sample Pre-test-Post-test** – this design is used when it is impossible to determine who receives the independent treatment, but the dependent variables can be determined. This type of design is often used, when the population is large, a pre-test measure will not produce any meaningful information. For example an advertising agency is launching an advertisement campaign for testing the image of the company it first draws a two sample of test units. One sample is interviewed about their perception of company's image prior to the campaign. After the campaign ends, test subjects in the second group are interviewed about their perception of the company.

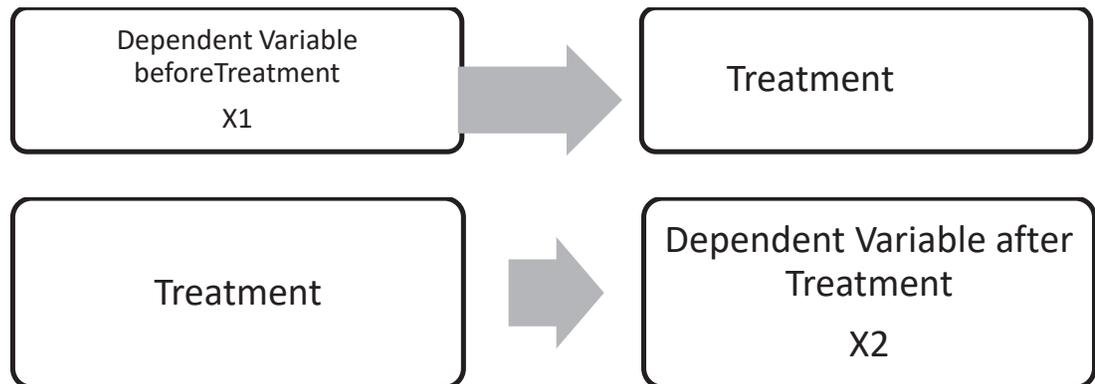


Fig. 9.8 Separate Sample, Pretest-Post-test

## 9.12 STATISTICAL DESIGN

With the help of statistical design a researcher can execute statistical control and can analyze the external variables. The design allows the researcher in finding the effect of more than one independent variable on the dependent variable. Through statistical design control can be exerted on the extraneous variable.

1. **Completely Randomized Design** – it is the simplest of these experimental designs and is a procedure used when the researcher is interested in investigating the effect of one independent variable. The researcher is making an assumption that there are no difference in the test units, and as result, all the test units are treated alike and are randomly assigned to test groups. In other words, the researcher is saying that there are no existing extraneous factors that could possibility affect the outcome.

For example – a marketing researcher is trying to find the most appropriate price of a newly launched product. He could test three different price levels- high, medium and low. To set up this experimental situation, test units, the stores are randomly assigned to each of the treatment level reflecting the different price levels.

Fig 9- Layout of Completely Randomized Design

	Treatment Level		
	High Price	Medium Price	Low Price
Nine stores are assigned randomly	Sales of store 4	Sales of store 8	Sales of store 1
	Sales of store 9	Sales of store 5	Sales of store 2
	Sales of store 3	Sales of store 6	Sales of store 7
	Average Sales for	Average Sales for	Average Sales for

	High Price	Medium Price	Low Price
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For measuring the result the average sales of all the stores where different price levels are assigned is quantified. Then the average prices are compared and the price at which highest sales is acquired is finalized as the final price of the new product. Limitation of completely randomized design is that it does not give due concern to the extraneous variables such as store location, size of store, competitors' pricing etc.

- 2. Randomized Block Design** – this design eliminates the limitation of the previous design, in the current design the researcher identifies an extraneous variable that affects the dependent variable, thus clearly identifying the impact of such extraneous variable. For example in the previous research the researcher ignores the effect store location. In the random block design firstly the stores are classified on the basis of its location such located within 2 Km, 5 Kms and 10 Kms. and more in radius from the center of the city.

Within	Treatment Level			
	High Price	Medium Price	Low Price	Block Means
2 Kms radius from the center of city	Sales of store 1	Sales of store 2	Sales of store 3	Average Sales of the Block
	Sales of store 4	Sales of store 5	Sales of store 6	
5 Kms radius from the center of city	Sales of store 1	Sales of store 2	Sales of store 3	Average Sales of the Block
	Sales of store 4	Sales of store 5	Sales of store 6	
10 Kms radius from the center of city	Sales of store 1	Sales of store 2	Sales of store 3	Average Sales of the Block
	Sales of store 4	Sales of store 5	Sales of store 6	
Treatment Means	Average Sales for High Price	Average Sales for Medium Price	Average Sales for Low Price	

**Table 9.10 – Randomized Block Design**

By grouping test units into homogeneous block on the basis of relevant characteristics, a known source of extraneous variation can be measured. The effect of the randomized block design can be found by studying the treatment and block means.

- 3. Latin Square Design** – this design is used when the researcher is interested in separating out the influence of two extraneous variables. It is more powerful than the randomized block design. This design ensures treating the subjects one at a time in a stated sequence so that the effect of extraneous variable could be counterbalanced. For example, a researcher is interested studying the influence of price on sales. The

price can be categorized a high, medium, low. Two extraneous variables that can effect the results are size of the store and its location. In the Latin Square design the number of categories of extraneous variables and the number of levels of treatment should be equal. Price levels are low X1, medium X2, high X3. The extraneous variables are the store size that could be 1. small, 2. medium, 3.large and its location could be 1. 2 Kilometres , 2. 5 Kilometres, 3.10 Kilometres distance from the centre of the city

Store Size	Location		
	2 Kms	5 Kms	10 Kms
Small	X1	X2	X3
Medium	X2	X3	X1
Large	X3	X1	X2

**Table 9.11 Latin Square Design**

This is a (3× 3) LS design with 3 levels of independent variable are there along with 3 levels of extraneous variable. The rows and columns represent those extraneous variables whose effect is to be controlled and measured. The researcher should note that the treatment should be randomly assigned to cells in such a way that each treatment occur once and only once in every row and column.

The major limitation so LS design is the assumption the factors in the blocks and the treatments does not interact. But this drawback can be removed by considering the rows and columns averages and adjusting it with the field averages.

- 4. Factorial Design** – is employed to measure the effect of two or more independent variables at various levels. The factorial design allow for interaction between the variables. An interaction is said to take place when the simultaneous effect of two or more variables is different from the sum of their individual effects. An individual may have high preference for Indian masala flavors and also loves pizza, which does not mean that he would also like pizza with Indian masala flavors.

For example a marketer considers that sales of the ice-cream brand is influenced by 1. advertisement 2. price. There may be three levels of price –low X1, medium X2, high X3. The advertisement could be categorized at two levels .5% of expenditure as percentage of sales Y1 and 1.0% of expenditure as percentage of sales Y2. Two factor design is used for the same, this would require 3 x 2 = 6 cells.

Price	Advertisement Expenditure	
	.5% Expenditure Y1	1.0% Expenditure Y2
Low X1	X1Y1	X1Y2

Medium X2	X2Y1	X2Y2
High X3	X3Y1	X3Y2

**Table 9.12 Factorial Design**

Respondents would be randomly selected and randomly assigned to the six cells. Respondents in each cell receive a specified treatment combination. For example respondent in the upper left corner would face low level of price and .5% advertisement expenditure.

The main advantages of factorial designs are it is possible to measure the main and interaction effect of two or more independent variables at various levels. The design provides equivalent accuracy with less labour at very economic cost. In one single experiment the effects of two or more factors can be studied using the factorial design.



***Check Your Progress- B***

**Q1. Discuss the types of causal research design.**

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**Q2. Write a short note on pre-experimental design.**

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**Q3. What are the types of quasi-experimental design.**

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**Q4. Discuss the experimental validity.**

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**5. State whether the following statements are true (T) or false (F):-**

- i. The one group after only design is a quasi-experimental design.
- ii. In the randomized block design, it is assumed that the scores of dependent variable in each of the block would be more or less same.
- iii. Completely randomized design assumes that there are no extraneous variables which could influence the outcome.

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## 9.13 SUMMARY

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Causal research is also known as hypothesis research design and is popularly known as experimental research design. Causal research helps in establishing cause and effect relationship between variables leading to conclusions capable of being verified with observations or experiments. The causal research design is most structured and formal research design and is used to draw inferences regarding causality.

Experiments help in confirming causality that expresses the relationship between cause and effect. The necessary conditions for making causal inferences are 1. concomitant variable, 2. time sequence of variables, 3. absence of other causal factors. The researcher has two goals while conducting an experiment, first, to draw valid conclusion and secondly, to make generalization of the results to a wider population, thus ensuring the two makes a research valid, i.e external validity. The causal design can be classified as pre-experimental, quasi-experimental, true experimental and statistical. The main difference among these groups is the degree of control that the researcher can exercise in the design and execution. The pre-experimental designs are characterised by an absence of randomization of test subjects. In true experimental design the researcher apply the principle of randomization. The quasi experimental design is appropriate when the researcher can control some variables but cannot establish equal experimental and control group based on randomization. It includes non-equivalent control group, separate sample pre-test-post-test. The statistical design allows the researcher in finding the effect of more than one independent variable on the dependent variable.




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## 9.14 GLOSSARY

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**Functional relationship** – An observable and measurable systematic change in one variable as another variable changes.

**One shot Case study** – it is also called the after only design.

**Laboratory Experiment** – the researcher works in a artificial environment to conduct a study.

**Field Experiment** – the research studies the subjects in the real market conditions.

**Static Group Comparison** – use two treatment groups in which test units are not selected randomly.

**Randomized block Design** – divide the test subjects in blocks so as to separate the influence of extraneous variable on a dependent variable.

**Factorial Design** – is employed to measure the effect of two or more independent variable at various levels.

**Latin Square Design** – helps the researcher in separating the influence of two extraneous variable.



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## 9.15 ANSWERS TO CHECK YOUR PROGRESS

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### Check Your Progress –A

Q5. Answer

- i. True
- ii. True
- iii. False

### Check Your Progress –B

Q5. Answer

- i. False
- ii. True
- iii. True



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## 9.18 TERMINAL QUESTIONS

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- Q1. Differentiate between a laboratory experiment and a field experiment.
- Q2. What is causality? Discuss the necessary condition for inferring causality between two variables.
- Q3. Define an experiment. Discuss the elements of experiment in detail.
- Q4. What are the strength and weakness of factorial design?
- Q5. How is the causal research design different from descriptive research design? Explain with the help of example.
- Q6. Describe each term 1. Completely randomized design 2. Randomized block design, 3. Factorial design
- Q7. A consumer product manufacturer wishes to test a new diet drink. The company selects the sample of 1000 from the population and randomly divides them into two groups. The first group is given the new drink every day for the month of July and their preference is measured on the first day of August. The second group preference is measured directly on the first day of August.
- Diagram this experiment
  - What is the reason for conducting this experiment?
  - Identify the independent and the dependent variable and the test unit.
- Q8. Consider an automobile company is interested in measuring the impact of different colors by keeping all the remaining features of the car the same. Discuss various methods to control the effect of extraneous variables while measuring the influence of color on the sales.
- Q9. The marketing manager of Fresh Basket an online grocery store is interested in knowing the ideal price difference between the company's grocery items and those marketed by convenience stores in the malls. The customers of grocery are mostly women. Identify the test unit, variables, hypothesis, and research design to be used.
- Q10. What type of experimental design would you suggest for a retail supermarket manager who would like to know the popularity of a new brand of cereal that is produced by Mohan Makin's.

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## **UNIT10 ATTITUDE MEASUREMENT AND SCALING**

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### **10.1 Introduction**

### **10.2 Objectives**

### **10.3 Meaning of Attitude Measurement and Scaling**

### **10.4 Scales of Measurement: Fundamental Properties**

### **10.5 Primary scales of Measurement**

### **10.6 Comparative and Non-comparative Scaling**

### **10.7 Selecting an Appropriate Scale**

### **10.8 Scale Evaluation**

### **10.9 Summary**

### **10.10 Glossary**

### **10.11 Answer to Check your Progress**

### **10.12 Reference/ Bibliography**

### **10.13 Suggested Readings**

### **10.14 Terminal and Model Questions**

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## **10.1 INTRODUCTION**

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We have learnt about marketing research process, data collection methods, data collection tools such as questionnaire, sampling methods and techniques in our earlier units.

Focus of this unit is to understand the meaning of attitude, measurement of attitude and scaling techniques. The basic scales of measurement i.e. ordinal, nominal, ratio and interval are covered in this unit. We will also study about comparative and non-comparative scaling techniques in this unit.

Further, this unit deals with selection of right scaling technique, developing a right scale, evaluating the validity and reliability of the research instrument in detail.

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## 10.2 OBJECTIVES

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After reading this unit you will be able to:

- Understand the meaning of attitude measurement
- Explain the different types of scales used for measuring attitude
- Learn how and where to use comparative and non-comparative scaling techniques
- Chose appropriate scaling technique
- Use the concepts of validity and reliability of scales

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## 10.3 MEANING OF ATTITUDE MEASUREMENT AND SCALING

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Attitude is the core concept to be focused, while studying consumer behavior in marketing. The role of attitudes cannot be ignored in the study of consumer behavior models. Thus, attitudes form the corner stone of consumer behavior studies which are most frequently conducted by the marketing researchers to understand their consumers. Marketers firmly believes that the consumers' purchases, buying and consumption experiences are all directly affected by their attitudes and these buying and usage experience in turn further affect their attitudes toward the product and services.

In most simple words, you can define attitude as a predisposition which an individual has towards a product, service, brand or idea. The attitude constructs of an individual are difficult to be observed and thus a marketer need to conduct proper research to infer them based on the data collected. It is difficult to study the attitudes as these structures exist deep in the consumer psychology. In the words of marketers, attitude means 'consumer's predisposition towards a product, idea, or service.'

You can understand attitudes as a composition of:

- Beliefs about the object of concern, such as its strength or economy.
- Emotional feelings about the object such as like and dislikes.
- And readiness of the individual to respond behaviorally to the object that is to buy.

As discussed above, attitude being the corner stone of consumer behavior, marketers offer conduct a number of attitudinal studies to take decisions like market segmentation, measuring advertisement effectiveness, or to position or reposition their brands.

In attitudinal studies, researcher make an attempt to measure the attitude of the respondents' by measuring their beliefs regarding the quality/ features of a product or service and how do consumers feel emotionally about these qualities/ features.

In order to understand attitude measurement we need to understand the meaning of measurement, it can be understood as a standardized process in which the researcher assign

numbers or some other identifiable symbols to the characteristics of the research object under consideration. Thus, the measurement process is done with the help of number or label assignment to the object properties.

Measurement process consists of-

**Construct development:** The process of construct development deals with the identification and listing of the subjective properties regarding the research object or defined research problem.

**Scale measurement:** The process of scale development relates to the development of a continuum/ scale against which the characteristics/ subjective properties of a research object are measured and located in terms of the degree in which research object possess these characteristics.

### **10.3.1 MEASUREMENT AND SCALING IMPORTANCE IN MARKETING RESEARCH**

We use measurement in our regular life as we use sampling for different purposes. You can understand the significance of using measurement as process with the help of following examples, 'Suppose if someone asks you which your favourite soap, before giving an answer your mind will develop a list of factors/ criteria that you may consider while deciding which is your favourite soap. The list of factors that would have come across your mind may be soap perfume, shape and color, the natural ingredients or the brand of the soap'.

Apart from this you can also decide upon which is number one brand in terms of your preference, number two and the one which is least preferred. The process of listing these several factors/ criteria in the mind for deciding upon the favourite soap is known as measurement.

**Defining Measurement:**

Measurement is a process of listing the different criteria or characteristics of the research object and assigning numbers or some identifiable symbols to these factors or criteria.

You need to understand that marketing researchers are not measuring consumers as objects rather they are studied in terms of their characteristics. Thus, marketing research studies deals with the study of consumers' perceptions, their belief patterns, their buying preferences and their attitudes. As discussed above, measurement process is initiated with assignment of numbers to the characteristics of research objects. This helps in better understanding of the phenomenon. It also provides statistical testing of an activity and a more standardized means of communication to report the findings across the globe. The use of numbers in

measurement of the attitude also allows an objective interpretation of the phenomenon. Measurement enables marketers to take accurate marketing decisions.

Once you have understand the meaning of measurement, the next process used in research is that of scaling. The success of measuring a research phenomenon depends upon the quality and appropriateness of data collected. Thus, selection of right scaling techniques will help the researcher to collect appropriate data.

**Scaling Defined:**

The process of assigning a set of descriptors or categories to indicate the possible range of responses which a respondent can give to a question regarding a specific phenomenon is known as scaling. Thus it provides the respondents with a pre-specified boundary.

To make you understand the concept and use of scaling we will take following example, there is a marketer such as Red Bull, who wants to know consumers' preference regarding its brand image. Researcher can measure consumers' preferences towards its brand image in terms of favourableness towards the brands. Thus, we can develop a scale by assigning two extreme values such as 1 = extremely favourable and 10 = least favourable. Thus in this example a scales is created by establishing the descriptors in terms of favourability towards the brand image. Al the responses of the consumers will be now within this pre-specified boundary. So, scaling is a method of placing the responses of the respondents in a continuum with respect to a particular criteria as in the example above it was brand image. Scale helps the researchers in measuring consumer responses easily. It is easy for the researchers to conduct statistical analysis based on the data collected on the scale and the results of these analysis are also easy to interpret. It is imperative for the researcher to develop easy and objective scales to be used for data collection.

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## **10.4 SCALES OF MEASUREMENT: FUNDAMENTAL PROPERTIES**

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Researchers can develop a research scale based on four basic properties. These scaling properties are: assignment, order, distance and origin. An understanding of these properties is crucial for scale development. Thus, in this section we will study these fundamental properties in detail.

We need to understand that the use of more scaling properties and their simultaneous activation while developing scale measurements helps in collecting sophisticated raw data. These scaling properties exist in an order and we should also understand that one particular

scaling property is built over the previous one. This means a scale developed on the basis of order property will also encompass property of assignment within it. And similarly any scale based on distance property will have built in property of order and assignment. And finally, any scales based on the property of origin will have all the lower order properties i.e. assignment, order and distance built in automatically. These different levels of scale properties are explained in detail in the following section.

### **10.4.1 ASSIGNMENT**

Assignment property means that researcher identify each object within a set by assigning it a unique number/ category or any descriptor. This property is commonly known as description or property of category.

The use of assignment property could be understood with the help of following example, suppose the marketer of a new brand of mobile phone wants to determine the demand for its phone, the researcher may ask his respondents, if they are having any intention to buy a new mobile in the coming two months? Now to recognize the responses of the respondents, researchers can make use of two descriptors i.e. 'Yes' or 'No'.

Here, we can say that in this example the assignment property of the scale is used. Similarly, the researcher can ask questions to respondents regarding their brand preferences in mobile phones and the different brand names will act as the descriptors.

### **10.4.2 ORDER**

Order property is the next property which is used by the researcher to develop a scale where he wants to measure the impact or the degree of magnitude among the categories. Mathematically, three fundamental properties of any research object can be measured with the help of relative magnitude, suppose if there are two objects 'X' and 'Y', this property can measure: if 'X' is equal to 'Y'; or 'X' is more than 'Y' and if 'Y' is more than 'X'. Thus this property is use to identify and measure these mathematical possibilities.

### **10.4.3 DISTANCE**

Unlike order property which subjectively measures if one is greater, lesser or equal, the distance property measures the distance between any two descriptors in exact terms. The example of distance property is, suppose you have bought 7 packets of a particular brand of noodles and your friend has just got 3 packets of the same brand then this means that you have bought 4 packets more in number.

The researchers can use the distance property only in those research questions where the respondents' responses can be obtained in pure numerical form such as how many cars you have? How many times you have been abroad? Etc.

#### **10.4.4 ORIGIN**

The researchers establish a distinct/ unique starting point in the set of scale points while developing a scale based on origin property. The typical form of using this property is the numbering system in which 'Zero' is assigned as the starting point of all possible responses. Origin property is also use when the researcher is measuring the responses such as, 'like it very much', 'like it', 'dislike it' or 'dislike it very much'.

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### **10.5 PRIMARY SCALES OF MEASUREMENT**

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We have already read about the four properties of scale i.e. assignment, order, distance and origin. The next concept which we need to understand is the different types of scales used for measurement in research. The four primary scale used for measurement are: nominal, ordinal, interval and ratio. The researcher develops a research instrument and collect the data based on these scales.

#### **10.5.1 NOMINAL**

The basic form of the measurement scale is nominal scale. This is the scale which caters to the assignment property of research responses. In this scale the researchers use the numbers to act as a label to identify and classify objects. While using this scale each respondent can be identified by a particular code or number assigned to them.

We have widely seen the application of nominal scale in cricket and football ground, where each of the player from a particular team is identified by the number assigned to him on his jersey. Marketing researchers can use this scale to determine the product attributes, brands or the respondents. This scale is used for classifying the classes or categories during a marketing research project, or for gender classification. When a particular number is assigned to a player in a sports field it is just use for identification purpose and it does not represent any numerical value i.e. 'if in a cycle race, there is a participant with a number 13 jersey it does not mean he is superior to another contestant with a jersey carrying number 27'. You can only perform counting on the responses achieved by using nominal scale. Researcher can use the data collected from nominal scale to conduct a few of statistical analysis such as finding out mode, chi-square analysis, calculation of percentages and binomial tests.

**Example of Nominal Scale Question:**

*Tick mark all the brands of television which you will consider while buying:*

- a. Sony b. Videocon c. Samsung d. LG

**10.5.2 ORDINAL**

An ordinal scale is constructed based on both assignment and order property. Unlike nominal scale this scale not only identifies the response but also measure the relative magnitude of the responses. Thus, this scale permits the respondents to arrange their responses in terms of their gravity or importance. Let us go back to the example of favourite soap which we discussed in the opening section of this unit, in that example the respondent is giving responses regarding one particular brand having more or less of a particular factor. This is an example of ordinal scale data. Hence, a researcher can get relative magnitude by using ordinal scale but the relative difference between the responses cannot be measured using this scale data. The data obtained in terms of sportsman ranking, brands ranking, ranking of organizations in newspaper and magazines are all examples of ordinal data. Where these ranking represents the position each brand or sportsman has as compared to another.

We often come across the variety of ranking such as Forbes' 500 companies or 100 best employers to work with. The statistical tools such as percentile, mean, rank-order calculation can be calculated on the data collected based on the ordinal scale.

**Example of Ordinal Scale Question:**

*Please rank each brand in terms of your preference please assign "1" to your most preferred brand, a "2" to your second preference, and so on*

- a. Sony b. Videocon c. Samsung d. LG e. Toshiba f. Phillips

**10.5.3 INTERVAL SCALE**

Interval scales are constructed by encompassing three fundamental scaling properties of: assignment, order and distance properties. The interval scale not only provides the relative magnitude of the responses but it also measures the difference between them in absolute terms. This means, suppose in our example of favourite soap when we ask the respondents to rank the different soap brands in terms of their preference we are just collecting ordinal data i.e. now we know that may be brand 'A' is ranked number one and brand 'D' is number 2. However, these ranks don't help the researcher to measure the exact difference between these two positions i.e. if the difference between rank 1 and rank 2 is similar to that between rank 3 and rank 4. Whereas, the interval scale provides the researchers actual preferential difference

between two brands of soap in case of our example. Thus, if a researcher is looking forward to measure the data regarding the intention to buy, intensity of behavior or any other data where the values also matter, the interval scale should be used. For example, if we are researching on internet usage behavior among males and females, the data such as males use more internet than females may not be relevant completely but if we get to know that what is the exact difference in their internet usage time then it will make more sense.

We can continue with our above example of 100 employers preferred to work with, we can further ask our respondents to rate these employers on a rating scale comprising of different factors. The point of origin which is also known as zero point is not fixed in case of interval scale thus the point of origin and measurement unit are arbitrary in this scale. Researcher can analysed the data collected based on this scale with the help of statistical techniques suitable for data collected based on nominal and ordinal scale. We can also analyse the data collected based on this scale with the help of techniques such as range, mean, standard deviation, product-moment correlation, t-tests, ANOVA, regression and factor analysis.

**Example of Interval Scale Question:**

*Please rate each brand in terms of its overall performance:*

*Brand rating (circle one)*

	<u>Very poor</u>									<u>Very good</u>
Mont Blanc	1	2	3	4	5	6	7	8	9	10
Parker										
Cross										

### 10.5.4 RATIO SCALE

Ratio scale is the highest order scale and it comprises of all four scaling properties: assignment, order, distance and origin. All the fundamental properties of nominal, ordinal, and interval scales and origin property is present in this scale. In case of data collected based on ratio scale, a researcher can identify the response, can rank the responses, make comparisons among the ranks and can also make absolute comparisons between them. We can understand this with the help of this example, the difference between 25 and 12 and 75 and 62 is same i.e. 13. However, in absolute terms, we see that 75 is 3 times that of 25.

Ratio scale is used by the researchers to measure the variables such as respondents' height, weight, age and salary etc. Further, marketing researcher use ratio scale to measure variables such as sales, cost, and customer numbers and so on. Researcher can use all the statistical techniques for the data collected based on ratio scale. Researchers calculate geometric mean, harmonic mean and coefficient of variation on the data collected with the help of ratio scale.

**Example of Ratio Scale Question:**

*What is the amount of premium paid per month by a typical customer of Rs. 10,00, 000 term life insurance buyer?*



**Check Your Progress- A**

**Q1. What is the meaning of Attitude?**

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**Q2. Explain the purpose of using scales in attitude measurement.**

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**Q3. What are the different types of scales available?**

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**Q4. True and False**

- i. Attitude does not directly affect purchase decisions and purchase and use experiences of customers.
- ii. Description or category property is another name used for assignment property.
- iii. Ordinal scale can be used for gender classification.

**Q5. Fill in the Blanks with appropriate word or words.**

- i. \_\_\_\_\_ is a predisposition which an individual has towards a product, service, brand or idea.

- ii. \_\_\_\_\_ is used by the marketing researcher to measure the variables such as cost, customer numbers and sales etc.
- iii. \_\_\_\_\_ is the measurement in which researcher can know exact difference between each of the descriptors and difference is expressed in absolute.

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## **10.6 COMPARATIVE AND NON-COMPARATIVE SCALING**

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You need to have a detailed understanding of the research problem and definition, data requirements, construct identification and development and measurement scale for developing high quality scales. All these requirements are essential for a marketing researcher to understand when they need to develop a valid and reliable scale for data collection.

So far we have studied that the understanding of consumers and market reaction towards marketing strategies and stimuli is very crucial for the marketers to know and understand. The customers respond in a particular way towards the marketing stimuli and it is the task of marketing researchers to measure, interpret and predict these consumer reactions prior to they take place. The key things which any marketers needs to know for formulating its marketing strategies are: beliefs, preferences and attitudes of its customers and how does its customers react towards its competitors. You will study about different scaling techniques in this section.

Comparative and non-comparative scaling techniques are available to the researchers. The use of comparative scaling techniques is done to compare the research object with one another directly. For example, it is always relevant for the marketing managers to know how a consumer prefers their brand over the competitors. To know the consumer's preference, the researcher can ask a direct question such as 'which out of the different brands of chocolate a consumer prefers or rank different chocolate brands in order of their preference?' This will clearly indicate the consumer brand preference. We will study about the common techniques of comparative scaling. These techniques are paired comparison, rank order, and constant sum scale.

While using non-comparative scaling, each stimulus object is considered and scaled independently of the other objects in the complete set. The data collected in non-comparative scales are based on either interval or ratio scale. The difference between comparative and non-comparative scaling technique can be understood with the help of following example:

1. If the respondents are asked to rank the brands in terms of their preference (comparative scaling)

2. If the respondents are asked to rate these brands based on different parameters on a scale of 1 to 10, 1 means poor performance and 10 represents good (non-comparative scaling)

Thus, non-comparative scaling techniques are based on continuous rating scales and itemised rating scales. Likert scale and semantic differential scale are examples of itemised rating scale and we have discussed them in detail in the next unit.

### **Comparative Scaling**

As discussed in the section above, we have seen that we use comparative scaling if we want to compare two stimulus objects directly. This technique is beneficial to use as it forces the respondents to choose among the different stimulus objects and thus it makes it easy for the researcher to measure the difference between these objects. The ease of its application for the researcher and easy comprehension for the respondents make this a favoured technique. Limitation of this scaling technique is that, the data collected with the help of this technique doesn't possess distance and origin properties. Thus, the researcher can't use advanced statistical tools on the data collected with the help of this technique. The different comparative scaling techniques are:

#### **Paired comparison scaling**

Use of paired comparison scaling technique is made by the researcher to know preference of the respondents among two or more alternatives in a given product category based on a specific criteria. The researcher selects the criteria to be used beforehand. Let us understand this technique with the help of an example, a researcher wishes to know respondents' preference between two well-known chocolate brands based on their taste. Researcher can collect ordinal data with the help of paired comparison scaling. Paired comparison scaling works well to compare the stimuli even if the number of stimuli is more than two. In the same example let's assume that a researcher wants to know consumers' preference among three different chocolate brands, X, Y and Z.

Using the paired comparison scaling researcher will create three questions for respondents namely:

1. Which brand of chocolate you prefer between 'X' and 'Y'?
2. Which brand of chocolate you prefer between 'Y' and 'Z'?
3. Which brand of chocolate you prefer between 'X' and 'Z'?

Suppose, the respondents answer that they prefer 'X' over 'Y' and in the next question they prefer 'Y' over 'Z' then based on simple logic we can say that brand Y is preferred over Z and brand X is preferred over Y, thus X is the most preferred brand of chocolate. Thus, paired comparison scaling helps the researcher to generate a rank order among stimuli. Pricing decisions are often taken by the marketers based on the results of paired comparison scaling between different pricing options. However, we can use this technique only with a limited number of stimuli.

Coca- Cola is reported to have conducted more than 190,000 paired comparisons before introducing new Coke in 1985.

### **Rank order scaling**

This scaling technique is used by the researchers when they ask the respondents to rank the research object or stimuli on a pre-defined set of parameters in the order of their preference. The order of preference is measured in terms of least preferred to most preferred.

The scale used in our earlier example in which respondents were asked to rank different soap brands in terms of most preferred soap brand to least preferred, was based on rank order scaling. While using this technique, researcher can also make the respondents to compare the research objects based on pre-determined criterion. As in the example of soaps, the criteria used can be brand, color, shape, perfume etc. The rank order scaling works effectively if there is set of criteria established else it gives biased results. The data collected on rank order scale is ordinal in nature.

### ***Constant sum scaling***

In this method, the researcher first identifies and determines the set of factors relevant for a particular set of research object. After identification of this criteria set is done, the researchers are provided with the criteria set and they are required to assign a constant sum of units in terms of points or some other form. Like we can see this method in use in this example, where the respondents are provided with the set of factors relevant in a newspaper and the respondents are required to allocate a total of 100 points across these factors. The attributes are scaled by counting the points assigned to each criterion by all the respondents and divided by the number of respondents.

Constant sum scale method enables the researchers to segment the respondents into different groups based on their preferences. The results generated by the data collected based on this scale is difficult to be generalized. This method is useful in the situations where researcher wishes to quickly discriminate among different stimulus objects.

### Non-Comparative Scaling

We have already discussed above that the researcher consider each stimulus object independently and scale it individually while using non-comparative scaling. Respondents rate each stimulus object individually without comparing them with others while responding on the questions based on this technique.

Thus respondent is evaluating each object one by one. The most popular ways of using this scaling technique are continuous and itemized rating scales. The continuous and itemized rating scales are discussed here.

### Continuous rating scale

Another name used for this rating scale is graphic rating scale. The continuous rating scale represents a continuum in the form of a straight line with infinite number of ratings possible between the two extreme ends. While using this scale, the respondents are required to rate the research objects by putting a mark at the right position. The respondent are free to mark at any point on the given line. This scale is quite simple and researchers often make use of this scale.

Continuous Rating Scale example:

Q. How would you rate newspaper X with regard to content quality?					
Version 1:					
The worst	-----X-----				The best
Version 2:					
The worst	-----X-----				The best
0	20	40	60	80	100
Version 3:					
The worst	-----X-----				The best
	20	40	60	80	100
	Very poor		Neither poor		Very good

The continuous rating scale in terms of graphic, verbal and numerical rating scales are discussed in detail in the next unit.

### Itemized rating scale

In case of itemized rating scale, a number of categories are pre-defined by the researcher. The respondents are then provided with the brief description about these categories and they are

asked to select any of the category which suits the research stimuli. Marketing researcher make wide use of these scales. We have discussed, Likert, and semantic differential in detail in the next unit.

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## 10.7 SELECTING AN APPROPRIATE SCALE

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The scales construction and selection is dependent upon the variety of decisions. A researcher must pay great attention to several factors while developing and selecting a scale. The factors or decisions to be taken in case of scale development are:

**Length of scale points:** The researcher has to decide upon the accurate length of the scale as we know longer the scale better will be quality of details collected by it but more will be the confusion. As per the prevalent researches it has been identified that any length between five to nine scale points is considered as appropriate.

**Scale balance:** Another decision to be taken while developing a scale is, 'should it be balanced where balance means that the researcher is using an equal number of both favourable and non-favourable categories' and 'should it be imbalanced?' You need to take more care while using unbalanced scale.

**Forced vs non-forced scales:** If a researcher is dealing with sensitive issues such as do you think dating is bad? There are chances that the respondents will confirm to the neutral response. Thus, it is useful for the researchers to use forced scale choices where the respondent is supposed to express an opinion rather being neutral.

**Description and presentation of scale:** The choice of words use to describe and present the scale is also relevant for respondents' engagement. Thus, the researcher need to take extra care while developing a scale.

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## 10.8 SCALE EVALUATION

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You should know that there are several reasons due to which researchers can face error in measurement, though the method of scale development used is accurate and robust.

The possible reasons for errors are:

- Respondent errors such as respondents' intelligence, education
- Errors caused due to respondents' fatigue, stress, anxiety

- Sometimes presence of other members and situational factors such as noise also result in errors
- Improper framing of questions will result in vague questions
- Inadequate printing, recording and poor design errors due to mechanical failures
- Interviewer bias in asking and reporting questions will also result in errors
- Inappropriate analysis due to wrong choice of analysis methods

All the errors mentioned above result in inappropriate reporting of results. These errors are classified in to systematic and random errors. Measurement is affected by the systematic errors while random errors are random in nature. These errors can be avoided by the researcher with the help of scale: validity, reliability and generalizability.

### **10.8.1 VALIDITY**

Validity of a scale can be understood in terms of the differences in observed scales scores and the real differences among the characteristics of the objects measured. The validity of the scale enables a researcher to determine if the scale is capable of measuring what it is required to measure. Measurement errors are minimum in case of a valid scale. There are three kinds of validity: content validity, criterion validity and construct validity. Content validity measures the content of the scale, criterion validity examines the relevance of the criteria selected and construct validity establishes the relationship between theory and scale.

### **10.8.2 RELIABILITY**

Reliability of a scale measures if the data collected from this scale can provide consistent results over a period of time or not. Thus a reliable scale is one which provides consistent results despite of repeated measurements. Reliability of a scale is affected by the random errors and systematic errors don't affect it. Reliability is measured in terms of test-retest reliability, alternative forms reliability and internal consistency reliability. In test-retest reliability the researcher administer same scale items to the respondents again and again at a time-interval and measures whether the responses are similar or different. In case of alternative forms reliability same items are presented in two different forms and administered to the same respondents at two different times. While measuring internal consistency reliability, researcher assess the reliability of a summated scale where several items are summated to form a total score. Researchers often use 'coefficient alpha' commonly referred as Cronbach's alpha to measure internal consistency reliability.

### 10.8.3 GENERALIZABILITY

While assessing the generalizability of a scale, a researcher measure if the findings obtained from a sample can be generalized for the universe or not. For example, a scale developed for personal interviews can be generalized for other data collection modes such as telephonic interviews.



#### *Check Your Progress- B*

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**Q1. Explain comparative scaling techniques with examples.**

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**Q2. Write a short note on selecting an appropriate scale.**

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**Q3. Distinguish between continuous rating scale and itemized rating scale.**

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**Q4. Name the various scale evaluation techniques.**

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**Q5. Fill in the blanks-**

- i. In \_\_\_\_\_ scaling, respondents are asked to choose one among two alternatives on a selected criterion.

- ii. Continuous rating scale is also known as \_\_\_\_\_ rating scale in which respondents rate the objects by placing a mark at the appropriate position on a line that runs from one extreme criterion to the other.

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## 10.9 SUMMARY

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The focus of this unit was on the understanding of attitude, measurement and scaling. You should understand the relevance of using measurement and scaling in the development of research instrument, analysis and interpretations. We have studied four fundamental scale properties in this unit. These properties are assignment, order, distance and origin. We have seen as we progress to the next level of property, the later one comprises of the earlier scale property. For example, origin property possesses assignment, order and distance properties.

There are four primary scales of measurement namely: nominal, ordinal, interval and ratio scale.

Nominal scale possesses only assignment property; ordinal scale possesses order property, interval scale possesses distance property and ratio scale possesses origin property. However, as stated above it can be understood that ratio scale in a way possesses all the four properties.

Marketing researchers use comparative and non-comparative scaling techniques. Comparative scaling includes paired comparison, rank order, and constant sum scaling techniques. Non-comparative scaling includes two types: continuous rating and itemized rating scales. Itemized scaling is further divided into Likert, and semantic differential scaling. Then we have discussed the factors required to select an appropriate scale based on its length, balance, force vs non-force and description and presentation. Scales should also be evaluated on for their validity, reliability and generalizability.




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## 10.10 GLOSSARY

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**Attitude:** It is a predisposition which an individual has towards a product, service, brand or idea.

**Measurement:** Measurement is a process of listing the different criteria or characteristics of the research object and assigning numbers or some identifiable symbols to these factors or criteria.

**Scaling:** It is the process in which researcher assign a set of descriptors or categories to stimuli object. It makes it easy for the respondent to indicate the possible range of responses for a question regarding a specific phenomenon.

**Description property:** It refers to use of a unique descriptor, or label, to stand for each designation in the scale.

**Order property:** Order property is the next property which is used by the researcher to develop a scale where he wants to measure the impact or the degree of magnitude among the categories.

**Distance property:** A scale has the characteristic of distance when absolute differences between the descriptors are known and may be expressed in units.

**Origin property:** A scale is said to have a characteristic of origin if there is a unique beginning or true zero point for the scale

**Nominal Scale:** The basic form of the measurement scale is nominal scale. This is the scale which caters to the assignment property of research responses. In this scale the researchers use the numbers to act as a label to identify and classify objects.

**Ordinal scale:** It is constructed based on both assignment and order property. Unlike nominal scale this scale not only identifies the response but also measure the relative magnitude of the responses. This scale permits the respondents to arrange their responses in terms of their gravity or importance.

**Interval scales:** They are constructed by encompassing three fundamental scaling properties of: assignment, order and distance properties. The interval scale not only provides the relative magnitude of the responses but it also measures the difference between them in absolute terms.

**Ratio scale:** It is the highest order scale and it comprises of all four scaling properties: assignment, order, distance and origin. In case of data collected based on ratio scale, a researcher can identify the response, can rank the responses, make comparisons among the ranks and can also make absolute comparisons between them.

**Comparative scaling:** The use of comparative scaling techniques is done to compare the research object with one another directly.

**Non-comparative scaling:** Each stimulus object is considered and scaled independently of the other objects in the complete set. The data collected in non-comparative scales are based on either interval or ratio scale.

**Continuous rating scale:** The continuous rating scale represents a continuum in the form of a straight line with infinite number of ratings possible between the two extreme ends.

**Itemized rating scales** involve selection of a specific category out of various categories predefined by the researcher. A brief description is associated with each category and respondents are asked to select the best fitting category with the stimuli object.

**Validity:** Validity of a scale can be understood in terms of the differences in observed scales scores and the real differences among the characteristics of the objects measured.

**Reliability:** It relates to consistency of results over a period of time.

**Generalizability:** It means the ability of a scale to generalize the observations from a sample to the universe.



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## 10.11 ANSWERS TO CHECK YOUR PROGRESS

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### Check Your Progress –A

#### Q4. True and False

- i. **False**
- ii. **True**
- iii. **False**

#### Q5. Fill in the Blanks with appropriate word or words.

- i. Attitude is a predisposition which an individual has towards a product, service, brand or idea.
- ii. ratio scale is used by the marketing researcher to measure variables such as sales, cost, and customer numbers etc.
- iii. distance property is the measurement in which researcher can know exact difference between each of the descriptors and difference is expressed in absolute.

### Check Your Progress –B

#### Q5. Fill in the blanks-

- i. In paired comparison scaling, respondents are asked to choose one among two alternatives on a selected criterion.
- ii. Continuous rating scale is also known as graphic rating scale in which respondents rate the objects by placing a mark at the appropriate position on a line that runs from one extreme criterion to the other.



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## 10.12 REFERENCES

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- <https://web.stanford.edu/dept/communication/faculty/krosnick/docs/The%20Measurement%20of%20Attitudes.pdf>
- Malhotra, N. (2004a), Marketing Research (4th ed.). Harlow: Prentice Hall.



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## 10.13 SUGGESTED READINGS

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1. Basic Marketing Research - Gilbert A. Churchill (Jr.) Hinsdale, Illinois, Dryden Press, Handbook of Marketing Research - Rober Ferber (Ed.) New York, McGraw Hill.
2. Marketing Research - Paurav Shukla & Ventus Publishing ApS, 2008
3. Marketing Research: Applications and Problems - Arun K. Jain, Christian Pinson and Brian T. Rachford, New York, Wiley.
4. Marketing Research: Text, Applications and Case Studies - Ramanuj Majumdar, New Delhi, Wiley, 1990.



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## 10.14 TERMINAL QUESTIONS

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- Q1. What is the significance of measurement and scaling in marketing research?
- Q2. What are the various scaling properties?
- Q3. Name and discuss the different types of scale.
- Q4. Differentiate between comparative and non-comparative scaling techniques.
- Q5. Why is validity, reliability and generalizability of a scale important?

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# UNIT11 QUANTITATIVE JUDGEMENT METHODS

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- 11.1 Introduction**
- 11.2 Objectives**
- 11.3 Introduction to Quantitative Judgement Methods**
- 11.4 Graphic Rating Scales**
- 11.5 Verbal Rating Scales**
- 11.6 Numerical Rating Scales**
- 11.7 Itemized Rating Scales**
- 11.8 Fractionation Rating Scale**
- 11.9 Constant Sum Method**
- 11.10 Likert Scale**
- 11.11 Semantic Differential Scale**
- 11.12 Summary**
- 11.13 Glossary**
- 11.14 Answer to check your progress**
- 11.15 Reference/ Bibliography**
- 11.16 Suggested Readings**
- 11.17 Terminal & Model Questions**

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## 11.1 INTRODUCTION

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In the previous unit you learnt the concepts of measurement and scaling. We have learnt that measurement and scaling construct are crucial in marketing research. These two constructs help in developing a better construct measurement, doing correct analysis and they enable easy interpretation and communication of the findings. There are four properties of the scales of measurement: assignment property, order property, distance property and origin property. You also studied that there are four primary measurement scales they are nominal, ordinal, interval and ratio scale. Then you covered, comparative and non-comparative scaling. Comparative scaling includes paired comparison, rank order, and constant sum scaling techniques. Non-comparative scaling includes two types: continuous rating and itemized

rating scales. Itemized scaling is further divided into Likert, and semantic differential scaling. You learnt how to select an appropriate scale. You also learnt that scales should be evaluated on for their validity, reliability and generalizability.

This unit is an extension to the earlier unit. In this unit, we will cover quantitative judgement methods in detail. This unit will discuss in detail how rating scales are used in self-report measurements. It will explain the basic rating scales such as itemized rating, graphic rating scales. The measurement level of data obtained is explained with the help of constant-sum rating scale. The commonly used multiple-item scales such as Likert and semantic-differential scales is also discussed in detail in this unit.

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## 11.2 OBJECTIVES

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This unit will help you to:

- Understand the various dimensions of quantitative judgement methods
- Learn the different types of scales
- Understand the different scales that are used to measure attitudes
- Understand the application of itemized, graphical, constant-sum, fractionation, Likert, semantic-differential scales
- Understand how the data generated by these scales are analysed and interpreted

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## 11.3 INTRODUCTION TO QUANTITATIVE JUDGEMENT METHODS

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As discussed in the previous unit, attitudes are one of the most frequently researched component of human behaviour in marketing research. The marketers are of the opinion that there is strong relationship between how a consumer think and how he acts. The thinking part represents his attitude and his actions depict his behavior.

Researchers have given ample number of reasons to justify the research focus on attitude then on behavior alone. Attitude formation is more instant than behavior which may take longer time period to occur. Further, it is not always possible to report behavior as it may take place one the new product is introduced in the market.

Thus, we can say that attitudes are capable of predicting a major part of consumer behaviour. And as a result it is possible to get an indication of someone's likely future behaviour also by measuring his/ her current attitude. In nutshell, attitudes help the marketers to gain an insight in the consumer behaviour.

As discussed earlier, it is very difficult to observe or measure attitudes directly and one can only infer them. Thus, measurement of attitude depends upon self-report, that is, by seeking

information from the respondents, instead of collecting it through observation. While using quantitative judgement methods respondents are probed with the help of fairly direct questions regarding their attitudes toward the research object. Researchers use rating scales to measure the intensity of respondents' attitudes by recording answers to these questions. The respondents are required to express their feelings by ticking off at the appropriate position on the rating scale.

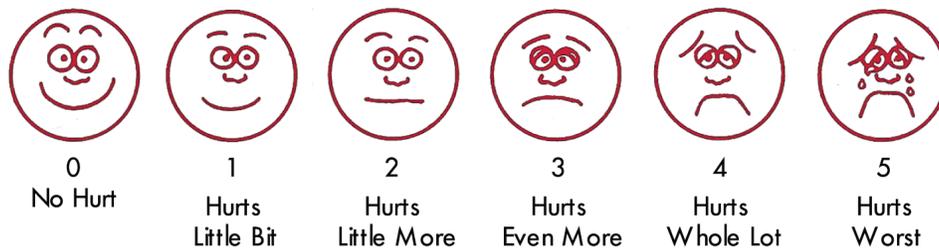
Marketing researchers have developed a variety of scales that are believed to capture the quantity of the construct's attribute. There are several key dimensions on which rating scales and the type of data they capture vary. The dimensions which you will be studying this unit are graphic and itemized formats in particular.

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## 11.4 GRAPHIC RATING SCALES

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Another name for graphic rating scale is pictorial scale. This scale is very simple to use and researcher often make use of this scale. The graphic rating scale represents a range of options lying between two extreme ends. It is represented in the form of a straight line. Marketing researchers often use this scale while conducting research with children. The use of facial expressions or the temperature in thermometer to depict the respondents' degree of like or dislike are common ways of using graphic rating scales by the marketing researchers.. The diagram given below presents an example of using facial expression scale to know the child's opinion regarding a dental treatment.



**Fig 11.1 Facial Expression Scale**

In this scale, rating of the individual respondent is represented in the form of the tick mark (such as ✓) which is marked by the respondents at a position which he/ she finds appropriate. The implicit logic behind using this scale is that it permits a researcher to detect the difference in attitudes accurately.

The scale-points with brief descriptions are indicated along the line. The purpose of using these indicators is to assist the respondents in performing his job. A pure or true example of graphic rating scales is given below:

Example: What is your opinion about Flipkart? Indicate it by placing a ✓ mark at an appropriate point on the line below.



This scale allows the researcher to quantify the magnitude of response by measuring the distance between the tick mark and positions at extreme of the line. Thus, if the distance between the response and left extreme is more than the distance between right extreme, then the respondent's possess favourable attitude towards the brand 'Flipkart'.

Though graphic rating scale is simple to use but it is not free from limitations. As you can see that the respondents may check at almost any position along the line. This may increase the difficulty of analysis. The major challenge with the use of graphic rating scale is the time taken to code and analyse the responses. The limitation of this scale is that, the researcher first needs to measure the physical distance on the scale for each respondent before coding the responses. Another more acute limitation of using this scale is that respondents may be incapable of mentally understanding/ perceiving continuum or fine shade of difference in attitudes, thus they may not accurately translate their perceptions in to measurable physical distances. Thus, we can say that although the major objective of graphic rating scale is to facilitate precise attitude measurement but if this can actually happen practically is doubtful. Hence, you will not see much use of this scale in marketing research surveys.

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## 11.5 VERBAL RATING SCALES

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The researchers in medical science use different kind of scales to know the intensity of pain among the patients. These rating scales can also be adapted for attitude studies. One of the common scales use to understand attitude is verbal rating scales. A series of words are used to describe attitude or attitude object (e.g., no liking, mild liking, moderate liking, intense liking) while using verbal scales. While using verbal rating scales, the respondents' respond in terms of the words which best fit their feelings about the object researched. A score (e.g., from 0–3) that is assigned to each word is then used to measure liking levels. In this scale the continuum is developed with the help of different words.

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## 11.6 NUMERICAL RATING SCALES

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Apart from verbal rating scales, another type of attitude scale is numerical rating scales. Researchers develop numerical rating scales by using a range of numbers from '0 to 10'. Just like graphical scale in this case also, the extreme numbers of the scale such as '0' may indicate 'highly negative attitude' and '10' may represent 'highly favourable attitude'. Just like other scales, in this case also respondent express their feelings regarding the research object by marking tick on the number that best describes the intensity of their feelings.

The verbal and numerical rating scales have advantages and disadvantages. The advantage of these scales is the simplicity to use them, as they are less prone to bias it is comparatively easy to use them for the variety of marketing research situations. The use of verbal and numerical scales is limited to some marketing situations. The major challenge with the use of these rating scales is that they can't indicate and measure the attitude alone on the basis of its severity. It is inappropriate to measure attitude only in terms of its intensity. It is like only considering the two extremes such as black or white and all the other colors i.e. intensity are not captured while using these scales.

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## 11.7 ITEMIZED RATING SCALES

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Itemized rating scales are the most commonly used scales in marketing research due to its simplicity and its adaptability to most measurement situations. It is commonly known as numerical rating scale. Unlike graphic rating scale, the researchers make use of distinct categories on which the respondents are required to respond. The respondents are required to mark his or her attitude by selecting a position on a continuum which indicates a range of possible views regarding an attitude object. These positions are places sequentially in terms of the degree of attitude held. As mentioned above the positions are clearly marked on the scale by using a descriptive statement of some kind. The itemized rating scale can either be used in numerical form or verbal rating form. The examples for itemized rating scale in both numerical and verbal form is:

Example: Show your overall opinion about Flipkart by checking  one of the following categories.

Very bad	Bad	Indifferent	Good	Very good
1	2	3	4	4

Or

Example: Tick mark the category which best describes your overall opinion about Flipkart?

Extremely Poor	Poor	Fair	Good	Very good	Excellent
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Though itemized rating scale is simple to use but there are several considerations that a researcher must consider:

*Number of categories:* The researcher has no limit with respect to the number of categories it choose to categorize the responses of respondents. This means that the researcher can either choose only two categories such as 'favourable and unfavourable' and respondent is classified into one of these two categories. This scale will have the property of nominal scale and thus its analysis is limited. However, you can use this if there are many items in the questionnaire or there is limitation of respondent's education. On the other hand as mentioned in the example above, researcher can choose as many categories as required to provide

flexibility in expressing opinion to the respondents. Since not all respondents are capable of 'fine tuning' their attitude response to many category levels, thus the researchers have asserted to use a maximum of five or six categories.

*Balanced or unbalanced categories:* Another aspect which a researcher has to consider while using itemized rating scale is to decide, 'if an equal number of favourable and unfavourable responses are to be considered in the categories? A balanced scale has the equal number of both favourable and unfavourable categories. If the scale is not balanced then there are chances for the biased responses.

For example: Please rate the promptness of Flipkart's service:

Extremely good      Very good      Good      Above average      Average

\_\_\_\_\_

In the given example, the respondent has no option to give a response if he disliked the service. This means that the company's service would, at worst, be rated average. This will not allow respondents to represent their low or negative attitudes. Thus, the researcher should be aware of using an unbalanced scale. However, there is an exception to this. If a researcher is aware that the true attitude of the respondents are likely to be predominantly one-sided i.e. either favourable or un-favourable then the scale should be unbalanced towards the side where the majority of the responses are anticipated to fall.

*Even or odd number of categories:* If the researcher is using odd number of categories in his scale then this permits the respondent to be indifferent or neutral toward the question by ticking on the middle value. On the other hand if there are even number of categories then the respondent has to be on either side. The researchers argue that there is nothing like being neutral or indifferent in terms of attitude.

The main benefit of using itemized rating scale is that it provides more information and meaning to the respondent, and thus increases its reliability. Further, it is also easy to code and analyse the raw data collected by using this scale. However, it is relatively difficult to develop the itemized rating scale and the statements may not say exactly what the respondent would like to express.



### *Check Your Progress- A*

#### **Q1. Explain the concept of quantitative judgment methods.**

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**Q2. Differentiate between graphic, verbal and numerical rating scales.**


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**Q3. What are the factors to be considered while designing itemized rating scale?**


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**Q4. True and False**

- i. Graphic rating scales are effective to be used with kids as respondents.
- ii. Both even and odd number of categories in an itemized scale will provide same results.
- iii. Use of two categories descriptor in itemized rating scale will give data on nominal scale.

**Q5. Fill in the Blanks with appropriate word or words.**

- i. The main benefit of using \_\_\_\_\_ is that it provides more information and meaning to the respondent, and thus increases its reliability.
- ii. The major challenge with the use of \_\_\_\_\_ is the time taken to code and analyse the responses.
- iii. Marketing researchers have developed a variety of scales that are believed to capture the \_\_\_\_\_ of the construct's attribute.

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## **11.8 FRACTIONATION RATING SCALES**

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Fractionation rating scales are based on a reference point. The respondents are required to rate the research object by doing a comparison between it and the reference point. The aim of using this scale is to measure the attitudes for a complete set of research objects on ratio-scale representation. The detailed functioning of this scale can also be understood in terms of constant sum scale. The constant sum method is explained in the next section.

Example of Fractionation rating scale:

Example: Suppose in the mobile phones, the Apple Iphone 7s has scored the maximum 100 points for its “touch quality”, how can we compare each of the given mobile brands to Apple Iphone 7s?

Apple Iphone 7s: 100 Points

Samsung C9 Pro: Points

One Plus 3T: Points

Vivo V5 Plus

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## 11.9 CONSTANT SUM METHOD

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In constant sum scaling method the researcher first determine the set of pre-defined criteria or factors for a specific set of research object. Once the criteria set is developed this set is given to the respondents to assign a constant sum of units which could be expressed in terms of points, currency or some other form. As in the example given below the respondents are asked to assign a total of 100 points to the different factors relevant for a newspaper. The attributes are scaled by counting the points assigned to each criterion by all the respondents and divided by the number of respondents.

Let's discuss the example of using constant sum scaling in real life. In the table given below different criteria are discussed for rating the newspaper. These criteria are: quality of content, editorial, columnists contributing, Pictures and images, Extent of news coverage in terms of local, regional, local and global and choice of advertisements for a newspaper. After defining the criteria, respondents were asked to rate each of them in a manner that the sum total of their responses is equal to 100. Two hundred respondents were asked to rate these criteria. After analyzing the responses of 200 hundred respondents, we can infer that quality of content is the most preferred factor and the least preferred factor for them is the advertisements. We can also see that the relevance of both editorial and pictures and images is twice of that of the columnists who are contributing in this newspaper.

Criteria	Overall respondents preference (200 responses)
Quality of content	35
Editorial	20
Columnist contributing	10
Pictures and images	20
Extent of news coverage	15
Advertisements	00
Total	100

Constant sum scale method enables the researchers to segment the respondents into different groups based on their preferences. The researchers consider constant sum scale to be treated as ordinal data measurement technique despite of it having distance and origin properties because the results generated by it lack the ability to generalize. However, the major usefulness of this method is that it offers fine discrimination among different stimulus objects in a quick manner without wastage of time.

Another challenge with this method is that the respondents may get disengaged if there is large number of criteria and this will affect the validity of this scale. This constant sum scales are useful for the marketing researchers to measure consumer shopping basket preferences. For example, if they want to know, 'how much each respondent spend on individual food items if they had Rs.500'? The use of internet based surveys have made constant sum scales easier to implement because researcher can keep a track of the total with the help of the software and can also inform the respondents to make the required changes if any.

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## 11.10 LIKERT SCALE

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In the itemized rating scale section, we have discussed the application of single-item rating scale. In case of this scale the researcher is attempting to measure the feelings or opinions of the respondents on the basis of one item alone.

Whereas, use of multiple-item scale is made by the researchers when they measure the opinion or attitude of the respondents for a product/ brand based on several items. These items are represented in terms of individual statements. The researcher can get the overall rating of a respondent by summing the individual ratings against each of the items and this total score measures the overall attitude of a respondent towards the object. Researchers generally make use of Likert and semantic-differential scales while measuring attitude based on multiple-items.

Likert scale is one of the highly used multiple-item scales in marketing research; it focuses on degree of agreement or disagreement of the respondent regarding a particular attribute of an attitude object. Respondents are required to rate the research object based on multiple items/ statement on a five-point scale ranging from agree to disagreement. Rensis Likert developed this scale and it is named after him. The researchers are required to analyze the attitude towards the research object in terms of multiple statements and frame these statements beforehand. After preparing this statement of inventory, the respondents are required to respond regarding their views on each of these statements. The most common form of Likert scale usually comprises of five items ranging from 'strongly disagree' to 'strongly agree'. Researchers have associated numbers with Likert scale to make its statistical calculation easy. The table below provides an example of Likert scale.

Q. Following are some statement relating too Newspaper X. Please indicate how strongly you agree or disagree with the statements using the scale provided by circling one of the numbers:

1 = Strongly disagree; 2 = Disagree; 3 = Neither agree nor disagree; 4 = Agree; 5 = Strongly agree.

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
a. Newspaper X has high quality content	1	2	3	4	5
b. Newspaper X has the best writers	1	2	3	4	5
c. Newspaper X has a balance of local and national coverage	1	2	3	4	5
d. Newspaper X is my preferred newspaper	1	2	3	4	5

**Fig 11.2 Example of Likert Scale**

Source: Paurav Shukla, 2008

The easy representation of Likert scale makes it user friendly for the respondents. While using Likert scale, marketing researchers can use different types of response systems each measuring five different positions. These five positions can be – 2, -1, 0, 1 and 2, or it can be normal rating of 1 to 5 or reversing this order from 5 to 1. Marketing researcher can both analyze the response on an item basis for each of the statements or an overall analysis based on the total score obtained by an individual respondent can be done. Likert scale are also used for the development of comparison constructs. As in case of above example, the same scale can be repeated for another Newspaper ‘Y’ and its results then can be compared to Newspaper ‘X’.

*Procedure:* As discussed above researchers need to develop an inventory of statements/ items while using Likert scale. The common process used to develop a Likert scale consists of:

1. First step in the process of developing Liker scale is to identify the series of statement which are essential to measure the attitude of the respondents towards the research object. It is important for the researcher to frame each of these statements in a manner that a respondent can easily express his/ her opinion in terms of distinct

favourableness or unfavourableness towards the research object. The researcher can choose to develop a balance scale comprising of an equal number of favourable and unfavourable statements.

2. It is advisable for the researcher to conduct a pilot on the research scale by administering it to a small sample of respondents before going full scale. The pilot means that researcher selects a small group of respondents from the actual sample of respondents. This small group give their responses on the series of statement developed in step one.
3. The respondents will express their opinions on a scale of '1 to 5' where '1' may represent the highest or lowest value and similarly '5' will stand for lowest or highest value. The researcher needs to describe what does '1' and '5' stands for.
4. The respondents will give their values for different statements and then researcher will obtain a total score buy totalling them.
5. After computing total score, the next step involves identification of those scores which are highly discriminated. Researcher can select a part of the highest and lowest total scores. These extreme groups will help the researcher to identify the most favourable and least favourable attitudes. This helps the researcher to measure the consistency among the statements in either category i.e. least favourable and most favourable.
6. After assessing the results of pilot test, statements which are correlated with each other must be considered in the final research scale.

*Benefits:* The several benefits of using Likert scale are:

- If the marketing researcher has required knowledge about the object to be researched, it is easy for him to develop a Liker scale.
- Range of data collected with the help of Likert scale is broader and the attitude is measured based on number of statements. This makes it reliable to use.
- It is possible for the researcher to empirically test the statements for their ability to discriminate.
- We can use this scale to measure the differences in responses of the respondents and also to measure the difference with respect to the stimuli for the same respondent.
- It is less time consuming. Both marketing researchers and students measuring opinion make use of this scale.

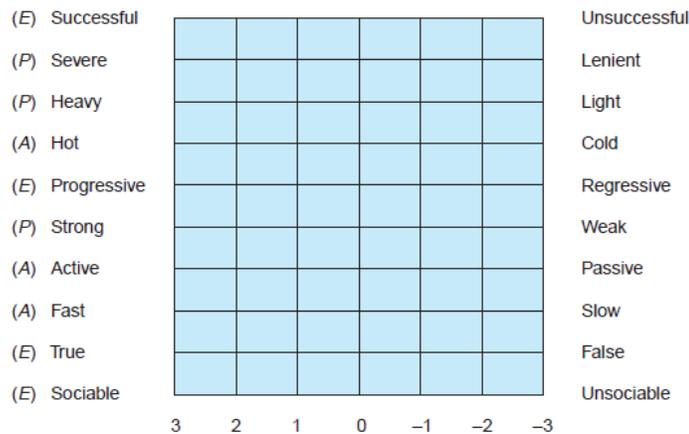
*Limitations:* Likert scale is not free from limitations. One of the biggest limitation of using this scale is that, though the marketing researcher can use this scale to determine whether respondents are more or less favourable towards research object, but this scale fails in

providing the intensity of their favourability. The reason for this is that, we cannot predict or be sure about the fact that the different positions on five-point scale are having equal space between them. This means that the interval between the following two positions i.e. ‘strongly agree’ and ‘agree’, may or may not be equal to the interval between these two position i.e. “agree” and “undecided”.

The major disadvantage of using this scale is that the total score obtained by a respondent is often vague. Different respondents can score same total score by giving different responses or following different answer patterns. Moreover, there “remains a possibility that people may answer according to what they think they should feel rather than how they do feel.”

## 11.11 SEMANTIC DIFFERENTIAL SCALE

While using semantic scale we use a bi-polar (i.e. extremely opposite) scale comprising of seven-points instead of Likert’s five-point scale. In semantic differential scale the both the extremes are clearly defined and in case of Likert each item on the scale is depicted with a category. We can use, ‘satisfaction’ and ‘dissatisfaction’ as the two extreme endpoints, when are developing a semantic differential scale. The figure given below suggests an example of using a semantic differential scale for evaluating different contestants for a leadership profile:



**Fig 11.3 Example of Semantic Differential Scale**

Source: C.R. Kothari, 2004

*Procedure:* The series of steps followed by a researcher to develop semantic differential scale is:

1. At first, the researcher needs to identify and select the different concepts or attributes of the attitude object to be researched. The researcher can make use of his own judgement and understand the research problem to select the attributes.
2. Next task of the researcher is to develop a range of bipolar adjectives which can be used to explain the research object.
3. Each pair of opposite adjectives is separated by a seven-category scale, with numerical labels or verbal labels.
4. The researcher can put some favourable or positive adjectives on the right-hand side, the scale for other items can be reversed, with favourable adjectives appearing on the left-hand side. This logic behind this reversal is to measure the overall attitudes.
5. After this, we need to code the seven categories numerically from '1' to '7' (making sure to reverse code items that are reversed. And then overall attitude scores are obtained by adding the coded responses on the individual statements/ items.

There are different advantages available to the user of semantic-differential scale. It is an easy and efficient method to measure attitudes of large sample size. Semantic differential scale is the most popular among the marketing researcher for measuring attitude. It generates a useful and comprehensive set of adjectival pairs to measure attitude in terms of both the intensity and direction. The researcher can obtain a complete meaning regarding the research object with the help of set of responses achieved from a respondent. The limitations discussed for Likert scale are relevant to for semantic-differential scale as well.



### *Check Your Progress- B*

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**Q1. Explain constant-sum scale method with examples.**

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**Q2. Explain the merits and demerits of using semantic-differential scale.**

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**Q3. Discuss the procedure of developing a Likert scale.**

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**Q4. Fill in the blanks-**

- i. \_\_\_\_\_ developed Likert scale and it is named after him.
- ii. Constant sum scale can also help segment various respondents according to their preferences and provide groupings.
- iii. Semantic differential scale is an efficient and easy way to secure attitudes from a large sample.

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**11.12 SUMMARY**

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In this unit, we have studied that attitude studies are of great significance to marketing researchers and attitudes can only be inferred and cannot be directly observed or measured. Thus, measurement of attitude depends upon self-report, that is, by seeking information from the respondents, instead of collecting it through observation. Self-report or quantitative judgment methods of measuring attitude typically involve the use of rating scales. There is a wide variety of rating scales available to a researcher to choose from. These scales differ on such dimensions as graphic versus itemized rating scales, balance versus un-balanced rating scales, odd versus even scale positions and measurement level of data obtained by using constant-sum scale method. The researcher must choose an appropriate format of scale depending upon the nature of variable to be measured, respondents' ability to make mental judgments, and the type of analyses to be performed on the data collected by these scales.

In this unit, we have covered two popular multiple-item scales, Likert scale and semantic-differential scale. The semantic-differential scale is the most widely used scale given its practical appeal and the visually effective profile diagrams that can be constructed from the data generated. However, the attitude inferred from the data generated from both Likert and semantic-differential scale does not show significant difference. Therefore a researcher is free to choose the scale that best meets the practical requirement of the research situation.



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## 11.13 GLOSSARY

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**Scaling:** It can be defined as the process of assigning a set of descriptors or rules to represent the range of possible responses to a question about a particular phenomenon.

**Graphic rating scale:** The graphic rating scale represents a range of options lying between two extreme ends. It is represented in the form of a straight line.

**Itemized rating scales:** Itemized rating scales are the most commonly used scales in marketing research due to its simplicity and its adaptability to most measurement situations. It is commonly known as numerical rating scale. Unlike graphic rating scale, the researchers make use of distinct categories on which the respondents are required to respond.

**Numerical rating scales:** Apart from verbal rating scales, another type of attitude scale is numerical rating scales. Researchers develop numerical rating scales by using a range of numbers from '0 to 10'. Just like graphical scale in this case also, the extreme numbers of the scale such as '0' may indicate 'highly negative attitude' and '10' may represent 'highly favourable attitude'.

**Verbal rating scales:** These scales make use of range of words commonly used to describe attitude or attitude object (e.g., no liking, mild liking, moderate liking, and intense liking).

**Constant sum scale:** A constant sum scale has a natural starting point (zero) and asks respondents to allocate a given set of points among several attitude objects.

**Single-item scale:** A single-item scale attempts to measure the feelings through just one rating scale.

**Multiple-item scale:** It is made by the researchers when they measure the opinion or attitude of the respondents for a product/ brand based on several items. These items are represented in terms of individual statements.

**Likert scale:** It is one of the highly used multiple-item scales in marketing research; it focuses on degree of agreement or disagreement of the respondent regarding a particular attribute of an attitude object. Respondents are required to rate the research object based on multiple items/ statement on a five-point scale ranging from agree to disagreement.

**Semantic-differential scale:** It also consists of statements/ items relevant to an attitude object. Each item is presented as bipolar adjectival phrases or words that are placed as labels to them.




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## 11.14 ANSWERS TO CHECK YOUR PROGRESS

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### Check Your Progress –A

#### Q4. True and False

- i. True
- ii. False
- iii. True

#### Q5. Fill in the Blanks with appropriate word or words.

- i. The main benefit of using itemized rating scale is that it provides more information and meaning to the respondent, and thus increases its reliability.
- ii. The major challenge with the use of graphic rating scale is the time taken to code and analyse the responses.
- iii. Marketing researchers have developed a variety of scales that are believed to capture the quantity of the construct's attribute.

### Check Your Progress –B

#### Q4. Fill in the blanks-

- i. Rensis Likert developed Likert scale and it is named after him.
- ii. Constant sum scale can also help segment various respondents according to their preferences and provide groupings.
- iii. Semantic differential scale is an efficient and easy way to secure attitudes from a large sample.




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## 11.17 TERMINAL QUESTIONS

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- Q1. What is the relevance of using self-report methods for measuring attitude?
- Q2. Which attitude rating scales most commonly applied in marketing research?
- Q3. What are the major differences between Likert and semantic differential scales?
- Q4. When should an itemized rating scale have unbalanced choices? Why?
- Q5. How would you select a set of phrases or adjectives for use in a semantic-differential scale to evaluate the brand image of quick service restaurants like

KFC, McDonalds etc.? Would the procedure differ if you were going to use a Likert scale?

Q6. Develop an itemized rating scale for the following question: Do you like the taste of Nestle yogurt?

Q7. Differentiate between constant sum scale and fractionation scale with example.

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**UTTARAKHAND OPEN UNIVERSITY**  
Teenpani Bypass road, Behind Transport Nagar, Haldwani  
Haldwani -263139, Nainital ( Uttarakhand)  
Phone : 05946-261122, 261123 Fax No. - 05946-264232  
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**Marketing Research**

**DEPARTMENT OF MANAGEMENT STUDIES**

**Block III Data Collection and Sampling**

**Block IV Data Analysis, Interpretation and Presentation**

## Marketing Research



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**UTTARAKHAND OPEN UNIVERSITY  
SCHOOL OF MANAGEMENT STUDIES AND COMMERCE  
University Road, Teenpani By pass, Behind Transport Nagar,  
Haldwani- 263 139**

**Phone No: (05946)-261122, 261123, 286055**

**Toll Free No.: 1800 180 4025**

**Fax No.: (05946)-264232, e-mail: [info@uou.ac.in](mailto:info@uou.ac.in), [som@uou.ac.in](mailto:som@uou.ac.in)**

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Department of Management Studies  
Uttarakhand Open University, Haldwani

**Dr. Sumit Prasad**  
Department of Management Studies  
Uttarakhand Open University, Haldwani

---

**Programme Coordinator and Editor**

---

**Dr. Manjari Agarwal**  
Assistant Professor, Department of Management Studies  
Uttarakhand Open University, Haldwani

---

**Units Written by**

---

**Unit No.**

**Dr. Namita Soni**  
**Professor and Dean**  
**Mahakal Institute of Management, Ujjain**

12 & 13

**Dr. Sanjay Mishra**  
**Associate Professor,**  
**Department of Business Administration,**  
**Mahatma Jyotiba Phule Rohilkhand University,**  
**Bareilly**

14, 15  
& 16

**Dr. Teena Saharan,**  
**Associate Professor (Dept. of HR & OB)**  
**Doon Business School, Dehradun**

17 & 18

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19

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20

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**Course Code-MS 501**

**Course Objective:** The course is designed to inculcate the analytical abilities and research skills among the students in the field of marketing.

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**Unit II Types of Marketing Research**

**Unit III Marketing Research Industry in India**

**Unit IV Marketing Research Process**

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**Unit XX Research Report Preparation & Presentation-I**

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**Unit XXII International Marketing Research**

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**Suggested Readings:**

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## **UNIT 12 INFORMATION NEEDS**

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## **12.1 INTRODUCTION**

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In any business setting marketing research will be conducted only if it seems to be helpful in decision making. Every time an organization confirms for undertaking a marketing research there exists several research design alternatives. With the finalization of the research undertaking, clear research objectives are stated and then the specific information needs are identified. The availability of appropriate information is considered to be one of the most important premises for achieving research objectives. Incorrect or non representative information may misinform managers and thereby hindering rather than helping decision making. More specific and clear the business information needs are defined the possibilities of gathering of needless information could be eliminated and the probability of getting appropriate information is promoted. When assessing the information needs for marketing research the method should be chosen carefully by comparing those available. The method of choice should be the most suitable for the accomplishing particular task. In this chapter we will discuss about the information needed by marketer at several point of time, where such information can be found and what are the methods for acquiring such information.

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## 12.2 OBJECTIVES

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After reading this unit you will be able to:

- Explain the concept of data and information.
- Learn about the information needed by the decision makers
- Know about the behavioural and non-behavioural correlates
- Learn about the available sources of information
- Describe the methods available for collection of information

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## 12.3 WHAT IS INFORMATION ?

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There may be certain situations where management is clear that no additional information is likely to change the decision taken by the company. In such situation the value of information is negligible. In contrast there exist numerous situations where there is requirement of the additional information as such information will improve the odds of making a good decision. Generally information is useful in two cases 1. Where one is unsure what is to be done, 2. where extreme values such as heavy profits or losses are involved. By collecting appropriate information the organizations simple reduce the odds of making wrong decision.

The word information can have many different meanings in a business setting. It may refer to data, knowledge or intelligence. Few terms are raw data; that represents the actual first hand responses that are obtained about an object or subject of investigation by asking questions or observing actions. Information; it is the data processed by the researcher who puts his time and efforts to interpret the data and attach a narrative meaning to them. Data is static text, numbers, code, marks or signals that do not necessarily include any meaning whereas Information has a meaning, purpose and value for its receiver and it is usually new to him. For example when a researcher comes to know about the demographic details of the customers it is data but when that demographic detail is received according to their purchasing lists may be seen as information for the marketing researcher who wishes to include a new product in the purchasing list of the customers. When information is enriched with insight and values it becomes knowledge, and adding personal experience to knowledge converses it into intelligence.

A marketing researcher generally needs information related to the business organization on which the research could be conducted for the purpose of decision making. Such information is known as business information. Business information is information regarding the company's own operations, markets, customers, competitors, and other factors and variables in the company's business environment. Business information can be seen as a researcher's fundamental resource because the research is conducted on such information and the decisions also rely on the business information.

The types of Information generally a marketing researcher looks for is scientific and technical information that enables him in learning, research, technical decisions and actions. The information can be in the form of policy and management information that fabricate in

decision making on alternate choices, negotiation, comparison etc. and lastly it can be in the form of operational and industrial information that enables decision regarding production, maintenance and so on.

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## 12.4 INFORMATION NEEDS

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Applicability and efficiency of decision depends on the correctness of information that a marketing researcher collects. The researcher can reduce the gathering of excess information by identifying the information needs for the research i.e. what information they really need, when they need it, and in which format to make optimal decisions and thereby attaining the research objectives.

Information need arises when a gap between the existing information and the information called for is recognized. According to Case 'Information need is the recognition that the existing knowledge is not enough'. Nicholas states that 'It is the information a person should have in order to perform his tasks or solve a problem in a satisfactory way'.

Carter has categorized information needs according to the types of questions the person in need asks:

- Orientation - the questions aim to find out what is happening.
- Reorientation - the questions aim to check if the course is right.
- Construction - the questions aim to get an understanding of things or to solve a problem.
- Extension - the questions aim to complete the existing knowledge.

The information needed should be very specifically defined as it incurs costs in collecting, processing, analyzing and disseminating the information. Incorrect information can further incur cost due to failure of business decision taken on the basis of the marketing research.

A marketing manager in an organization generally relies on management information system and reports generated for establishing marketing plans. A marketing researcher helping the marketing manager in developing reliable marketing plans requires following information -

- Internal company information – For developing business strategies a researcher will study the internal data of the company. The marketing researcher uses the internal information of the company to determine company's strengths and weaknesses. Researcher may use data related to sales, purchase, margin, costs, expenses, budgets, customer database, service etc. Such information is effortlessly available through internal records of the company.
- Marketing intelligence – The Market intelligence is the information related to overall market demand, market potential, competitors etc. The marketing intelligence can be gathered from internal as well as external sources. Information of customers, employees, suppliers, distributors, competitors helps the decision makers in understanding the day to day

changes in the business environment. A cosmetic company for instance is interested in launching a new range of cosmetics. The company will have to collect the information from distributors, wholesalers, retailers about the current trends in the cosmetic industry, the researcher will have to find out the competitors and the products recently doing good in the market.

- Market Research – Along with the internal information and the market intelligence a marketing manager is required to know “What a customer wants?” For the same diligent marketing research is required from time to time to understand the market and consumers. Huge business failure happens due to lack of marketing research or lack of applicability of information while taking business decisions. Kodak film is one of the examples of failure due to lack of innovation and market understanding as it stayed with the photographic film roll and customers moved to digital cameras. Major changes in industries are known by being in touch with the customers and understanding their wants. These are the reasons why normally organizations conduct business research.

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## **12.5 INFORMATION NEEDED BY DECISION MAKERS**

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A nearly endless variety of data and information exists in the current times, but one of the important tasks of the researcher to identify a few types of information relevant to the research objectives and further the data objective. Researchers have a substantial task in selecting the precise type of information to be acquired. For the purpose of aiding in the research process we will identify the types of data and information required. Information needed for research can be classified on the basis of 1. Nature of data, 2. Functions of data.

- Nature of data

While categorizing the data on the basis of its nature following types of information can be obtained –

- o Facts – it include the measurement of anything that actually exists or has existed. Facts can be defined as events, information, or existing state of affairs that were observed, or had happened and are confirmed as ‘reality’. In simple words we can say that facts are valid statements that occur to be correct. Usually, facts describe tangible, although they can be intangible also. For example in 2016 summers in the month of June, July and August the cold drink sales shows a sharp increase by 7% is a tangible fact as it could be measured but the it is also a fact that Pepsi sales also increased along with other cold drink brands though non-measurable.

The facts should always be cautiously dealt as many facts are based on estimates or on samples that have a degree of unreliability. These may be used in research but should not be treated as absolute truth.

o Estimates- an estimate can be considered one step above the fact because it is generalized application of a fact from a limited source to a larger source. For example when a survey is conducted among a representative sample of customers, the results are facts as long as any references to them are restricted to just that sample. These facts are transformed into estimates only when the researcher suggests that they represent the accurate data

o Knowledge – it is known as what people know or also as desired data. This information is determinant of what consumers, employees, suppliers, distributors or any other relevant group know or do about the topic of research. Consumers' knowledge, their purchasing pattern, their awareness of products or brands can be classified as knowledge. A research, for instance wants to find out the decision making process customers follow and the factors they consider while buying a new automobile in order to do use the information in planning a new advertisement campaign.

o Opinions – are the perception of people about something, what their beliefs are and what these beliefs signify. These are the views or judgements formed about something, not necessarily based on knowledge or facts. Opinions are the most influential attitudes, which are mental sets to act in a particular manner. Another form of opinion can be image in the mind of the people. For example a marketer is launching a new health drink can take the benefit of the opinion of customers who consider that regular food does not replenish the necessary minerals and vitamins required for the body thus the customers may be willing to pay premium price for such health drink. Opinions are significant as they affect the behavior, and attitude of individuals.

o Intentions - are the acts that people have in mind to do, expectations of their behavior. They are the mental state that represents a commitment for carrying out an action or actions in the future. Intention involves mental activities such as planning and forethought. The extent to which people are committed to exhibit their intentions through marketing behavior and changes in such intentions may be key information for the marketing researcher. For example Tata Motors learns from monthly data service that 12.5 percent of consumer families intent to buy a new car within the next 12 months, as against 12.6 percent in the previous report, it may revise its production plans. An example Nike may plan a discount on its shoes as it is aware of the intentions of buyers of buying shoes at a discounted price.

o Motives – are the internal forces that cause people to behave as they do. Marketer would like to have accurate data on the motives that impel buyers' action related purchasing, buying action related to a product category etc. Many motives are quite obvious as the people freely talk about it, but few motives may be hidden or may be difficult to draw out. Marketing researcher may choose out of various projective techniques for collecting information such as word association, sentence completion etc.

- Function of Data

The data can also be classified on the basis of how it is being utilized at the stage of analysis by the researcher when he brings all the bits of data to form some information in order to draw conclusion from them. This information acts as the background for decision making by

the marketer. It is important for the researcher to decide the observation design in which he plans beforehand that what information would be required at the initial stage of research. This ensures that researcher avoid wasting time and money in gathering redundant and repetitive data. The type of information classified on the basis of function -

- o Causation – researcher need to collect the data related to the variable under study that act as the independent variable in the study, we may say as the cause of the changes in the specific variable. A researcher for instance is interested in knowing the effect of taking a test ride (i.e. causation) on the buying of the car (i.e. payoff). The information related to person or family buying the car may have significant effects on the payoff. As people with some specific characteristics may be affected by test ride than others.
- o Payoff – is the data that represents the dependent variable. In the previous example the buying of car is the payoff variable related to which the data is collected.
- o Description – it requires description of the sample or cross section of the population that the study has covered. As seen in the above stated example the effect of test ride on car buying, a researcher may be interested in knowing difference among male and female buyers or already owners and the first time buyers etc.
- o Identification – the researcher identifies particular source of information. It involves specifying the unit of study and then the sample from which the data would be collected.

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## **12.6 REASONS OF INFORMATION NEEDED BY MARKETER**

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Market research is an integral part of an organization's strategic planning. Market research consists of fact finding, analysis and problem solving; these are crucial in deciding how to a company's product could reach maximum customers and construct the potential growth of business. An enterprise driven by research addresses these questions through its unending efforts to strategically use customer information to sort customers into profitable and unprofitable segments. Following are the reasons why information is required by a marketer -

- Identifying the target market

For any organization to succeed in its business it is important to know the target market for its products and to reach it. Marketing researcher gather statistical information related to the target market's demographics, market segment, needs and buying decisions. Developing customers profile help in catering the market profitably. Information related to age, sex, profession, income, kids, products they own, whether have internet access etc will help in clearly defining the methods for pricing, promoting and placing the product in the market.

- Understand the strengths and weaknesses of competitors

For getting clear information regarding the business environment the data related to the competitors is also to be collected. Question such as 'How competitors promote their

products?’, ‘What is their price point?’, ‘What is the placement strategy adopted by them?’ etc. The information collected through marketing research help the business in minimizing risks by taking actions on certain subjects.

- Catering the Market better

It is important for a researcher to research similar products in the market in order to know the current trends in the market, and what the competition is offering in order to cater the market better. The marketer can improve his product or service based on findings about what your customers really want and need and what the competitor are offering. As the market changes continuously and constantly, marketing research helps in establishing the ongoing trends and formulating plans according to the current customer needs and requirements. Focus on things like function, appearance, customer service and warranties are important parameters.

- For identifying best marketing mix for company’s product or service

The marketer has to take decisions regarding the marketing mix which include decision on the product, its price, its place or distribution and its promotion. The marketer can ask questions regarding the best marketing mix for the company’s product and service by collecting information regarding current trends, customers preference, their choices, decision criterion, about competitors etc. Through research the decision makers are aware of the customers’ likes, dislikes, their personalities etc. and it helps providing better product and services to the customers.

- Find out possible problems

Through research data related to customer reactions, choices, and preferences can be gathered and such information can help the business in identifying the problems in advance. This information will helps in avoiding unpleasant surprises when starting, maintaining and growing any business organization. Regular market research ensures that a marketer is aware of market trends, demographic shifts and changes in the economy in order to grow business steadily and increase profits.



### *Check Your Progress- A*

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**Q1. What do you mean by information?**

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**Q2. What are types of data?**

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**Q3. Describe the types of data on the basis of nature of data.**

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**Q4. What are the reasons for which a marketer may need information?**

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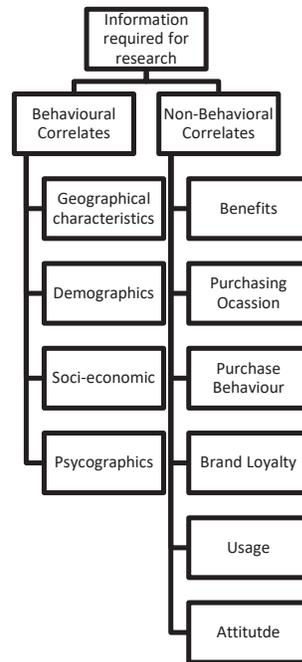
## **12.7 BEHAVIOURAL AND NON BEHAVIOURAL CORRLATES**

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The marketing researchers generally have to collect the information from people related to the behavioural and non-behavioural correlates of the customers. Information collected for the purpose of research confirms the reliability and generalizability of results. Through the customer information companies can acquire competitive advantage. At the granular level the data that are highly detailed, highly personalized, and specifically structured around an individual customer are collected. When the researcher use the granular information to anticipate and fulfil customer’s desire it becomes a customer centric approach. The granular information can take form of behavioural and non-behavioural information -

The non-behavioural correlates explain the nature of consumer by identifying factors that explain the consumers’ state of being like age, sex, income, occupation etc.

The behavioural correlates explain the past behaviour of customer, current consumption pattern, and intended behaviour that affect their decision making process. Manager needs to understand and acquire adequate knowledge on both behavioural and non-behavioural correlates of customers for better managerial decision making.



**Fig 12.1 : Behavioural and non-behavioural correlates**

- Behavioural Correlates

Behavioural correlates are the variables that are fundamental piece of information for conducting the marketing research, it helps in understanding the customers so that the company can plan its marketing mix in such a manner that the customers get attracted to its products and services. Buying pattern of the customers such as frequency of buying, volume of buying, the reason for buying the product, the benefit sought are the behavioural variables. Following are the behavioural correlates that a marketing researcher studies-

- o Benefits Sought – Customers always buy a product to get some specific benefits from the product. Customer for instance seeks benefit of fuel efficiency and comfort from a car. The information collected on the benefits sought by the customers ensures that a company can plan its product, price, place and promotion in such a way that the choice criteria of the customer can be met. With the information collected about the benefits the customer seek the marketer can focus on a specific features and can serve the customers in the best possible manner.

- o Purchase Occasion- information related to the occasion of purchase help the marketer in creating a product offering that can meet the customers need at a specific point in time. Occasion where customers generally buy may in times of festivals, emergency or regularly. A

marketer can plan special offers and package design according to the information on purchasing occasion of customer.

- o Purchase behaviour – Different buying behaviour are shown by customers at different times, such as buying for the first time or going for a repeat purchase. The information related to the purchase behaviour can help the marketer in targeting the customer with specific promotional strategy. For example in case of a newly launch product mostly the innovators are the ones who initially try new products. They are the opinion leaders who help the company in establishing their new products or brands. The marketer has to very specifically plan the communication and placement strategy for the product so that it can reach the innovators. These innovators are the opinion leaders who are followed by rest of the segment.
- o Brand Loyalty – Brand loyal customers stick to a specific brand, but most of the customers switch brands. Numerous customers do not have any brand preference and few are variety seeking customer. Information related to the brand loyalty of customer towards a brand help the marketing researcher work on the factors that leads to brand loyalty among customer. Such information can help in monitoring the switching behaviour of customers.
- o Usage – A marketer collects the information regarding the usage behaviour of the customers. The customers can be classified as heavy user, light user or non-user of the product. Such information help the marketer in formulating strategies for attracting heavy users by providing them membership advantages and concession to retain them. The non-user can also be attracted by showing the usefulness and the benefits they can get from the product.
- o Attitude –It is the attitude of the customer that influence him in creating buying intention and accomplishing the buy. For example it is the attitude of mothers' that decide that whether health drinks are required for the growth of the child, and what are benefits that she wants to draw if she buy a health drink. Thus information regarding the attitude can help the marketer in planning the marketing strategy, communication strategy, advertisements in such a way that can aid in the purchasing attitude of the customers.

- Non-behavioural Correlates

These are the variables that describe the characteristics of customers. Age, gender, education level of customers, their occupation, income etc. are few examples. Collecting information related to such factors help companies in focussing their attention on the probable customers. Following are the non-behavioural correlates –

- o Demographic variables – variables such as Age; Customers belonging to different age groups have different choices and preferences, the marketer use this information for segmentation. The products and marketing strategies for teenagers would obviously be different than kids.

Gender; men and women may have different needs and can buy a similar product but may sought different benefits from it. For example men may buy cosmetic product for hygiene but women may buy cosmetics for enhancing their beauty.

Life cycle; customers requirement depends on the life cycle stage they belong to Newly married couples for instance buy electronics and consumer durable product in order to set their new houses whereas the couples with grown up children may sought education loan etc. Company catering to the higher income group will have different range of products and strategies as compared to companies that target the lower income group.

Marital Status; the marital status of the person defines the way of purchasing and the products he buys. For example travel agencies plan different holiday packages for bachelors and married couples.

Occupation; Office goers would have different needs as compared to school or college students. The information collected according to the occupation of customer can help in understanding the requirements and specification of the customers.

- o Geographical variables – the geographical location of the customer intensely affect their purchasing behaviour. Their product choices, their buying patterns, their consumption behaviours all are of governed by the place they live. McDonald's, for instance in India does not sell beef products as it is strictly against the religious beliefs of the countrymen, whereas in US it freely sells and promotes beef products. Companies may create product to fulfil the needs of specific geographic location.

- o Socio-economic variables – are the "factors of a social and economic nature (occupation, income, etc) which indicate a person's status within a community". Information of the socio-economic variables can help the marketer in identifying the difference among customers who may geographically or demographically be classified in a similar category but have different preferences and buying patterns.

- o Psychographic variables – in order to understand the deeper motivation behind buying specific products or brands, the psychological makeup of customers is analysed. The information on customers' values, opinion, activities, lifestyle etc. are collected. The basic motive is to acquire the information related to the patterns of buying behaviour so that the customers can be classified into similar categories.

Lifestyle; According to the Barron's Marketing Dictionary lifestyle is 'Individual pattern of living as reflected by interests, opinions, spending habits and activities.' Marketer relates its brand to lifestyles of its targeted customers.

Personality; customers prefer products and brands that reflect their own personalities. Information related to the personalities of the customers help the marketer in creating brand personalities that attract the buyers and also I selecting the brand ambassadors who advertise their products.

The information about the behavioural and non-behavioural correlates helps in attaining specific research objectives.

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## 12.8 SOURCES OF DATA

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A researcher after finalizing the research objectives, the next step is to identify the information needs and then he finalized about the sources of information. It is useful in itself, especially when it is accompanied by an explanation about the selection and use of the sources. Generally data is collected from primary as well as secondary sources.

- Secondary sources – are always considered first by the marketing researcher, he can opt to choose the data that is already available from various sources. Such as internal company sources or external sources. Data that is stored by the organization in any form forms the internal source. Records, reports, statements, previous studies are few examples of internal sources of data. If data from internal source is not sufficient then the researcher can move to external sources.

External data refers to the data that is gathered by other individuals or associations. It may include information gathered by universities, government sources, media such as newspaper, magazines, internet, trade and business expert and other commercial information.

Data from secondary sources is mostly free or is available at a very less cost and takes lesser time in collection.

- Primary Source – where the researcher considers that the available information is not useful for solving specific problems then he collects first hand data from primary sources. Innovating new products, improving the existing ones or providing faster and efficient services etc. could be the specific problems. Primary information is collected from the original source in a controlled or an uncontrolled environment. Controlled environment is the exhibited through experimental research where certain variables are being controlled by the researcher. On the other hand, data collected through observation or questionnaire survey in a natural setting are examples information obtained in an uncontrolled environment.

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## 12.9 METHODS FOR COLLECTION OF INFORMATION

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The information required by the researcher is collected according to the research objectives stated by the researcher, a structured plan for collecting relevant data should be made in advance so as to ensure that correct and relevant data is collected. An observation design should be prepared by the researcher that mentions the data collection methods, techniques and the structure. Following techniques can be used -

Primary Information collection techniques – are explained below -

- Focus Group Interview –A group of people with common characteristics is brought together at a place and insightful questions are asked regarding research objective. It is a

qualitative research method focusing on the customer's attitude, preferences, their feedback etc.

- Observation – it is a quantitative method where in a researcher or a trained observer observes the respondents behavior. In comparison to surveys and questionnaires, it is a personal approach and the observer with his experience and skill can gather accurate data of any observable phenomenon.
- Surveys and questionnaires – are very frequently used in research for collecting primary data. Questionnaires, forms, interviews etc. are few ways for administering the survey. Relevant and uniform information can be collected and it can be further analyzed for reaching at applicable research results.
- Experimentation – Experiments are conducted for testing assumptions and hypotheses either in laboratory or in the field, these experiments serve as the fresh source of primary data.
- In-depth Interviews – in order to disclose and understand the hidden needs and wants in-depth interviews are conducted. Such interviews are conducted by the moderator who asks structured and unstructured questions from the respondents. The collected data is later analyzed and companies prepare product offering accordingly.

Secondary Information Collection Techniques – are explained below –

- Internal sources – Information stored in the business's database act as a valuable source of secondary information. Balance sheets, profit and loss statements, records and reports of sales, inventory, purchases, expenses, supplier's etc. can be referred to find out the best product offering.
- External sources – when the internal sources prove to be insufficient external sources can be explored. Government websites, official sources, universities and colleges library and researches, Internet, data available with competitors can all be data searched for collecting the relevant data.

The specific research problem and the objectives are the background that helps in deciding the most appropriate sources of information.



### *Check Your Progress- B*

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#### **Q1. Discuss the behavioral correlates in detail.**

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**Q2. Discuss the secondary sources of data available to the researcher?**

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**Q3. What are the different sources of information?**

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**Q4. Describe the primary sources information.**

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## **12.10 SUMMARY**

The availability of appropriate information is considered to be one of the most important premises for achieving the research results. Specific and clearly defined business information needs can minimize the risk of failure and can enhance the chances of profitability. Information is the processed data that has a narrative meaning. When information is enriched with insight and values it becomes knowledge, and adding personal experience to knowledge converts it into intelligence. For marketing research information can be classified on the basis of 1. Nature of data, 2. Functions of data. Applicability and efficiency of business decision depends on the correctness of information thus a researcher should clearly define its information needs. Internal company information, marketing intelligence, market research are generally the information required by the marketing manager. These information can be in the form behavioural and non-behavioural correlates of the customers where non-behavioural correlates explain the nature of consumer and behavioural correlates explain the past behaviour of customer, current consumption pattern, and their intended behavior. Primary as well as secondary sources can be used for collecting data. Various techniques and methods such as focus group interview, surveys and questionnaires, observation, trials and experimentation, in-depth interviews can be used for collecting primary information and secondary information can be collected through internal or external sources.




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## 12.11 GLOSSARY

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**Raw data** - actual first hand responses that are obtained about an object or subject of investigation by asking questions or observing actions.

**Information** – the sets of facts derived from the data the researcher or decision maker interprets and attaches narrative meaning to the data structures.

**Facts** – Some piece of information that is observable and verifiable through a number of external sources.

**Estimates** – A generated application of a fact from a limited source to information about a larger source.

**Granular Information**– highly detailed, highly personalized data specifically structured around an individual customer.

**Customer centric approach** – use of granular data to anticipate and fulfill customers' desire.

**Product Offering** – Product offering is a total offer a marketer offer to the customers.

**Brand loyalty** – the tendency of some consumers to continue buying the same brand of goods rather than competing brands.

**Observation design** – it involves decision about the methods and techniques of data collection and the condition under which the observation are to be made.

**Behavioural correlates** - The behavioural correlates explain the past behaviour of customer, current consumption pattern, and intended behaviour influence the consumer decision making process.

**Non-behavioural correlates** – explain the nature of consumer by identifying factors that explain the consumers' state of being like age, sex, income, occupation etc.




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## 12.14 TERMINAL QUESTIONS

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- Q1. Explain which of these data classification would be more useful; function or nature?
- Q2. Discuss the reasons why information is needed by the marketing researcher for strategic decision making.
- Q3. What type of information is required by a marketing researcher in order to help the marketing manager in developing reliable marketing plans?
- Q4. Discuss when a marketing researcher opts for secondary data and when he chooses to acquire primary data for accomplishing the research objective.
- Q5. What types of information the behavioral and non-behavioral correlates provide to the researcher?
- Q6. Describe each of the following
- a. Survey
  - b. Focus group Interview
  - c. Questionnaire
  - d. Observation
- Q7. A marketing manager of personal appliance department of large and widely diversified organization. The company is trying to test the proposal for adding a new product, a hearing aid in its appliance line

- a. What information, if any could be obtained from respondents would be useful for deciding whether to develop and introduce a hearing aid? If it is concluded that no useful information could be obtained from respondents, so indicate and do not answer further questions
- b. What techniques are applicable for obtaining each type of information?
- c. Design a survey to obtain desired information.

Q8. A product manager of brand M Margarine is interested in finding out the reasons for decline in the absolute sales for last four consecutive months. What information could be obtained from the respondents that would be useful for determining the causes of decline.

Q9. Indicate whether you agree or disagree with the following statement 'One of the important reasons for the use of survey is that they can obtain sound information on what people's action in the future will be.'

Q10. Suppose that you are framing the data objectives for a consumer study relative to a new product introduction. Name the main factors you should consider.

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## UNIT 13 PRIMARY METHODS OF DATA COLLECTION

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### 13.1 Introduction

### 13.2 Objectives

### 13.3 Selection of Appropriate Source of Data

### 13.4 Advantages and Limitations of Primary Data

### 13.5 Evaluation of Primary Data

### 13.6 Primary Data Collection Methods

### 13.7 Collection of Primary Data through Questionnaire

### 13.8 Collection of Primary Data through Schedule

### 13.9 Other Methods of Data Collection

### 13.10 Editing the Collected Primary Data

### 13.11 Summary

### 13.12 Glossary

### 13.13 Answers to Check Your Progress

### 13.14 References

### 13.15 Suggested Readings

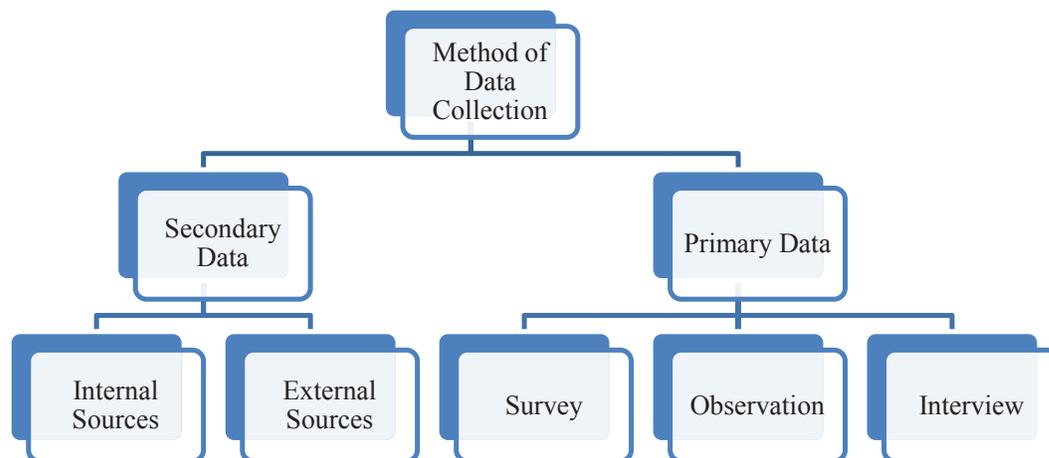
### 13.16 Terminal Questions

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## 13.1 INTRODUCTION

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The researcher after identification of the research problem states the research objectives and then the research design is finalized. During the course of the researcher states a specific and clear observational design. While preparing the observation design methods, techniques and the sources of data are decided. Both primary and secondary data collection methods can be used. When the researcher know that available data can fulfill the requirements of research then he used secondary data but when specific information needs are to be fulfilled and no information is available to meet such needs then *primary data* is collected. On the basis of the research objective the sort of data required is identified. In this chapter primary methods of data collection are discussed.



**Fig 13.1 Methods of Data Collection**

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## 13.2 OBJECTIVES

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After reading this unit you will be able to -

- Explain the factors considered for selecting the suitable source of data.
- Learn about the advantages and limitations of primary data.
- Know the techniques used for evaluation of primary data.
- Learn about the primary data collection methods.
- Describe questionnaire as a tool for collecting primary data.
- Understand the use of schedule for collecting primary data.
- Find out the ways of editing the collected primary data.

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## 13.3 SELECTION OF APPROPRIATE SOURCE OF DATA

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As discussed earlier secondary data can usually be gathered faster and at lesser cost than primary data, but if specific information need exists and the available data does not fulfill the requirement the researcher will have to opt for primary data. Primary data incur more time and efforts and requires skilled researcher. Primary sources, for instance include finding out first-hand; the attitudes of a community towards health services, determining the job satisfaction of the employees or obtaining customer preference toward a brand are examples of information collected from primary sources. On the other hand, the use of census data to obtain information on the age–sex structure of a population, the use of an organization’s records to ascertain its activities from sources such as articles, journals, magazines, books and

periodicals to obtain historical and other types of information, are all classified as secondary sources.

Determination of sources for research is based on three fundamental dimensions 1. the extent that the data already exist in some type of recognizable format, 2 the level at which the data is used and interpreted, and 3. the degree to which the decision maker understands the reasons why the data were collected and assembled. Both the sources of information have their merits and demerits. Following factors helps in selecting a particular source of data-

- **Purpose of Information**

In the very beginning of the research the purpose of collecting the information should be clearly mentioned, it helps in clearly stating the source of data. For instance a researcher is interested in knowing the effect of discounted prices on sales of the product it would be necessary to collect data of commodity prices and sales. Failure to set out clearly the purpose of enquiry can lead to confusion and waste of resources.

- **Time Availability**

The researcher need to specify the time duration within which the research results should be made available to the decision makers, as any delay in the decision can lead to missed opportunity in a business setting. Investigation should be carried out within a reasonable period of time. For instance, if a marketer is interested in knowing the expected demand of new product launched by the company and if the enquiry takes two years then the whole purpose of enquiry would become useless. So the researcher will have to choose the source of data on the basis of time available to him for the enquiry.

- **Resources Availability**

Reliability and applicability of any research depends quality resources valuable. Ample financial resources, time, technically skilled researcher etc. ensures selection of relevant data sources. Larger the sample size is more reliable and applicable the research results are.

- **Desired Degree Of Accuracy**

In qualitative research the investigator is unable to achieve absolute accuracy and even if the research is of quantitative nature complete accuracy is still in question. Therefore, a desire of 100% accuracy is bound to remain unfulfilled. However, the researcher must aim at attaining a higher degree of accuracy otherwise the whole purpose of research would become meaningless.

- **Statistical method Used**

After deciding the unit of study, the researcher decides about the sources of collecting the information. The researcher on the basis of the statistical method that will be used for analyzing the data decides the data source.

- **Method Of Data Collection**

In case of collecting primary data, decision has to be taken whether census method or sampling technique is to be used for data collection. In census method, every unit in the universe is studied while in sampling technique only few selected representative are studied. Census method is more scientific and 100% accuracy can be attained through this method, choosing this becomes difficult because it is time consuming, it requires more labour and it is very expensive. Therefore, for a single researcher or for a small institution it proves to be unsuitable. On the other hand, sample method is less time taking, less laborious and less expensive but 100% accuracy cannot be attained through this method.

Hence, a researcher has to be very cautious and careful while choosing a method of data collection.

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## 13.4 ADVANTAGES AND LIMITATIONS OF PRIMARY DATA

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Primary data is collected by a researcher specifically for a research assignment. In other words, primary data are information that a company must gather because no one has compiled and published the information in a forum accessible to the public. Companies generally allocate time and resources required to gather primary data only when a question, issue or problem is sufficiently important or unique that it warrants the expenditure necessary to gather the primary data. Such data are directly related to the issue or problem. The primary data have following advantages and drawbacks -

### Advantages of primary data

- **Data is Accurate-** The primary data are original and relevant to the topic of the research study thus they ensure higher degree of accuracy. The primary data can be checked at three levels of accuracy; first on the investigator's skills, then on his trustworthiness, and lastly the data collection process require searching for the most representative sample.
- **Wide geographical coverage** - Primary data ensures wide geographical coverage from a large representative population. The data can be collected with the help of personal interviews, telephonic interview, mail or internet surveys, focus groups, observation etc.
- **Reliability of Result** – As the primary data is current and specific data, through it realistic and reliable results can be achieved by the researcher about the topic under consideration. Reliability of primary data is very high.
- **Applicability of results** – Through primary data unique information is collected thus the results achieved are absolutely applicable.

### **Drawbacks of primary data**

- A lot of time and efforts are required for collecting primary data, and still if timely information is not available the research results may become outdated and their application may lead to serious problems.
- Primary data collection procedure is expensive as it requires trained and skilled researcher and when larger population is to be covered cost is even higher.
- When observation or interview is used for collecting primary data, it requires more number of researchers. Skilled researchers are required at each stage so as to ensure collection of appropriate data.
- Trained researchers are required for data collection, inexperienced people in the data collection process may give inadequate data of the research.
- If the instrument for conducting the survey is not designed with precision accurate primary information cannot be collected. In both the cases the questions must be simple to understand and respond.
- In case of self-administered survey getting timely response is difficult. Sometimes, the respondents may give fake or socially acceptable answers in order to cover up the realities.
- When the researcher loses control over the research instrument non response or incomplete response leads to negative impact on research.

Despite of all the drawbacks and advantages it is the research objective that leads to finalization of data collection source and the methods adopted for data collection.

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## **13.5 EVALUATION OF PRIMARY DATA- RESEARCH AUTHENTICATION**

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Tough the data collected through primary sources is very valuable and critical to the research there must be certain quality checks that a researcher sometimes must undertake. On the first review the information may seem complete and applicable but on closer examination, one may find mismatch between framed research objective, doubt regarding the methodology or analysis of data. Thus following evaluation of primary data should be conducted –

- **Methodology Check** – the first and the foremost criteria is to check the methodology so as for increasing reliability and accuracy of research results. The researcher should take care of these factors while checking the methodology 1. Information is collected from the representative sample 2. Information is collected using appropriate method 3. Instrument used is appropriate. If the researcher is cautious about the above aspects the accuracy of data can be ensured.
- **Accuracy check** – emphasises on the significance of source of information. The researcher must determine whether the data is accurate enough for the purpose of the present study.

- Topical check – the primary data collected for current need should be collected in the current time or its applicability could be reduced and the results acquired from such data could not be generalized for taking business decisions.
- Cost Benefit Analysis –the researcher should measure the cost of procuring the data viz., the advantage of the information, thus a cost benefit analysis should be conducted.

If proper evaluation is done before collecting data through primary data reliable and accurate research results can be achieved.



### *Check Your Progress- A*

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**Q1. How the evaluation of primary data can be conducted?**

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**Q2. Discuss how the researcher chooses a data source for conducting a research.**

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**Q3. What are advantages and drawbacks of primary data?**

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**Q4. State whether the following statement are true (T) or false (F):-**

- Primary data is the data that is always collected first.
- Secondary data is not always specific to the research problem under study.
- Primary data methods have a significant time and cost advantage over secondary data.

## 13.6 PRIMARY DATA OF COLLECTION METHODS

The marketing manager should first of all, explore the secondary data from various sources and examine the possibility of their use for the study. But if the researcher finds the data inadequate or unsuitable, he may realize the need for collecting first-hand data. During social science research if a researcher is interested in collecting first hand information on any happening or event the researcher either ask someone who knows about it or observes the individuals from whom the data could be collected or can do both. And during scientific or hypothesis testing research primary data can be collected by conducting an experiment. In case of descriptive research performs surveys, or conducts observation or interview.

There are several ways of collecting the appropriate data which differ considerably in context of cost, time and other resources at the disposal of the researcher. Important ones are: 1. observation method, 2. interview method, 3. in-depth interview, 4. focus group interview, 5. questionnaires, 6. schedules, and 7. other methods which include a. warranty cards; b. distributor audits; c. pantry audits; e. using mechanical devices; and f. through projective techniques.

### 1. Observation Method

In observation instead of asking respondent about their current behavior, the researcher observes and records his observation. During the process the researcher is personally present in situation and observes. The results of observation entirely depend on the skill, knowledge and experience of the researcher.

Observation can be divided into participatory observation and disguised observation: in participatory observation the observer becomes the part of the group being observed while in disguised observation the participants are not aware of the observation.

Advantage	<ul style="list-style-type: none"> <li>• Researcher can obtain accurate answers as there exist no respondent bias.</li> <li>• Researcher does not require a lot of preliminary information about the subject while executing the observation.</li> <li>• In this method the respondents' willingness is not required.</li> <li>• Observer can observe directly rather than relying on responses of participants.</li> </ul>
Limitations	<ul style="list-style-type: none"> <li>• It is an expensive method as only skilled and trained observer can be employed for observing the respondents.</li> <li>• Not appropriate for studying a large group of people.</li> <li>• In case of larger population this method is laborious and time consuming.</li> <li>• It is difficult to validate the results from the data collected.</li> </ul>

	<ul style="list-style-type: none"> <li>• Requires skilled, proficient and competent researcher.</li> </ul>
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**Table 13.1- Advantage and Limitations of Observation Method**

The observation method is already discussed in detail as the methods used in conduction of descriptive research design in Unit 8, Descriptive Research Deign, in Section 8.9.

## 2. Interview Method

The interview method involves direct contact of the interviewer with the respondent. In this method the interviewer personally meets the respondents and asks necessary questions to them regarding the subject of enquiry. Usually the researcher develops a structured set of questions for gathering the responses in a structured and uniform method. The interviewer must be very efficient and tactful to get the accurate and relevant data from the respondents. An interviewer can collect the data in person through personal interview or on telephone through telephonic interview.

Different kinds of interview techniques can be used by the researcher such as structured and semi-structured interviews, thematic interview and form interview. In the structured interview responses are collected in a uniform pattern through structured questions. In the semi-structured interview the interviewer ask similar questions from everyone but order of questions is changed. In the thematic interview the respondents answer open ended questions based on different themes. In the form interview the interviewer reads the questions aloud and the respondent answers those questions.

Following are the advantage and limitation of the interview method –

Advantage	<ul style="list-style-type: none"> <li>• The interview process allows the researcher to adapt the questions and the language to suit different situations and different respondents.</li> <li>• The chances of non-response reduce drastically in the interview process as the researcher can tactfully handle non-response.</li> <li>• It allows the researcher to ask personal questions and additional information can be obtained through observation.</li> <li>• The collected data is very reliable since the interviewer tactfully collects the data by cross examining the responders, it may elicit</li> </ul>
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	subconscious needs.
Limitations	<ul style="list-style-type: none"> <li>• The interview process is expensive and time consuming as it requires experienced and skilled interviewers to collect the data.</li> <li>• There are chances of interviewer's as well as respondents' bias. It requires continuous supervision and control.</li> <li>• The respondents may not be willing to answer some personal questions.</li> </ul>

**Table 13.2- Advantage and Limitations of Interview Method**

The interview method is already discussed in detail as the methods used in conduction of descriptive research design in Unit 8, Descriptive Research Deign, in Section 8.11.

### 3. In-depth Interview

In-depth interview is repeated face-to-face interaction between the researcher and the respondents. It is conducted for discovering the information about the respondents' viewpoint, experiences, feelings expressed in their own words. These interviews are designed to understand the unconscious and underlying motives and desires of the respondent.

One of the advantages of in-depth interview is that it involves repeated contacts and so good rapport is developed between the researcher and the respondents and this ensure collection of in-depth and accurate information. Only trained, skilled and experienced researcher should be engaged in depth interviewing.

Advantage	<ul style="list-style-type: none"> <li>• Helps in collecting in depth information that normally could not be collected through an interview.</li> <li>• It provide great deal of flexibility as the process involves one to one personal interview that allows the researcher in asking questions related to variety of topics.</li> </ul>
Limitations	<ul style="list-style-type: none"> <li>• The in-depth interviews are time-intensive and expensive process as it requires repetitive interaction and only experienced researcher can</li> </ul>

	<p>conduct such interview.</p> <ul style="list-style-type: none"> <li>• The interpretation of the information collected with the help of in-depth interviews may vary from one analyst to other.</li> </ul>
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**Table 13.3- Advantage and Limitations of In Depth Interview Method**

In-depth interview is discussed in detail in Unit 7, Exploratory Research, in the section 7.10

#### 4. Focus group interviews

In a focus group interview the researcher conduct an interview among the group of people to explore their perceptions, experiences and understandings. The group usually consists of 8 to 12 people generally selected purposively to include people who have a common background or similar buying or use experience that relates to the problem to be researched. Focus group interviews are used primarily to define problems, to provide background information, and to generate hypothesis rather than to provide solution to the problem. Members of a focus group express their opinions while discussing these issues and the researcher records the discussion accurately.

Advantage	<ul style="list-style-type: none"> <li>• Group dynamics in the focus group interview provides useful information that individual data collection method does not provide.</li> <li>• It is useful in gaining insight into a topic that may be more difficult to gather information through other data collection methods.</li> <li>• It generates new ideas and helps the researcher in identifying the underlying reasons for the behavior of customers.</li> </ul>
Limitations	<ul style="list-style-type: none"> <li>• In the focus group interview the discussion may be dominated or sidetracked by a few individuals.</li> <li>• The information is not representative of other groups and thus the results obtained can not be generalized.</li> <li>• The focus group interview involves a lot of cost as it requires a experienced moderator, a location and individuals for focus group.</li> </ul>

**Table 13.4- Advantage and Limitations of Focus Group Interview Method**

The focus group interview is discussed in detail in Unit 7, Exploratory Research, in the section 7.8.

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## 13.7 COLLECTION OF PRIMARY DATA THROUGH QUESTIONNAIRE

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A questionnaire is a set of questions in printed or electronic form in a definite order to be answered by the individuals. The forms often have blank spaces in which the answers can be written. Sets of such forms are distributed to sample respondents and the answers are collected relating to research topic. It is a popular method used by the researchers. Questionnaire is sent to the respondents along with a cover letter that explains the purpose of research. Questionnaire can be administered in person or through mail.

It is a vital instrument for data collection through which statements can be made about specific groups or people or entire populations. Questionnaire serves four basic purposes: it (1) collects the appropriate data, (2) make data comparable and amenable to analysis, (3) minimize bias in formulating and asking question, and (4) make questions engaging and varied. Questionnaire has following are the advantage and drawbacks -

Advantage	<ul style="list-style-type: none"> <li>• The main benefits of a questionnaire are its easiness and economy as it can capture the data from the respondents who are spread over wide geographical region at a very minimum cost.</li> <li>• Uniform question are asked from the respondents and the answers can be analyzed quantitatively.</li> <li>• A questionnaire is filled independently by respondents thereby consuming lesser time.</li> <li>• As the respondents have ample time to fill the questionnaire the answers can be well thought.</li> <li>• Absence of the researcher prevents his persona from influencing the answers.</li> <li>• Questionnaire is a good way to get answers from shy and timid persons.</li> </ul>
Limitations	<ul style="list-style-type: none"> <li>• This method can only be adopted only when the respondents are literate, still there is possibility of misunderstanding of the questions by the respondents.</li> </ul>

	<ul style="list-style-type: none"> <li>• The questionnaire receives a low response rate as soon as researcher send the questionnaire he loss the control and thus an uncertainty exist about the response and even if questionnaire is received back there is possibility of non response of few questions.</li> <li>• The information provided by the respondents may not be correct, it may be difficult to verify the accuracy or even sometimes a wrong person may fill the questionnaire.</li> <li>• If a researcher fails to develop a good questionnaire then the information acquired by such questionnaire will not be accurate and the research results will not be reliable.</li> </ul>
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**Table 13.5- Advantage and Limitations of Questionnaire**

### Types of Questionnaire

The questionnaire can be classified on the basis of the degree which the questionnaire is formalized or structured, the disguise or lack of disguise of the questionnaire and the communication method used –

- **Structured Questionnaire** – When a researcher follows a prescribed sequence of questions, it is referred as structured questionnaire. The structured questionnaire is always easy to analyze as the responses are gathered in a uniform way. The words and the order of the questions are always the same.
- **Unstructured Questionnaire** - when no prescribed sequence of questions exists, the questionnaire is non-structured it allows the respondents to express his/her attitude in a liberated and uninhibited manner.
- **Concealed Questionnaire** – tries to reveal the latent causes of behavior which cannot be determined by direct questions. It helps in mapping basic values, opinions and beliefs.
- **Non-concealed Questionnaire** – in it the researcher collects the information regarding the attitude and behavior of the respondent.
- **Non-disguised questionnaire** - When a questionnaire is constructed in such a way that the research objective is clear to the respondents then these questionnaires is known as non- disguised.
- **Disguised questionnaire**- when the research objective is not clear, the questionnaire is a disguised one.

- Self administered Questionnaire – the respondents receive the questionnaire and he read, understands and respond to the questionnaire on his own without the interference of the researcher.
- Mail Questionnaire – the self-administered questionnaire can be sent though mail so as to reach the required sample spread over a wide area, through this method a wide population can be covered in a very economic manner.
- Internet Questionnaire – Nowadays internet is one of the most powerful ways of reaching the desired sample respondents. The questionnaire is sent through e-mail or some other websites are used for collecting the data. The questionnaire is sometimes sent through fax, if fax services are available with the respondents.
- Schedule – the questionnaire can also be developed for the purpose of collecting the data in person by the researcher. In this an enumerator is appointed who meet the respondent along with the questionnaire and handwrites the response.

### **Questionnaire Design**

The most difficult steps in the entire research process is designing a well structured instrument. The effectiveness of the instrument depends upon the researchers' ability to effectively list the information required for the study. Following step are followed for developing a good questionnaire -

- **Identify the information required in order to fulfill research objectives**

The researcher should start the designing process of the questionnaire by stating the research problem followed by crystallizing the research objectives. The variables to be studied are identified and then the researcher specifies the information needed for the study. A researcher can take help from secondary data, previous exploratory research studies etc.

- **Define the target respondents**

The researcher must define the population of the study from whom the data is to be collected. For example, in marketing research, researchers often have to decide whether they should cover only the existing users of the generic product or should also include non-users. Then a sampling frame is drawn in which the size of the sample, the techniques of identifying the sample is finalized. Factors such as the age, education, etc. of the target respondents should be studied well in advance.

- **Identifying the method of reaching target respondents**

After developing a sampling frame the researcher need to specify how the information should be collected. The main methods are personnel schedule, self administered questionnaire

through mail, fax, e-mail, and web based. If the researcher require higher degree of control over the way question are answered schedule should be used.

- **Content of the questionnaire**

While structuring the questionnaire the researchers should always ask, "Is this question really needed?" No question should be included unless the data it provides directly contribute to achievement of research objective. For example while studying the buying patterns of automobiles questions related to age, occupation , income, gender, family size might make sense but questionnaire related to religion, caste are not required. Sometimes multiple questions are asked from the respondents in order to acquire complete information.

- **Determining the types of questions**

The researcher then decides the types of questions to be included in the questionnaire–

- Open-ended questions - the respondent answers these questions in his own words. It provides scope for wider, more spontaneous and more unforeseeable answers. But the answers to open-ended questions are often vague and imprecise or the questions are left unanswered. For example ‘What training programme did you last attended?’ may be left by the person who have not attended any training in the current time.
  - Closed-ended-questions – have formatted questions in these questions both format the question and response format are defined. Such questions can be easily tabulated and analyzed. Closed ended question can be in three forms -
  - Dichotomous questions – there are restrictive alternatives options available to the respondents. For example a respondent is asked ‘Your working hours in the organization’. He have to choose out of fixed/flexible.
  - Multiple-choice questions – respondent is given a number of response alternatives. For example a respondent is asked ‘How much do you spend on grocery products?’ options are 1. Less than 2500 Rs, 2. Between 2500 Rs – 5000 Rs. 3. More than 5000 Rs. The researcher sometimes provide a list of options that a respondent can select few or even all, such kind of questions are known as checklist.
  - Scales – the responses can also be acquired in a scale. For example A respondents to asked to indicate the agreement/disagreement with each –

(1-Strongly Disagree -----5- Strongly Agree)	1	2	3	4	5
The people in my company know their role very clearly.					

Existing system is very effective					
I feel the need of the organization to change.					

The main advantage of these scaled questions is that they are easy to administer.

- **Criteria for Question designing**

This step involves translating the questions identified into meaningful questions. The researcher should take care while -

**Wording questions** - Utmost care should be taken while wording the questions, since reliable and meaningful information depends on the ease of understanding. Simple, familiar and clear words should be chosen as it likely may affect the responses. Instead of a question such as ‘How often do you visit Pizza Hut annually?’ appropriate question would be ‘How many times you visit Pizza Hut during last month? ‘

**Sequencing the questions** - A proper sequence of questions reduces the chances of individual questions being misunderstood. The question-sequence must be clear and smoothly-moving, with easiest questions in the beginning. The first few questions are important because they are likely to influence the attitude of the respondent and in seeking his desired cooperation. The opening questions should be such as to arouse human interest.

Demographic questions should be asked in the beginning as the respondent is well aware of his own information and these questions make him comfortable with the answering process.

- **Physical Appearance of the Questionnaire**

The physical appearance of the questionnaire has significant effect on both the quantity and quality of data obtained. Ill-designed questionnaires can give an impression of complexity and bigger time commitment, thus can affect the quantity of data. Data quality can also be affected by the physical appearance of the questionnaire with unnecessarily confusing layouts. Following details should be taken care while structuring the questionnaire –

- Questionnaire should be sent in a booklet form in the place of loose or stapled sheets of paper as make it easier for interviewer or respondent to progress through the document.
- Research objective with which the questionnaire is framed should be communicated to the respondent in the starting.
- Clear instructions must be provided at the top of the questionnaire so as to increase the response rate.
- Creative use of space should be done by the researcher as the questionnaires that make use of blank space appear easier to use, enjoy higher response rates and contain fewer errors when completed.

- Questionnaire should be of limited number of pages, but the researcher should be conscious in doing so as in anxiety to reduce the number of pages sometimes he may put too much information on a page.
- Color coding can help in the administration of questionnaires. Printing the questionnaires on two different colors of paper can make the handling easier.
- At the end of the questionnaire the respondent effort for his contribution should be acknowledged.

- **Pilot Testing the Questionnaire**

Even after the researcher has proceeded along the lines suggested, the draft questionnaire is a product evolved by one or two minds only. Until it has actually been used, it is impossible to say whether it is going to achieve the desired results. For this reason it is necessary to pre-test the questionnaire before it is used in a full-scale survey, to identify any mistakes that need correction. After the pilot test the final form of the questionnaire will be evolved.

Finally after following all the above stated steps a researcher can administer the questionnaire to acquire desired results.

### **Features of a good questionnaire**

- To be successful, questionnaire should be comparatively short and simple.
- Questions should proceed in logical sequence moving from easy to more difficult questions. Personal and intimate questions should be left to the end.
- Technical terms and vague expressions capable of different interpretations should be avoided in a questionnaire.
- There should be some control questions in the questionnaire which indicate the reliability of the respondent.
- Adequate space for answers should be provided in the questionnaire to help editing and tabulation.
- There should always be provision for indications of uncertainty, e.g., “do not know,” “no preference” and so on.
- Brief directions with regard to filling up the questionnaire should invariably be given in the questionnaire itself.

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## **13.8 COLLECTION OF PRIMARY DATA THROUGH SCHEDULE**

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Schedule is an instrument with set of questions, which are asked and filled by an interviewer in a face to face situation with the respondents. The data collection method is similar to that of a questionnaire but the difference is that these schedules are being filled in by the

researchers or enumerators. The enumerator meets the respondents in person along with the schedules and asks questions and record the responses in the questionnaire form.

The enumerators explain the aims and objects of the investigation and also remove the difficulties of respondents during the process. Population census all over the world is conducted through this method. This method of data collection is very useful in extensive enquiries and can lead to fairly reliable results. The only condition is that the enumerators should be trained and intelligent people so that they can cross-examine the respondents to find out the truth.

Advantage	<ul style="list-style-type: none"> <li>• Due to the presence of the enumerator the chances of non-response are very less and the benefits of observation method can also be derived.</li> <li>• The information received is more reliable as the accuracy of statements can be checked by supplementary questions and the doubts can be immediately solved.</li> <li>• It can be adopted in those cases where informants are illiterate.</li> </ul>
Limitations	<ul style="list-style-type: none"> <li>• It is a very expensive method of collecting primary data as trained and experienced enumerators are required for the process.</li> <li>• The success of the method depends largely upon the training imparted to the enumerators as without good interviewing most of the information collected may be of doubtful value.</li> </ul>

**Table 13.6- Advantage and Limitations of Schedule**

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## 13.9 OTHER METHODS OF DATA COLLECTION

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Let us consider some other methods of data collection, particularly used by big business houses in modern times.

- **Warranty cards** - are usually postal sized cards used by dealers of consumer durables to collect information regarding their products. Questions are printed on the 'warranty cards' and it is placed inside the package along with the product and consumers are requested to fill the card and post it back to the dealer.

- **Distributor or store audits** - are performed by distributors as well as manufactures through their salesmen to collect information related to market size, market share, seasonal purchasing pattern and so on. The data are collected through observation.
- **Pantry audit** – is conducted to know about the customer preferences while buying. The basic objective of a pantry audit is to find out what types of consumers buy certain products and certain brands.
- **Consumer panel** – involves maintaining detailed daily records of consumption by the customers and the record is made available to investigator on demands. A consumer panel is essentially a sample of consumers who have given their consent to be interviewed repeatedly over a period of time.
- **Mechanical devices** - are widely used for collecting information through indirect means. Devices such as eye camera, Pupil-o-metric camera, psycho-galvanometer, Motion picture camera and audiometer are commonly used by researchers for collecting the required information.
- **Projective techniques** - are indirect interviewing techniques for discovering underlying motives, urges, or intentions of the respondent. In projective techniques the respondent unconsciously provides information about his own attitudes or feelings on the topic under study. A skilled and well trained researcher can use any of the below stated projective technique –
  - *Word association tests*- In this test the respondent is asked to mention the first word that comes to mind when an interviewer reads out each word from a list. This technique is quick and easy to use, and yet yields reliable results. This technique is frequently used in advertising research.
  - *Sentence completion tests* - It is an extension of word association tests, in this the respondents are asked to complete a sentence. Several sentences are stated and the responses are analyzed to reveal the attitude of respondent toward a particular subject. This technique is also quick and easy to use, but it may lead to analytical problems, particularly when the response happens to be multidimensional.
  - *Story completion tests*- In such tests the researcher asks the respondents complete the stories instead of sentences. The respondent is asked to supply a conclusion to the story.
  - *Verbal projection tests*- In these tests the respondents are asked to comment on or what other people do. For example, why do people break traffic rules? Respondent's own motivations are revealed through such answers.
  - *Pictorial techniques*- In these techniques the respondents are shown pictures and then they express what they think about the picture. On the basis responses the researcher draws inferences about the personality structure, attitudes and inner feelings of the respondents.
  - *Sociometry* – It is a technique for describing the social relationships among individuals in a group. The approach attempts to describe attractions or

repulsions between individuals by asking them to indicate whom they would choose or reject in various situations.

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### 13.10 EDITING THE COLLECTED PRIMARY DATA

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After collection of data the next task of the researcher is to process the raw data into information so as to make it useful for the purpose of decision makers. Once the data is obtained from primary sources the next step in a statistical investigation is to edit the data so as to detect possible errors and irregularities. The primary data should be edited for -

- **Completeness** - The data that is collected should be ensured that it provides complete information thus while editing, the editor should see that each schedule and questionnaire is completely answered in all respects. If some questions are not answered the respondents should be contacted again. Even after putting all the efforts if a few questions remain unanswered then such schedule or questionnaire should be dropped.
- **Consistency** - The editor should see that the answers to questions are not contradictory in nature. In case of contradictory answers the researcher must reach the respondents and clarify.
- **Accuracy** - Reliability of the results depends on information accuracy. Wrong information can lead to wrong research results, therefore, necessary for the editor to see that the information is accurate in all respects.
- **Homogeneity** - Homogeneity is the condition in which all the questions are understood in the same sense by the respondents. The editor must check that the information supplied by the respondents is homogeneous and uniform.

If the researcher is capable of editing the data at all the above stated levels then the researcher can ensure reliable and accurate results.



#### *Check Your Progress- B*

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**Q1. Compare the in-depth and focus group interview.**

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**Q2. Discuss the advantages and disadvantage of observation method.**

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**Q3. How a researcher edits the collected primary data?**

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**Q4. Discuss the sources of primary information?**

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## 13.11 SUMMARY

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While developing a research design a researcher creates an observational design in which he decides the sources, methods and techniques for collecting data. Data can be available in two forms primary and secondary. The original and research specific data is *primary data* and already available data is *secondary data*. The researcher in order to select a particular source has to study factors such as purpose of information, time and resource available, desired degree of accuracy and statistical method used. In order to evaluate the primary data researcher should conduct methodology check, accuracy check, topical check and cost benefit analysis. There are various advantages and drawbacks of primary data that a researcher should keep in mind. Primary data can be collected through observation method, interview method, in-depth interview, focus group interview, questionnaires, schedules, and various other methods such as warranty cards, distributor audits, pantry audits, mechanical devices; and through projective techniques etc.




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## 13.12 GLOSSARY

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**Primary data** – is original, problem-or project-specific and collected for serving a particular purpose.

**Secondary data** – is not topical or research specific. It can be economically and quickly collected by the decision maker in a short span of time.

**Methodology Check** – involves the evaluation of the process or design used to collect the data or respondent sampling or data analysis.

**Unstructured Observation** – there is lack of clearly defined objectives and the chances of an observer's biases remain high.

**Mechanical Observation** – the recording is done through electronic medium and is later subjected to an interpretation and analysis.

**Questionnaire** - is a systematic compilation of questions that are submitted to a sampling of population from which information is desired.

**Open ended questions** - are unstructured. Thus the words, logic and structure are provided by a respondent and not the researcher.

**Schedule** – is a set of questions asked and filled by an enumerator in a face to face situation with respondent.

**Enumerator** – is the trained person employed for the purpose of collecting the data using the schedule.



## 13.13 ANSWERS TO CHECK YOUR PROGRESS

### Check Your Progress –A

Q4. Answer

- i. False
- ii. True
- iii. False



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## 13.16 TERMINAL QUESTIONS

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- Q1. Explain why it is important to develop an observational design?
- Q2. Majority of the researcher use primary sources of data as the secondary data sources do not really contribute to a scientific enquiry. Do you agree/disagree with the statement.
- Q3. Explain the interview method of data collection. What are the advancements that have been made in the techniques?
- Q4. What are focus group interview? Under what circumstances should they be used?
- Q5. What are projective techniques? What are the different types of techniques available to a researcher?
- Q6. Explain the role of questionnaire in the information research process. Discuss the advantage and disadvantage of using a structured questionnaire.
- Q7. Assume you wish to determine whether men are brand-conscious when they are shopping for suits. How could this question be studied using the observation method? Using questionnaire method?
- Q8. The owner of a new gift shop has placed advertisements in the local community newspaper. The owner wants to know if adults are aware of the store, the offers, and whether they have visited the store and are they likely to shop from the store. What method of data collection should be used by the owner? What types of questions should be asked? Give specific examples of each.
- Q9. One of the largest nursery school chain Kids Zee are concerned with the attitude parents have towards the various aspects of the school and whether they would recommend the school to their friend and colleagues. For the purpose a marketing research firm is consulted and is directed to cover – all functions with which the parents and the children come into contact such as admission, school infrastructure, teachers, teachers' attitude, meals, fees structure and so on. Frame a questionnaire for this study. What would be the design change if this was a schedule?
- Q10. Visit the Visual Research's Website at ([www.vrcinc.com](http://www.vrcinc.com)). Browse through the site and evaluate various new technologies offered for conducting surveys via the Internet. Write advantages and disadvantages associated with collecting survey data through Internet.

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## UNIT 14 SAMPLING: DESIGN AND PROCEDURES

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- 14.1 Introduction
- 14.2 Objectives
- 14.3 Sampling
- 14.4 Methods of sampling
- 14.5 Sampling and Non-Sampling Error
- 14.6 Summary
- 14.7 Glossary
- 14.8 Answers To Check Your Progress
- 14.9 References
- 14.10 Suggested Readings
- 14.11 Terminal Questions

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### 14.1 INTRODUCTION

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A big retail chain management desires to evaluate the effectiveness of training programs conducted by them for their employees. The chain has a list of 500 retail outlets with around 20,000 employees of different categories. Since collecting data from all 20,000 employees seems unrealistic and time as well as money consuming, hence management decided to collect data from some 2000 employees of different outlets.

There is a saying that “to know whether the rice has been cooked properly or not only a few grains are enough.” Similarly, in our day to day life, while purchasing grains the person examines only a handful of it. Thus, in many such situations we draw conclusions about the larger or bigger group on the basis of results obtained from a smaller portion of it. This smaller portion which we study or examine in order to draw conclusions regarding the larger group is called sample and the larger group about which we draw conclusions is known as population.

Samples drawn from population are analysed and sample results are called sample statistic. Statistical inferences are drawn about the population characteristics. These sample statistics are treated as estimator of population parameters.

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### 14.2 OBJECTIVES

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After studying this module you would be able to understand the;

- Concept of population, sample, sampling & frame;
- Methods of sampling – random sampling & non random sampling;
- Simple Random Sampling;

- Systematic Sampling;
- Stratified Sampling;
- Multi Stage Sampling;
- Cluster Sampling;
- Quota sampling;
- Convenience sampling;
- Judgment sampling;
- Advantages & disadvantages of different sampling methods; and
- Sampling & Non Sampling Errors.

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## 14.3 SAMPLING

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The process of selecting a sample or portion of elements from a population or a process using a specific method is called sampling. For example, a doctor examines a few drops of blood to draw conclusion about the nature of disease or an auditor selects a sample of vouchers and calculates the sample mean for estimating population average amount.

In many situations we study all units of the population, instead of sample, to draw conclusions regarding it. This approach is known as Census Method or Complete Enumeration Method.

Sampling is frequently used in many situations. The important purpose of a sample is to obtain information about population. Sample is never studied for its own sake but it is always studied for the sake of drawing conclusions regarding population. Before we proceed further, let us understand in detail the meaning of the words ‘population’ and ‘sample’.

### 14.3.1 POPULATION:-

Population is the group of units, defined according to the aims and objectives of the survey, which we want to study or examine. In the starting example, of this chapter of retail chain, all the 20,000 employees who attended the training programs constitute the larger group or population. Here in this case population size is 20,000. Similarly, if a bank manager wants to find out that how many customers of his/her bank are satisfied with their services then population will consist of all the customers of the bank.

“The population or universe consists of the total collection of items or elements that fall within the scope of statistical investigation.” **-M. Hamburg**

“The population or universe may be defined as an aggregate of items possessing a common trait or traits.” **-Simpson & Kafka**

### 14.3.2 SAMPLE:-

It is a finite subset of statistical individuals of the population. In other words sample is that small set from population which we select for the purpose of our study. The number of units in a sample is called ‘sample size’, and an individual unit of a sample is called ‘sample unit’.

“A sample is that part of the population which we select for the purpose of investigation.”

**-Simpson & Kafka**

“A sample is relatively small group scientifically chosen so as to represents the population.”

**-Norma Gilbert**

### **14.3.3 REASONS FOR SELECTING SAMPLE:-**

- Selecting a sample saves money.
- Selecting a sample saves time.
- Sample can help in more detailed study.
- Sample is the only option if destructive nature of testing is involved.
- If collecting information from population is virtually impossible then sample is the only option.

### **14.3.4 SAMPLING FRAME:-**

The first step in any sampling process is defining the frame. The frame, which is a complete list of all items that makes up the population, is data source such as population list, map or directory. Samples are drawn from frames. Ideally, there exists a one-to-one correspondence between units in the frame and the population units. If a frame doesn't contain certain units of the population then it could lead to inaccurate or biased results.

Once a frame has been selected then a sample is drawn from it. If the population is homogeneous with respect to the characteristics under study, then how we draw the sample hardly matter, but this is rare. Normally, various units of the population hold different characteristics. In such situations the method of drawing sample plays an important role. The method of selecting sample from a population is known as sampling.

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## **14.4 METHODS OF SAMPLING**

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A sampling method is a scientific and objective procedure of selecting units from a population and providing a sample that is expected to be representative of the population.

On the basis of selection process of sample units, methods can be divided into random sampling methods and non random sampling methods.

### **14.4.1 RANDOM SAMPLING:-**

In this method all the items have a definite known probability of being included in the sample. Since each unit has a definite known probability it is also known as probability sampling. The conclusions made from a sample selected randomly regarding the population of interest are unbiased.

The five main methods most commonly used for randomly selecting a sample are:-

1. Simple Random Sampling
2. Stratified Sampling

3. Systematic Sampling
4. Cluster Sampling
5. Multi Stage Sampling

#### 14.4.1.1 Simple Random Sampling

In simple random sampling each and every unit of the population has an equal chance of being included in the sample. In this method the personal bias or desire of the investigator does not play any role in the selection process, hence sample selected is considered to be most representative of the population.

“Random sample is a scientific undertaking. It indicates not a haphazard choice but a careful selection to ensure that every item has an equal chance of inclusion.”

–C. J. Grohmann

There are two different methods for selecting a simple random sample - Lottery Method & Random Number Method

a) **Lottery method-** In lottery method each unit of the population is properly named or numbered. The name or numbers are written on different slips of paper. All these slips of paper should be of same colour and size. These slips of paper are then folded and mixed together in a box. Then a blindfold selection of desired number of slips of paper (based on sample size) is made. The names/numbers appearing on the selected slips are included in the sample.

b) **Random number method-** If the population size is relatively large then forming chits in lottery method is difficult, further this method become time consuming with chances of error. In such cases random number tables are used as an alternative. A random numbers table consists of a series of digits listed in a randomly generated sequence in which every digit or sequence of digits in the table is random, the table can be read either horizontally or vertically.

In this method the units of population are numbered from 1 to N and, then, a sample of size n is selected by reading the table of random numbers and selecting those individuals from the frame whose numbers match the digits found in the table. For example- A researcher has a list of 900 persons out of which he need to select 90 units as a sample, so in this case each unit of the population is numbered from 1 to 900. Since the population size (900) is a three-digit number, so each unit of population is assigned a three digit number starting from 001 and ending at 900.

This population contains only 900 units, so all the numbers greater than 900, that is, (901 to 999 & 000) must be ignored. Several standard tables of random numbers are available.

61424	20419	86546	00517
90222	27993	04952	66762
50349	71146	97668	86523
85676	10005	08216	25906
02429	19761	15370	43882
90519	61988	40164	15815
20631	88967	19660	89624
89990	78733	16447	27932

A part of table of random numbers

Advantages:

- i) Sample drawn through simple random sampling is representative of the population.
- ii) Biasedness in selection is completely eliminated.
- iii) Population estimate is easy to calculate.

Disadvantages:

- i) If N is very large, this method of sampling is impractical.
- ii) Sometimes the sample selected are most non-random in nature.
- iii) Sometimes the units selected are widely scattered.

#### 14.4.1.2 Stratified sampling

This method of sampling is based upon concept of homogeneity and heterogeneity. In this we first divide the heterogeneous population into separate homogeneous subpopulations, or strata. Then a random sample is taken from each of the strata. The sample obtained by stratified sampling is more representative of the population than the sample obtained through simple random sampling because portions of the total sample are taken from different population subgroups. The results of stratified sampling are much better if the different subpopulations, or strata are homogeneous internally but heterogeneous externally i.e. within stratum variation should be minimum but between strata variation should be maximum. Generally stratification is done on the basis of sex, economic conditions, geographic region, religion, etc.

For example- a researcher wishes to select 10 students out of a group of 100 students in which there are 60 boys and 40 girls. Thus to make the sample more representative of population the researcher may divide the population into two groups – boys and girls. Then either the researcher can select 5 boys and 5 girls from two groups (Disproportionate Stratified Sampling) or the researcher can select 6 boys and 4 girls from two groups – the number of boys & girls depending upon the size of sub groups (Proportionate Stratified Sampling), using simple random sampling.

Advantages:

- i) Every unit in the strata has an equal chance of being selected.
- ii) Adequate representation of minority subgroup of interest can be achieved.
- iii) The precision of estimate is high.

Disadvantages:

- i) Separate sampling frame has to be prepared for each strata.
- ii) It is necessary to have information about each strata.
- iii) Characteristics of each strata can not be analyzed.

#### 14.4.1.3 Systematic Sampling

In this form of sampling, the units of the population are arranged in some systematic order such as alphabetical, numerical, geographical, chronological, etc. and then the first unit of sample is selected at random and the rest being selected automatically according to a predetermined pattern. For example in order to produce a sample of size  $n$  from a population of size  $N$  every  $k$ th item is selected where  $k = N/n$ . If  $k$  is not an integer value, then we round it to the nearest integer. To select a systematic sample we pick randomly the first unit from the first  $k$  items. Then, we select the remaining items by picking every  $k$ th item thereafter from the entire frame.

For example- if a researcher wishes to select a sample of size 100 units from a population of 1000 units, then the value of  $k = 1000/100 = 10$ . For obtaining the sample, first unit can be selected randomly from first to tenth unit (say 5<sup>th</sup>), then with a gap of 10 we will select rest of the units unit like 15, 25, 35,.....985, 995.

Advantages:

- i) The sample is evenly spread over the entire population.
- ii) The sample is easy to select.

Disadvantages:

- i) This method of sampling may have certain pattern of periodicity.
- ii) The precision of estimate is less as compared to simple random sampling or stratified sampling.

**14.4.1.4 Cluster Sampling** - In this method the total population is divided into some recognisable naturally occurring sub-divisions such as districts, cities, households, colleges, sales territories, etc. which are termed as clusters. Then a random sample of clusters is taken; and either all the units in selected clusters are studied or individual units are randomly selected from chosen clusters for collecting information.

It might seem as there is no difference between stratified sampling and cluster sampling but in reality the two are quite different. One very important difference between the two is that whereas in stratified sampling strata are homogeneous internally in cluster sampling clusters are internally heterogeneous. A cluster contains a wide range of units that are good representative of the population.

Advantages:

- i) Sampling frame of population is not required.

- ii) Less time consuming.
- iii) Saves cost of data collection.

Disadvantage:

- i) If clusters are homogeneous that is the units within a cluster are similar then it may not be effective approach.

**14.4.1.5 Multi Stage Sampling** As the name indicates, multi stage sampling involves the selection of units in more than one stage. For example, a researcher wants to select a sample of rural households from the entire country so as to study their consumption pattern. For this purpose he may select randomly few states (say 5) out of all states, then few districts (say 5 from each state) in second stage, then few villages (say again 5 from each district) in third stage, and, finally, few households (say 5 from each village) in the fourth stage. Thus in this fashion the researcher will get the required sample of rural households in four stages in random manner.

Advantages:

- i) Sample is spread over the entire population
- ii) Reduces cost and time required.

Disadvantage:

- i) The sampling error is high as compared to simple random sampling.

#### **14.4.2 NON-RANDOM SAMPLING-**

The sampling technique where the selection of sampling units is not based on random or probability method are called non-random or non-probability sampling methods.

The three main methods most commonly used for selecting a sample non- randomly are:-

1. Quota sampling
2. Convenience sampling
3. Judgment sampling

##### **1.4.2.1 Quota Sampling**

In Quota Sampling quotas are fixed for different constituent parts of the population. After this units are selected in a non-random manner to fill the quotas fixed for different sub parts. For example, a producer of a famous TV serial wants to know about the views of female viewers of Delhi regarding different contents of the programme. In this case suppose sample size is fixed at 500, then under quota sampling the producer can fix that in the sample 40% should be housewives, 30% should be working women, 15% should be girls in the age group 10 to 18 years, and 15% should be women above 60 years. Then while selecting units it is to be ensured that there should be 200 housewives in the sample of 500 units but these 200 housewives are selected in a non-random manner from the group of housewives. Similar approach is followed in case of other sub parts i.e. in case of selecting 150 working women, 75 girls in the age group 10 to 18 years, and 75 women above 60 years of age.

If on the other hand if some random sampling method is followed to select these 40% housewives, 30% working women, 15% girls in the age group 10 to 18 years, and 15% women above 60 years then it will become stratified sampling.

Advantages:

- i) Flexibility in selecting units
- ii) Saves money and time

Disadvantages:

- i) Sample may be biased
- ii) Problem of sampling error may occur.

#### **14.4.2.2 Convenience Sampling**

As the name indicates, in convenience sampling sample units are selected on the basis of convenience of researcher i.e. they are easy, inexpensive, or convenient to sample. In case of convenience sampling normally the variation within the sample units are less than the variation that exists within the population units. For example- a researcher working in university is interested in knowing the views of farmers regarding the fertilizers of a particular fertilizer company. Then in convenience sampling he will collect information from farmers who belong to villages which are on the roadside or the villagers who are there at the “Mandi Sthal” (the market place where farmers come to sell their produce) when the researcher goes there for collecting information. So in this case information is collected from farmers who happen to be on a particular place at a particular time when the researcher is there.

#### **14.4.2.3 Judgement Sampling**

In this method of sampling researcher selects sample units based on his/her judgment. In certain situations researcher feels that on the basis of his/her knowledge, experience, etc he/she can select a more representative sample, in less time and less cost, than which will be obtained using some random sampling approach. For example - if a teacher has to select a sample of ten students, which truly represent the class, from a section of 80 students, then on the basis of his/her knowledge & experience with the students he/she can select a better sample in comparison to the one which will be obtained by some random sampling method.

Judgement sampling is also used in many day to day decision making situations where due to paucity of time or immediate decision making requirement random sampling methods cannot be used.

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## **14.5 SAMPLING & NON-SAMPLING ERROR**

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### **14.5.1 SAMPLING ERROR**

Sampling Error occurs due to the fact that a sample is being studied for drawing conclusions regarding the population. So even if we have a highly representative sample, then also

chances are that there will be difference between the value of statistic (computed from sample units) and parameter (based on all units of population). The units included in the sample randomly are different from the units not included in the sample hence there will be difference between the value of statistic and parameter. This difference or error which creeps in because sample is never a perfect miniature of the population is known as sampling error. So sampling error reduces as sample size increases and it is non-existent if we study the entire population.

### 14.5.2 NON-SAMPLING ERRORS

All errors other than sampling errors are termed as non-sampling errors. Such errors occur due to reasons like - Non-response, Substitution error, Faulty instrument of measurement and Calculations error.



#### *Check Your Progress- A*

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**Choose the correct alternative.**

**Q1. Sample is subset of;**

- a. Data
- b. Group
- c. Population
- d. Itself
- e. Distribution

**Q2. The list of all units in a population is called as;**

- a. Random sampling
- b. Sampling Frame
- c. Bias
- d. Parameter
- e. Statistic

**Q3. A researcher divides the population of product users into three groups based on degree of use. If the researcher then draws a random sample from each user group independently, she has created a \_\_\_\_\_ sample.**

- a. random
- b. stratified
- c. judgment
- d. group data
- e. quota

**Q4. If a researcher wishing to draw a sample from sequentially numbered invoices uses**

**a random starting point, then draws every 50th invoice, he has thus drawn a \_\_\_\_\_ sample.**

- a. simple random
- b. stratified
- c. systematic
- d. none of the above

**Q5. Convenience sampling is an example of;**

- a. probabilistic sampling
- b. stratified sampling
- c. non-probabilistic sampling
- d. cluster sampling

**Q6. Which of the following is an example of nonprobabilistic sampling?**

- a. simple random sampling
- b. stratified simple random
- c. cluster sampling
- d. judgment sampling

**Q7. Stratified random sampling is a method of selecting a sample in which;**

- a. The sample is first divided into strata, and then random samples are taken from each stratum
- b. Various strata are selected from the sample
- c. The population is first divided into strata, and then random samples are drawn from each stratum
- d. None of these alternatives is correct

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## 14.6 SUMMARY

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In many such situations we draw conclusions about the larger or bigger group on the basis of results obtained from a smaller portion of it. This smaller portion which we study or examine in order to draw conclusions regarding the larger group is called sample and the larger group about which we draw conclusions is known as population. This procedure of drawing conclusions about larger group is known as sampling. In many situations we study all units of

the population, instead of sample, to draw conclusions regarding it. This approach is known as Census Method or Complete Enumeration Method.

In random sampling method all the items have a definite known probability of being included in the sample. Since each unit has a definite known probability it is also known as probability sampling. The five main methods most commonly used for randomly selecting a sample are: Simple Random Sampling, Systematic Sampling, Stratified Sampling, Multi Stage Sampling and Cluster Sampling. The non-random sampling technique the selection of sampling units is not based on random or probability method. The three main methods most commonly used for selecting a sample non- randomly are: Quota sampling, Convenience sampling and Judgment sampling.

Sampling Error occurs due to the fact that a sample is being studied for drawing conclusions regarding the population. All errors other than sampling errors are termed as non-sampling errors.




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## 14.7 GLOSSARY

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**Population-** A *population* is the total group of people about who you are researching and about which you want to draw conclusions.

**Sample** - When the population is large or generally inaccessible then the approach used is to measure a subset or *sample*. It is the part of a population

**Census** – when we study all units of the population to draw conclusions regarding it. This approach is known as Census.

**Element/ unit-** A unit is the thing being studied. Usually in social research this is people.

**Frame/ exhaustive list** - The list of people from whom you draw your sample, such as a phone book or 'people shopping in town today', may well be less than the entire population and is called a *sample frame*.

**Non-probability sampling** – non-probability sampling does not involve *random* selection.

**Probability sampling** - A **probability sampling** method is any method of sampling that utilizes some form of *random selection*.

**Random sampling** - Process used to draw a sample of a population strictly by chance, yielding no discernible pattern beyond chance.

**Sampling error** - This is the standard error for the sample distribution and measures the variation across different samples.



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## 14.8 ANSWERS TO CHECK YOUR PROGRESS

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### Check Your Progress –A

1. c
2. b
3. b
4. c
5. c
6. d
7. c



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## 14.9 REFERENCES

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## 14.11 TERMINAL QUESTIONS

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- Q1. What is a sample?
- Q2. What are sampling errors?
- Q3. What is the difference between proportionate and disproportionate stratified sampling?
- Q4. Mention the sampling methods corresponding to the two approaches mentioned below:
- a. Inspect every 10<sup>th</sup> item
  - b. Inspect a random sample of 6 during each hour production's
- Q5. What would you prefer - sampling or census method in the following :
- a. A study in depth
  - b. Tensile strength in a metal

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## UNIT XV SAMPLING DISTRIBUTION

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### 15.1 Introduction

### 15.2 Learning Objectives

### 15.3 Terminology used in Sampling distribution

### 15.4 Standard error of statistics

### 15.5 Central Limit Theorem

### 15.6 Sampling Distribution of sample mean

### 15.7 Sampling distribution of sample proportion

### 15.8 Summary

### 15.9 Glossary

### 15.10 Answers of Check your Progress

### 15.11 References

### 15.12 Suggested Readings

### 15.13 Terminal Questions

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## 15.1 INTRODUCTION

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In the previous unit, several statistical methods have been discussed to calculate parameters such as the mean and standard deviation of population of interest. These values were used to describe the characteristics of the population. If a population is very large and the description of its characteristics is not possible by the census method then to arrive at the statistical inference, sampling is used for the purpose of inference. In this chapter we will expand the idea of a sampling distribution, and discuss different types of distributions and how they are related to one another.

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## 15.2 LEARNING OBJECTIVES

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After completing this unit you will be able to understand the:

- Construct a sampling distribution for a proportion.
- Construct a sampling distribution for a mean.

- Identify situations in which the Rule of Sample Proportions and Central Limit Theorem may be applied.
- Use a sampling distribution to determine the probability of a given sample statistic occurring.

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## 15.3 TERMINOLOGY USED IN SAMPLING DISTRIBUTION

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### 15.3.1 DISTRIBUTION

A distribution is a statement of the frequency with which units of analysis (or cases) are assigned to the various classes or categories that make up a variable. A variable can also consist of a number of classes or categories. For instance the variable, “Gender”, usually consists of two classes: Male and Female; “Marital Communication Satisfaction” might consist of the “satisfied”, “neutral”, and “dissatisfied” categories, and “Time Spent Viewing TV” could have any number of classes, such as 25 minutes, 37 minutes, and a number of other values. The definition of a distribution simply states that a distribution tells us how many cases or observations were seen in each class or category. For instance, a sample of 100 college students can be distributed in two classes which make up the variable “Ownership of a laptop”. Every observation will fall either in the “owner” or “non-owner” class. In our example, we might observe 27 students who “own a laptop” and a remaining 73 students who “do not own” a laptop. These two statements describe the distribution. There are three different types of distributions that are used in observation and statistical generalization. These are the population distribution, which represents the distribution of all units (many or most of which will remain unobserved during our research); the sample distribution, which is the distribution of the observations that we actually make, after drawing a sample from the population; and the sampling distribution, which is a description of the accuracy with which we can make statistical generalization, using descriptive statistics computed from the observations we make within our sample.

### 15.3.2 POPULATION DISTRIBUTION

A population distribution is made up of all the classes or values of variables which we would observe if we were to conduct a census of all members of the population. For instance, if we wish to determine whether voters “Approve” or “Disapprove” of a particular candidate for president, then all individuals who are eligible voters constitute the population for this variable. If we were to ask every eligible voter his or her voting intention, the resulting two-class distribution would be a population distribution. Here is a formal definition of a population distribution:

*“A population distribution is a statement of the frequency with which the cases that together make up a population are observed in the various classes or categories that make up a variable. The mean of a population distribution is represented by  $\mu$ , variance is denoted by  $\sigma^2$  and standard deviation by  $\sigma$ .”*

### 15.3.3 SAMPLE DISTRIBUTION

A sample is simply a subset of all the units of analysis which make up the population. For instance, a group of voters who “Approve” or “Disapprove” of a particular presidential candidate constitute a small subset of all those who are eligible voters (the population). Below is a definition of a sample distribution:

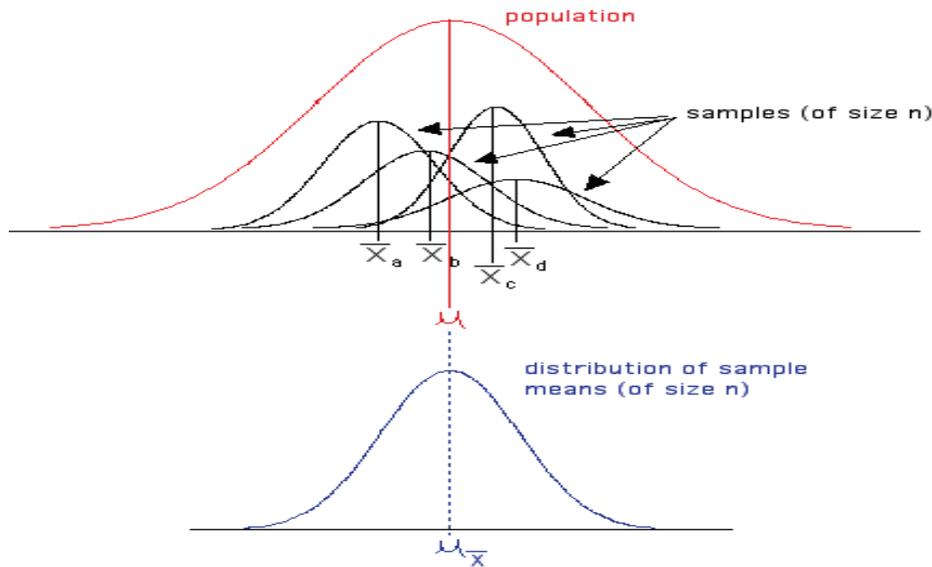
*“A sample distribution is a statement of the frequency with which the units of analysis or cases that together make up a sample are actually observed in the various classes or categories that make up a variable.”*

If we think of the population distribution as representing the “total information” which we can get from measuring a variable, then the sample distribution represents an estimate of this information. Each sample distribution is a discrete distribution because the value of the sample mean would vary from sample to sample. This variability serves as the basis for the random sampling distribution. In this the arithmetic mean represents the average of all possible sample means or the ‘mean of means’ denoted by  $\bar{x}$ ; the standard deviation which measures the variability among all possible values of the sample values, is considered as a good population’s standard deviation.

### 15.3.4 SAMPLING DISTRIBUTION

This is the distribution of all possible values of a statistics from all the distinct possible sample of equal size drawn from a population or a process as shown as in figure.1. The sampling distribution of the mean value has its own arithmetic mean denoted by  $\mu_{\bar{x}}$  or  $\bar{\bar{x}}$  (mean of mean value) and the standard deviation  $\sigma_{\bar{x}}$ . The standard deviation of the sampling distribution indicates how different sample is based on the following properties:

- (i) The arithmetic mean  $\mu_{\bar{x}}$  of sampling distribution of mean values is equal to the population mean  $\mu$  regardless of the form of population distribution, that is  $\mu_{\bar{x}} = \mu$
- (ii) The sampling distribution has a standard deviation (also called standard error or sampling error) equal to the population standard deviation divided by the square root of the sample size, that is,  $\sigma_{\bar{x}} = \sigma / \sqrt{n}$ .
- (iii) The sampling-distribution of sample mean values from normally distributed population is the normal distribution for sample of all size.



**Figure 15.1 Relations between sample, population & sampling distribution**

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## 15.4 STANDARD ERROR OF STATISTIC

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Since sampling distribution describes how values of a sample statistic, say mean, is scattered around its own mean  $\mu_{\bar{x}}$ , therefore its standard deviation  $\sigma_{\bar{x}}$  is called the standard error to distinguish it from the standard deviation  $\sigma$  of a population. The population standard deviation describes the variation among values of the members of the population, whereas the standard deviation of sampling distribution measures the variability among values of the sample statistics due to sampling error. Thus knowledge of sampling distribution of a sample statistics enables us to determine the probability of sampling error of the given magnitude. Consequently standard deviation of sampling distribution of a sample statistics measures sampling error and is also known as standard error of statics. The standard error of statics measures not only the amount of chance error in the sampling process but also the accuracy desired. When standard deviation of population is not known, the standard deviation of sample ( $s$ ), which closely approximates  $\sigma$  value, is used to compute standard error, that is,

$$\sigma_{\bar{x}} = s / \sqrt{n}$$



### Check Your Progress- A

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#### Multiple Choice Questions;

Q1. A sampling distribution is the probability distribution for which one of the following:

- a) A sample
- b) A sample statistic
- c) A population
- d) A population parameter

Q2. The standard error of the mean

- a) Is less than the standard deviation of the population.
- b) Decreases as the sample size increases.
- c) Measures the variability of the mean from sample to sample.
- d) All of the above

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## 15.5 CENTRAL LIMIT THEOREM

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According to the central limit theorem, if a population is normally distributed, the sample means for the samples taken from that normal population are also normally distributed regardless of sample size. A population has a mean  $\mu$  and standard deviation  $\sigma$ . If a sample of size  $n$  is drawn from the population, for sufficiently large sample size ( $n > 30$ ), the sample means are approximately normally distributed regardless of the shape of the population distribution.

For a population with a mean  $\mu$  and variance  $\sigma^2$ , the sampling distribution of all possible means of all possible samples of size  $n$  generated from that population will be approximately normally distributed with mean  $\mu$  and standard deviation  $\sigma/\sqrt{n}$  as the sample size increases.

Central limit theorem is perhaps the most important theorem in statistical inference. The beauty of the central limit theorem lies in the fact that it allows a researcher to use the sample statistics to make an inference about the population parameter, even in cases where we have no idea about the shape of the distribution of the population. Central limit theorem provides a platform to apply normal distribution to many populations when the sample size is large. In many situations, a researcher is not sure about the shape of the population distribution. Sometimes, a sample drawn from the population may not be distributed normally. In both the situations, if sample size is sufficiently large, the central limit theorem provides the opportunity of using the properties of normality.

For a normally distributed population, sample means are normally distributed for any size of the sample. Here the formula for determining z scores, for individual value from a normal distribution is,

$$Z = (x - \mu) / \sigma.$$

In case where sample means are normally distributed, z formula applied to sample mean will be  $Z = (\bar{x} - \mu_{\bar{x}}) / \sigma_{\bar{x}}$ , where  $\sigma_{\bar{x}}$  is equal to the population standard deviation divided by the square root of sample size i.e.

$$\sigma_{\bar{x}} = \sigma / \sqrt{n}.$$

### **15.5.1 THE MEAN OF THE SAMPLING DISTRIBUTION OF MEANS WHEN PARAMETER IS KNOWN:**

According to the Central Limit Theorem, the mean of the sampling distribution of means is equal to the population mean. We have already observed this in the examples given in the previous chapter. Our population, consisting of the values 5, 6, 7, 8 and 9, has a mean of 7. When we took all samples of  $N=2$  or  $N=3$  out of this population, the mean of all the resulting sample means ( $\bar{X}$ ) in the two sampling distributions were both equal to 7.

Therefore, if we know the parameter mean, we can set the mean of the sampling distribution equal to  $M$ . This allows us to avoid two massively difficult steps: (1) calculating sample means for all possible samples that can be drawn from the population and (2) calculating the sampling distribution mean from this mass of sample means.

### **15.5.2 THE VARIANCE OF THE SAMPLING DISTRIBUTION OF MEANS WHEN PARAMETER IS KNOWN:**

According to the Theorem, the variance of the sampling distribution of means equals the population variance divided by  $N$ , the sample size. The population variance ( $\sigma^2$ ) and the size of the samples ( $N$ ) drawn from that population have been identified in the preceding chapter as the two key factors which influence the variability of the sample means. As we saw in the examples in that chapter, the larger the variance of the values in the population, the greater the range of values that the sample means can take on. We also saw that the sample size was inversely related to the variability of sample means: the greater the sample size, the narrower the range of sample means. The effect of both factors is thus captured by computing the value of the sampling variance as  $\sigma^2 / N$ . If we know the variance of the population as well as the sample size, we can determine the sampling variance and the standard error.

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## **15.6 SAMPLING DISTRIBUTION OF SAMPLE MEAN**

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In general, the sampling distribution of sample means depending on the distribution of the population or process from which sample are drawn. If a population or process is normally distributed, then sampling distribution of sample means is also normally distributed regardless of the sample size. Even if the population or process is not distributed normally,

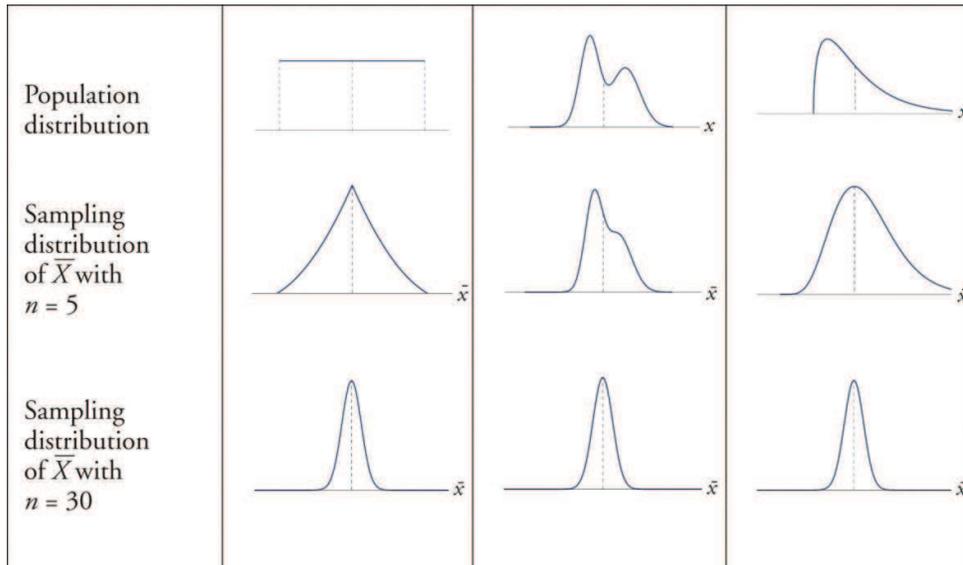
the sampling distribution of sample mean tend too be distributed normally as the sample is sufficiently large.

### 15.6.1 SAMPLING DISTRIBUTION OF MEAN WHEN POPULATION HAS NON-NORMAL DISTRIBUTION:

In this case, central limit theorem is used, according to which, “ when the random samples of observations are drawn from a non-normal population with finite mean  $\mu$  and standard deviation  $\sigma$ , and as the sample size  $n$  is increased, the sampling distribution of sample mean  $\bar{x}$  is approximately normally distributed, with mean and standard deviation as :

$$\mu_{\bar{x}} = \mu \text{ and } \sigma_{\bar{x}} = \sigma/\sqrt{x}$$

Regardless of its shape, the sampling distribution of sample mean  $\bar{x}$  always has a mean identical to the sampled population, i.e.  $\mu_{\bar{x}} = \mu$  and standard deviation  $\sigma_{\bar{x}} = \sigma/\sqrt{x}$ . this implies that the spread of the distribution of sample means is considerably less than the spread of the sampled population.



**Fig 15.2 Sampling Distribution Of Mean When Population Has Non-Normal Distribution**

The behaviour of these estimations can be described in repeated sampling and are used to evaluate the probability of observing certain sample results using the normal distribution as follows:

standard normal random variable,  $z = \frac{\text{Estimator} - \text{Mean}}{\text{standard deviation}}$

### 15.6.2 SAMPLING DISTRIBUTION OF MEAN WHEN POPULATION HAS NORMAL DISTRIBUTION:

**Population standard deviation  $\sigma$  is known-** It does not matter what the population distribution is, for any given sample of size  $n$  taken from a population with mean  $\mu$  and standard deviation  $\sigma$ , the sampling distribution of a sample statistic, such as mean and standard deviation are defined respectively by

Mean of the distribution of sample means  $\mu_{\bar{x}} = \mu$  and

Standard deviation of the distribution of sample means  $\sigma_{\bar{x}} = \sigma/\sqrt{n}$

If all possible samples of size  $n$  are drawn with replacement from a population having normal distribution with mean  $\mu$  and standard deviation  $\sigma$ , then it can be shown that the sampling distribution of mean  $\bar{x}$  and standard error  $\sigma_{\bar{x}}$  will also be normally distributed irrespective of the size of sample. This is true because any linear combination of normal random variables is also a normal random variable. In particular, if the sampling distribution of  $\bar{x}$  is normal, the standard error of the mean  $\sigma_{\bar{x}}$  can be used in conjunction with normal distribution to determine the probabilities of various values of sample mean. For this purpose, the value of sample mean  $\bar{x}$  is first converted into a value  $z$  on the standard normal distribution to know how any single mean value deviates from  $\mu$  of sample mean values by using the formula

$$Z = (\bar{x} - \mu_{\bar{x}}) / \sigma_{\bar{x}}$$

or

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

Since  $\sigma_{\bar{x}}$  measures the dispersion (standard deviation) of values of sample means in the sampling distribution of means, it can be said that

- $\bar{x} \pm \sigma_{\bar{x}}$  covers about middle 68% of the total possible sample means
- $\bar{x} \pm 1.96 \sigma_{\bar{x}}$  covers about middle 95% of the total possible sample means.

The procedure for making statistical inference using sampling distribution about the population mean  $\mu$  based on mean  $\bar{x}$  of sample means is summarized as follows:

- If the population standard deviation  $\sigma$  value is known and either population distribution is normal or population distribution is not normal but the sample size  $n$  is large then the sampling distribution of mean  $\mu_{\bar{x}} = \mu$  and standard deviation  $\sigma_{\bar{x}} = \sigma/\sqrt{n}$ , is very close to standard normal distribution given by

$$Z = (\bar{x} - \mu_{\bar{x}}) / \sigma_{\bar{x}}$$

$$\text{Or } Z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}$$

- If the population is finite with  $N$  elements whose mean is  $\mu$  and variance is  $\sigma^2$  and the sample of fix size  $n$  are drawn without replacement then the standard deviation of sampling distribution of mean  $\bar{x}$  can be modified to adjust the continued change in the size of the population  $N$  due to the several draws of samples of size  $n$  as follows:

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} \sqrt{\frac{N-n}{N-1}}$$

Where  $\sqrt{\frac{N-n}{N-1}}$  is called the finite population multiplier or finite correction factor.

**Population standard deviation  $\sigma$  is not known-** while calculating standard error  $\sigma_{\bar{x}}$  of normally distributed sampling distribution where  $\sigma$  is not known the value of normal variate  $z$  can not be calculated for a specific sample. In such a case, the standard deviation of population  $\sigma$  must be estimated using the sample standard deviation  $s$ , thus the standard error of sampling distribution of mean  $\bar{x}$  becomes

$$\sigma_{\bar{x}} = s/\sqrt{n}$$

Since the value of  $\sigma_{\bar{x}}$  varies according to each sample standard deviation therefore instead of using the conversion formula

$$Z = (\bar{x} - \mu)/(\sigma/\sqrt{n})$$

We use following formula, called ‘Student’s t-distribution’

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}}$$

Where,

$$s = \sqrt{\sum(x - \bar{x})^2/(n - 1)}.$$

### Examples based on sampling distribution

#### Example 1:

Let  $\bar{X}$  be the mean of a random sample of size 50 drawn from a population with mean 112 and standard deviation 40.

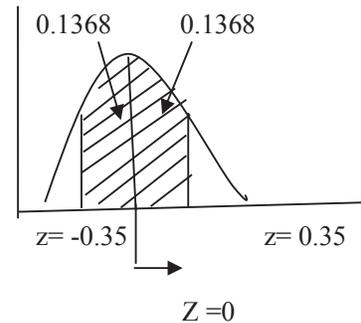
1. Find the mean and standard deviation of  $\bar{X}$ .
2. Find the probability that  $\bar{X}$  assumes a value between 110 and 114.
3. Find the probability that  $\bar{X}$  assumes a value greater than 113.

**Solution 1.** By the formulas in the previous section

$$\mu_{\bar{x}} = \mu = 112 \quad \text{and} \quad \sigma_{\bar{x}} = \sigma/\sqrt{n} = 40/\sqrt{50} = 5.65685$$

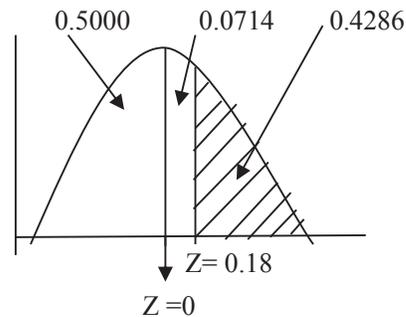
2. Since the sample size is at least 30, the Central Limit Theorem applies:  $\bar{X}$  is approximately normally distributed. We compute probabilities using Normal variate in the usual way, when we standardize:

$$\begin{aligned}
 P(110 < \bar{X} < 114) &= P[(110 - \mu_{\bar{X}}) / \sigma_{\bar{X}} < Z < (114 - \mu_{\bar{X}}) / \sigma_{\bar{X}}] \\
 &= P[(110 - 112) / 5.65685 < Z < (114 - 112) / 5.65685] \\
 &= P(-0.35 < Z < 0.35) = 0.1368 + 0.1368 \\
 &= 0.2736
 \end{aligned}$$



3. Similarly

$$\begin{aligned}
 P(\bar{X} > 113) &= P[Z > (113 - \mu_{\bar{X}}) / \sigma_{\bar{X}}] \\
 &= P[Z > (113 - 112) / 5.65685] \\
 &= P(Z > 0.18) \\
 &= 0.5000 - 0.0714 \\
 &= 0.4286
 \end{aligned}$$



### Example 2:

The numerical population of grade point averages at a college has mean 2.61 and standard deviation 0.5. If a random sample of size 100 is taken from the population, what is the probability that the sample mean will be between 2.51 and 2.71?

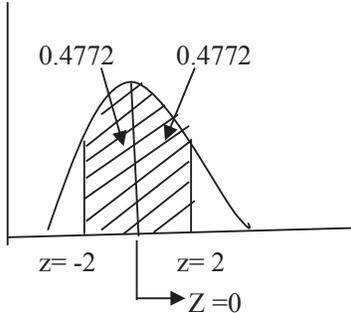
#### Solution:-

The sample mean  $\bar{X}$

has mean  $\mu_{\bar{X}} = \mu = 2.61$  and standard deviation  $\sigma_{\bar{X}} = \sigma / \sqrt{n} = 0.5 / 10 = 0.05$

So,

$$\begin{aligned}
P(2.51 < X < 2.71) &= P\left(\frac{2.51 - \mu_{\bar{x}}}{\sigma_{\bar{x}}} < Z < \frac{2.71 - \mu_{\bar{x}}}{\sigma_{\bar{x}}}\right) \\
&= P\left(\frac{2.51 - 2.61}{0.05} < Z < \frac{2.71 - 2.61}{0.05}\right) \\
&= P(-2 < Z < 2) \\
&= 0.4772 + 0.4772 = 0.9544
\end{aligned}$$



### 15.6.3 SAMPLING DISTRIBUTION OF DIFFERENCE BETWEEN TWO SAMPLE MEANS

The concept of sampling distribution of sample mean introduced earlier can also be used to compare a population of size  $N_1$  having mean  $\mu_1$  and standard deviation  $\sigma_1$  with another similar type of population of size  $N_2$  having mean  $\mu_2$  and standard deviation  $\sigma_2$ . Let  $\bar{x}_1$  and  $\bar{x}_2$  be the mean of sampling distribution of mean of two populations respectively. Then the difference between their mean values  $\mu_1$  and  $\mu_2$  can be estimated by generalizing the formula of standard normal variable as follows:

$$Z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_{\bar{x}_1} - \mu_{\bar{x}_2})}{\sigma_{\bar{x}_1 - \bar{x}_2}} = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sigma_{\bar{x}_1 - \bar{x}_2}}$$

where  $\mu_{\bar{x}_1} - \mu_{\bar{x}_2} = \mu_1 - \mu_2$ ,

$$\sigma_{\bar{x}_1 - \bar{x}_2} = \sqrt{\sigma_{x_1}^2 + \sigma_{x_2}^2} = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} \text{ (standard error of sampling distribution of two means)}$$

$n_1, n_2$  = independent random samples drawn from first and second population respectively. Since random samples are drawn independently from two populations with replacement, therefore the sampling distribution of the difference of two means will be normal provided sample size is sufficiently large.

#### Example 3:

The strength of the steel rod produced by company X has a mean of 4,500kg and a standard deviation of 200kg. company Y has a mean of 4,000kg and a standard deviation of 300kg. if 50 steel rod of company X and 100 steel rod of company Y are selected at random and tested for strength, what is the probability that the sample mean strength of X will be atleast 600kg more than that of Y?

Solution:

Given  $\mu_1 = 4500$ ,  $\sigma_1 = 200$  and  $n_1 = 50$

$\mu_2 = 4000$ ,  $\sigma_2 = 300$  and  $n_2 = 100$ , then,

$$\mu_{\bar{x}_1} - \mu_{\bar{x}_2} = \mu_1 - \mu_2 = 4500 - 4000 = 500$$

$$\sigma_{\bar{x}_1 - \bar{x}_2} = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} =$$

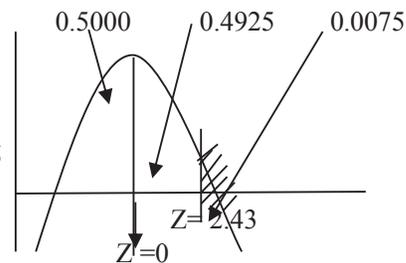
$$\sqrt{\frac{40000}{50} + \frac{90000}{100}} = 41.23$$

$$P[(\bar{x}_1 - \bar{x}_2) \geq 600] = P\left[Z \geq \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sigma_{\bar{x}_1 - \bar{x}_2}}\right]$$

$$= P\left[Z \geq \frac{600 - 500}{41.23}\right]$$

$$= P[Z \geq 2.43]$$

$$= 0.5000 - 0.4925 = 0.0075$$



### Check Your Progress- B

- Which of the following statements does not refer to the Central Limit Theorem?
  - The expected value of the mean of the distribution of sample means is  $\mu$ .
  - The distribution of sample means is approximately normally distributed.
  - The Central Limit Theorem is true for any distribution, when the sample size is at least 30.
  - The standard deviation of the distribution of sample means is equal to  $\sigma$ .
  - When a non-normal population is sampled, the distribution of sample means is still normally distributed, as long as the sample size is large.
- Suppose that we draw random samples of size 5 from two normal populations. The mean and standard deviation of population 1 are 100 and 25. The mean and standard deviation of population 2 are 90 and 40. Find the probability that the mean of sample 1 exceeds the mean of sample 2.

## 15.7 SAMPLING DISTRIBUTION OF SAMPLE PROPORTION

Often sampling is done in order to estimate the proportion of a population that has a specific characteristic  $x$ , such as the proportion of all items coming off an assembly line that are defective or the proportion of all people entering a retail store who make a purchase before leaving. The population proportion is denoted  $p$  and the sample proportion is denoted as  $\bar{p}$ .

$$\bar{p} = \frac{\text{elements of sample having characteristic, } x}{\text{sample size, } n}$$

Thus if in reality 43% of people entering a store make a purchase before leaving,  $p = 0.43$ ; if in a sample of 200 people entering the store, 78 make a purchase,  $\bar{p} = 78/200 = 0.39$ .

The sample proportion is a random variable: it varies from sample to sample in a way that cannot be predicted with certainty. Viewed as a random variable it will be written  $\bar{p}$ . It has a mean  $\mu_{\bar{p}}$  and a standard deviation  $\sigma_{\bar{p}}$ .

Here are formulas for their values.

Suppose random samples of size  $n$  are drawn from a population in which the proportion with a characteristic of interest is  $p$ . The mean  $\mu_{\bar{p}}$  and standard deviation  $\sigma_{\bar{p}}$  of the sample proportion  $\bar{p}$

Satisfy,

$$\mu_{\bar{p}} = p \quad \text{and} \quad \sigma_{\bar{p}} = \sqrt{pq/n}$$

where,  $q = 1 - p$ .

For large samples, the sample proportion is approximately normally distributed. The mean and standard deviation of the sampling distribution of proportion are valid for a finite population in which sampling is with replacement. However, for finite population in which sampling is done without replacement, we have  $\mu_{\bar{p}} = p$  and  $\sigma_{\bar{p}} = \sqrt{pq/n} * \sqrt{\frac{N-n}{N-1}}$ .

Under the same guidelines as mentioned in previous sections, for a large sample size  $n$  ( $\geq 30$ ), the sampling distribution of proportion is closely approximated by a normal distribution with mean and standard deviation as stated above. Hence to standardize sample proportion  $\bar{p}$ , the standard normal variable

$$z = \frac{\bar{p} - \mu_{\bar{p}}}{\sigma_{\bar{p}}} = \frac{\bar{p} - p}{\sqrt{p(1-p)/n}}$$

is approximately the standard normal distribution.

### Example 4:

An online retailer claims that 90% of all orders are shipped within 12 hours of being received. A consumer group placed 121 orders of different sizes and at different times of day; 102 orders were shipped within 12 hours.

1. Compute the sample proportion of items shipped within 12 hours.
2. Assuming the retailer's claim is true, find the probability that a sample of size 121 would produce a sample proportion so low as was observed in this sample.
3. Based on the answer to part (2), draw a conclusion about the retailer's claim.

Solution

1. The sample proportion is the number  $x$  of orders that are shipped within 12 hours divided by the number  $n$  of orders in the sample:

$$\bar{p} = x/n = 102/121 = 0.84$$

Since  $p = 0.90$ ,  $q = 1 - p = 0.10$ , and  $n = 121$ ,

$$\sigma_{\bar{p}} = \sqrt{(0.90)(0.10)/121} = 0.027$$

2. Using the value of  $\bar{p}$

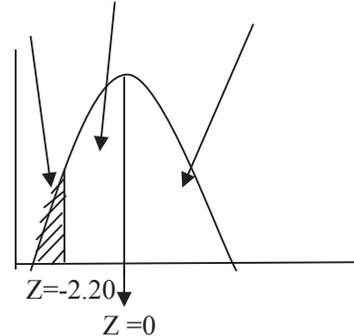
$$P(\bar{p} \leq 0.84) = P(Z \leq (0.84 - \mu_{\bar{p}}) / \sigma_{\bar{p}})$$

$$= P(Z \leq (0.84 - 0.90) / 0.027)$$

$$= P(Z \leq -2.20) = 0.5000 - 0.4861$$

$$= 0.0139$$

0.0139    0.4861    0.5000



3. The computation shows that a random sample of size 121 has only about a 1.4% chance of producing a sample proportion as the one that was observed,  $\bar{p} = 0.84$ , when taken from a population in which the actual proportion is 0.90. This is so unlikely that it is reasonable to conclude that the actual value of  $p$  is less than the 90% claimed.



### Check Your Progress- C

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1. Out of 300 students in the school, 225 passed an exam. If You take a sample of 10 of these students. What is the standard deviation of the distribution of sample proportions?

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## 15.8 SUMMARY

To summarize: 1.) the sampling distribution is a theoretical distribution of a sample statistic. 2.) There is a different sampling distribution for each sample statistic. 3.) Each sampling distribution is characterized by parameters, two of which are  $\mu$  and  $\sigma_x$ . The latter is called the standard error. 4.) For any population with mean  $\mu$ , and variance  $\sigma^2$ , the mean of all sample means of size  $n$  also equals  $\mu$  and the variance equals  $\sigma^2/n$ . 5) The sampling distribution of the mean is a special case of the sampling distribution. 6.) The Central Limit Theorem relates the parameters of the sampling distribution of the mean to the population model and is very important in statistical thinking. 7)The distribution of sample means tends to the normal as the sample size increases, regardless of the shape of the parent population from which the samples are drawn. This tendency is known as the Central Limit Theorem.




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## 15.9 GLOSSARY

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**Population:** The entire area or group of individuals about which we desire information.

**Parameter:** A numerical summary (usually unknown but desired) based on the entire population. e.g. mean and SD, are summary measures of population, e.g.  $\mu$  and  $\sigma$ . These are fixed.

**Sample:** A subset of the population from which data is actually collected.

**Statistic:** A numerical summary based on data collected from the sample. e.g. sample mean and sample SD, are summary measures of a sample, e.g.  $\bar{x}$  and  $s$ . These vary.

**Population Distribution (of a variable):** The value of a variable over a population can be thought of as a random variable because the value of the

variable depends on which individual is selected. The probability distribution of this random variable is called the population distribution.

**Sampling Distribution (of a statistic):** A statistic computed from a random sample (or in a randomized experiment) is a random variable because the outcome depends on which individuals are included in the sample. The probability distribution of the sample statistic is called the sampling distribution.

**Standard error** – standard deviation of a sample statistic



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## 15.10 ANSWERS TO CHECK YOUR PROGRESS

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### Check Your Progress –A

1. (b)
2. (d)

### Check Your Progress –B

1. (d)
2. 0.6808

### Check Your Progress –C

1. 0.137



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## 15.11 REFERENCES

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- <https://onlinecourses.science.psu.edu/stat200/node/42>

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## 15.12 SUGGESTED READINGS

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## 15.13 TERMINAL QUESTIONS

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- Q1. Explain with the help of an example, the concept of sampling distribution of a sample statistics and point out its role in management decision making.
- Q2. Why does the sampling distribution of mean follow a normal distribution for a large sample size even though the population may not be normally distributed?
- Q3. Explain the concept of standard error. Discuss the role of standard error in large sample theory.
- Q4. What is the Central Limit Theorem? Why is it important in statistical inference?
- Q5. Why does the sample size play such an important role in reducing the standard error of the mean? What are the implications of increasing the sample size?

Q6. A diameter of a component produced on a semi-automatic machine is known to be distributed normally with a mean of 10mm and a standard deviation of 0.1mm. if a random sample of size 5 is picked up, what is the probability that the sample mean will be between 9.95 mm and 10.05mm?

[Ans;  $\sigma_{\bar{x}} = 0.047$ ,  $P(9.95 \leq x \leq 10.05) = 0.7372$  ]

Q7. The time between two arrivals at a queuing system is normally distributed with a mean of 2 minutes and standard deviation 0.25minute. if a random sample of 36 is drawn, what is the probability that the sample mean will be greater than 2.1 minutes?

[Ans;  $\sigma_{\bar{x}} = 0.042$ ,  $P(\bar{x} > 2.1) = 0.0087$  ]

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## **UNIT 16 DETERMINATION OF SAMPLE SIZE AND TESTING OF HYPOTHESIS**

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### **16.1 Introduction**

### **16.2 Learning Objectives**

### **16.3 Determination of sample size**

### **16.4 Concepts used in Hypothesis testing**

### **16.5 Direction of the hypothesis test**

### **16.6 Procedure for hypothesis testing**

### **16.7 Errors in Hypothesis Testing**

### **16.8 Power of a hypothesis test**

### **16.9 Hypothesis testing for population mean with large samples**

### **16.10 Hypothesis testing for difference between two population means**

### **16.11 Hypothesis testing for single population proportion**

### **16.12 Hypothesis testing for difference between two population proportions**

### **16.13 Hypothesis testing for population mean with small samples**

### **16.14 F- test for difference in two variances**

### **16.15 Summary**

### **16.16 Glossary**

### **16.17 References**

### **16.18 Suggested Readings**

### **16.19 Terminal Questions**

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## **16.1 INTRODUCTION**

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In the previous units, the basics of sampling and sampling distribution have been discussed. In this unit we will discuss about the determination of appropriate sample size and hypothesis testing.

Inferential statistics helps us in making decisions about some characteristics of a population based on the sample information. Determining a suitable sample size is a crucial aspect of inferential statistics. Another important concept is of hypothesis testing, on the basis of which inferences about population can be made.

In business, there arise several situations when managers have to make quick decisions about population based on the statistical inference. These decisions may have an impact on the success or failure of their enterprises. The term, 'statistical inference' means reaching on a conclusion about a population on the basis of one or more samples. For example, a manager is interested to check whether all the items supplied by the supplier are of good quality or not. The manager can check few items as a sample and check the quality for those items. The results can be used to draw a conclusion about the quality of whole lot of items.

In this unit we shall study the methods of testing hypothesis about population parameters. It may be noted that it is essential to determine an appropriate sample size to arrive on the best decision. Here, we shall also discuss about determination of sample size.

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## 16.2 LEARNING OBJECTIVES

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After completing this unit you will be able to understand;

- How to determine the appropriate Sample size.
- Basic concept of hypothesis, Defining null and alternative hypothesis.
- Procedure for hypothesis testing.
- Type I and Type II errors in hypothesis testing and difference between them.
- Understand the power of a hypothesis test
- Various types of hypothesis tests used in different situations.

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## 16.3 DETERMINATION OF SAMPLE SIZE

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One crucial aspect of sample statistics to infer about population is deciding how big the sample should be. As the entire population is not studied in sampling, there is always some sampling error. If you increase your sample size you increase the precision of your estimates, which means that, for any given estimate, the greater is the sample size the more "statistically significant" the result will be. In other words, if an investigation is too small then it will not detect results that are in fact important. In view of these considerations, it becomes necessary to choose a sample of an appropriate size.

### 16.3.1 SAMPLE SIZE FOR ESTIMATING MEAN

There are three considerations required to be checked when determining the appropriate sample size to estimate the population mean. These are:

1. the extent of error or imprecision allowed
2. The degree of confidence desired in the estimate
3. The standard deviation of the population

The first two considerations depends on judgment involving the use of the data. The third consideration, the standard deviation of the population is to be calculated. We may consider the problem of determining sample size in two different situations, namely when the standard deviation of the population is known and when it is unknown.

### 16.3.1.1 Determination of Sample Size when the Standard Deviation of the Population is Known

**Extent of error:** The first consideration relates to the extent of error allowed. This is indicated by standard error. The magnitude of standard error that can be tolerated is to be decided by researcher.

**The degree of confidence:** A second consideration is the degree of confidence that researcher wants to have in the results. Normally three confidence levels, 99 percent, 95 percent and 90 percent are used. When a 99 percent level of confidence is used, it implies that there is a risk of only one percent of true population statistic falling outside the range indicated by confidence interval. It should be noted that there is a trade off between extent of error permissible and degree of confidence.

The formula for determining sample size can be put as follows:

$$n = \frac{z^2 \sigma^2}{E^2} \text{Mean}$$

Where  $n$  is sample size,  $E$  is the maximum error of estimate and  $z$  is the degree of confidence required. If necessary, the answer can be round up to obtain a whole number. That is, if there is any fraction or decimal portion in the answer, use the next whole number for sample size  $n$ .

#### Example 1

The college principal asks the statistics teacher to estimate the average age of the students at their college. How large a sample is necessary? The statistics teacher would like to be 99% confident that the estimate should be accurate within 1 year. From a previous study, the standard deviation of the ages is known to be 3 years.

#### Solution

Since the level of confidence is 99 percent therefore,  $z = 2.58$ , and  $E = 1$  year,  $\sigma = 3$  years.

Substituting in the formula, one gets

$$n = \frac{z^2 \sigma^2}{E^2} = \frac{2.58^2 3^2}{1^2} = 59.9 \sim 60$$

Therefore, to be 99% confident that the estimate is within 1 year of the true mean age, the teacher needs a sample size of at least 60 students.

### 16.3.1.2 Determination of Sample Size when the Standard Deviation of the Population is Unknown

The formula for determining sample size requires the use of the population standard deviation. What, then, happens when  $s$  is unknown? In this case, an attempt is made to estimate  $s$ . One such way is to use the standard deviation  $s$  obtained from a sample taken previously as an estimate for  $s$ . Another alternative approach to determine standard deviation is to use the concept that entire area under normal curve falls within  $\mu \pm 3\sigma$ . This means we should have some idea about the range of variation, that is the difference between highest and the lowest item. The standard deviation can also be estimated by dividing this range by 6.

#### Example 2

For a proposed survey, it is known that the minimum monthly income amongst households is Rs. 3000 and the maximum is Rs. 18000. Determine appropriate sample size if the error allowed for estimation is  $\pm 50$  rs. The degree of confidence is 95 %.

#### Solution

Here for 95 % confidence level  $Z = 1.96$  the standard deviation is not known so using the range which is (18000- 3000) Rs. 15000 to compute standard deviation hence  $\sigma = 15000/6 =$  Rs. 2500.

Given that  $E =$  Rs. 50 Substituting the values in the formula

$$n = \frac{z^2 \sigma^2}{E^2} = \frac{1.96^2 2500^2}{50^2} = 9604$$

This shows that a sample of 9604 households should be taken.

### 16.3.2 SAMPLE SIZE FOR ESTIMATING PROPORTION

At times, it is the proportion of population that becomes more relevant than the mean value. For example, one may be more interested in knowing the proportion of households having a monthly income of, say, Rs. 1000 and less or of Rs. 2500 and above rather than in knowing the average income of households.

In this case, the formula for calculating sample size can be written as

$$n = \frac{z^2 pq}{E^2}$$

Where, the values of  $z$  and  $E$  are predetermined, while the value of proportion may be estimated on the basis of past experience.

#### Example 3

A researcher wishes to estimate, with 95% confidence, the proportion of people who own a car. A previous study shows that 40% of those interviewed had a car. The researcher wishes to be accurate within 2% of the true proportion. Find the minimum sample size necessary.

#### Solution

Since confidence level is 95% therefore,  $z=1.96$ ,  $E=0.02$ ,  $p=0.40$ , and  $q=0.60$ , then

$$n = \frac{z^2 pq}{E^2} = \frac{1.96^2 * 0.4 * 0.6}{0.02^2} = 2304.96$$

which, when rounded up, is 2305 people to interview.

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## 16.4 CONCEPTS USED IN HYPOTHESIS TESTING

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In everyday life, we often have to make decisions based on incomplete information. These may be decisions that are important to us such as, "Will I improve my financial knowledge if I do a course on financial accounting?" or "Should I join some personality development course to increase my chances of getting into a good job in a company?" This section is about the use of hypothesis testing to help us with these decisions. Hypothesis testing is a tool of statistical inference in which some claim about population is tested with the help of sample data and some conclusion is made. In a hypothesis test, a hypotheses is developed and tested in order to be accepted or rejected. These hypotheses are statements about the population. In this chapter, we will examine the hypothesis tests that involve statements about the average values (means) of some variable in the population. For example, we may want to know if the average time that college professor teaches in a week is really 20hours per week. There are some basic concepts used in hypothesis testing. These are explained as follows-

### 16.4.1 HYPOTHESIS

A statistical hypothesis is *an assertion or conjecture or claim concerning one or more populations*. To prove that a hypothesis is true, or false, with absolute certainty, we would need absolute knowledge. That is, we would have to examine the entire population. Instead, hypothesis testing concerns on how to use a random sample to judge if it is evidence that supports or not the hypothesis.

**Example:** A pharmaceutical company claims that 95 % of all patients who take a particular medicine get cured. A study was conducted to examine this claim. 100 patients were given the medicine and it was found that 96 patients got cured with a standard deviation of 1.2.

Do these statistics support the claim of the company? What is needed is an objective method to determine if the data support or contradict the hypothesis that 95 % of all patients who take a particular medicine get cured.

Hypothesis testing enables a decision maker to test the validity of his claim by analyzing the difference between the sample statistic and the corresponding hypothesized population parameter value.

To test a hypothesis (beliefs, claims or ascertions) statistically, sample data is used and the hypothesized value of population parameter is accepted or rejected.

### 16.4.2 NULL AND ALTERNATE HYPOTHESIS

In statistical hypothesis testing, there are always two hypotheses. The hypothesis that is to be tested is called the null hypothesis and given the symbol  $H_0$ . The null hypothesis is a

statement about a population parameter (such as mean) and the test is used to decide whether or not to accept the null hypothesis. It states that there is no difference between a hypothesized population mean and a sample mean. It is the status quo hypothesis. In other words, the hypothesis under verification is known as *null hypothesis* and is always set up for possible rejection under the assumption that it is true.

For example, if we want to find out whether extra training has benefited the employees or not, we shall set up a null hypothesis that “*extra training has not benefited the employees*”. Similarly, if we want to find out whether a particular medicine is effective in curing fever we will take the null hypothesis that “*the medicine is not effective in curing fever*”.

Another example that can be given as, If we want to test the hypothesis that a professor teaches 18 hours per week, we would express our null hypothesis as:

$H_0: \mu = 18$

We test this null hypothesis against an alternative hypothesis; if the null hypothesis is rejected, alternate hypothesis is to be accepted. Alternate hypothesis is represented by the symbol  $H_a$ . It includes the outcomes not covered by the null hypothesis. In this example, the alternative hypothesis can be written that a professor do not teach 18 hours per week.

$H_a: \mu \neq 18$

#### Example 4

We have a mixture that is being manufactured and each Kg of mixture is supposed to have 95 milligrams of the nitrogen. What are our null and alternative hypotheses?

#### Solution

$H_0: \mu = 95,$

$H_a: \mu \neq 95$

Our null hypothesis states that the population has a mean equal to 95 milligrams. While alternative hypothesis states that the population has a mean that is different than 95 milligrams.

### 16.4.3 FORMATS OF HYPOTHESIS

As mentioned earlier, a hypothesis is a statement about the true value of population parameter that is to be tested using sample statistics. A hypothesis about any significant difference between two or more populations with respect to any of their common parameter can also be tested. A hypothesis can also be stated in the form of if-then statement. Consider the following statements:

- If death rate has decreased, then population will increase.
- If employees are healthy, then absenteeism will be less.

If terms such as, ‘positive’, ‘negative’, ‘more than’, ‘less than’, etc are used to make a statement then such a hypothesis is called “directional hypothesis”, because it indicates the direction of the relationship between two or more populations under study with respect to a parameter value as illustrated below:

- Side effects were experienced by less than 20 percent of the people who take a particular medicine.
- Greater the stress experienced in the job, lower the job satisfaction to employees.

The ‘non directional hypothesis’ indicates a relationship (or difference), but offer no indication of the direction of relationships. In other words, though it may be obvious that there would be a significant relationship between two populations with respect to a parameter, we may not be able to say whether the relationship is positive or negative. Similarly it will not be easy to say which population will be more or less. Following are few examples of non directional hypotheses-

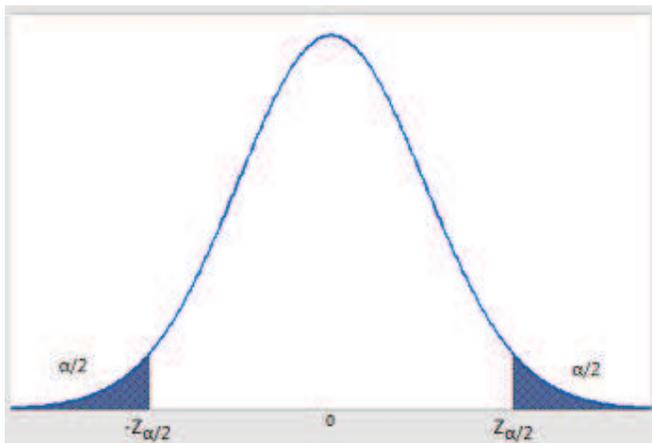
- There is a relationship between age and height.
- There is a difference between average blood pressure of men and women.

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## 16.5 DIRECTION OF THE HYPOTHESIS TEST

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The location of rejection region (area) under the sampling distribution curve determines the direction of the hypothesis test, i.e. either left tail or right tail of the sampling distribution. It indicates the range of sample statistic values that would lead to a rejection of the null hypothesis. A hypothesis test can be one-tailed or two-tailed. An example of two-tailed hypothesis tests is that the average no. of teaching hours is either 20 hours per week, or it is not. It is not specified whether the true mean to be higher or lower than the hypothesized mean. It is believed that it must be different. An alternative hypothesis that specified that the parameter can lie on either side of the value specified by  $H_0$  is called a two-sided (or two-tailed) test, e.g.



$H_0: \mu = 18$ ,  $H_a: \mu < > 18$  or  $H_a: \mu \neq 18$

In a **two-tailed test**, the null hypothesis will be rejected if the sample mean falls in either tail of the sampling distribution. For this reason, the alpha level (let's assume .05) is split across the two tails. The curve below shows the critical regions for a two-tailed test. These are the regions under the normal

curve that, together, sum to a probability of  $\alpha$  (0.05). Each tail has a probability of  $\alpha/2$

(0.025). The z-scores that designate the start of the critical region are called the critical values. If the sample mean taken from the population falls within these critical regions, or "rejection regions," it can be concluded that there was too much of a difference and we would reject the null hypothesis. However, if the mean from the sample falls in the middle of the distribution i.e. acceptance region (in between the critical regions) we would fail to reject the null hypothesis.

### ***One-Tailed Hypothesis Test***

A single-tail hypothesis test is used when we are only interested in one direction of the results. An alternative hypothesis that specified that the parameter can lie on only one side (either lower or upper) of the value specified by  $H_0$  is called a one tailed test, For Example: suppose the null hypothesis is that the average pulse rates of men and women are same. A two-tailed alternative hypothesis would simply state that the pulse rates are not same – implying that pulse rate of men could be more than that of women, or it could be less. A one-tailed alternative would be that pulse rate of men is more than that of women. The latter is a stronger statement as not only it is claimed that there is a difference, it is also mentioned what direction the difference is in. Symbolically the hypothesis can be represented as

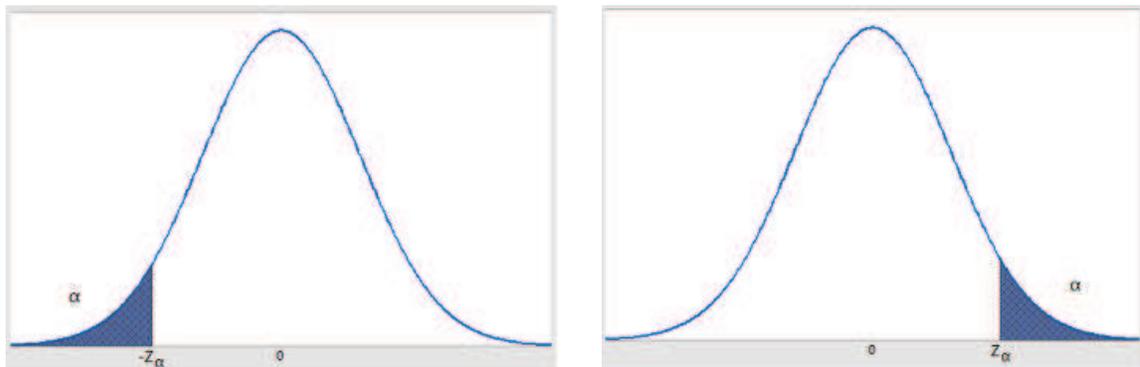
$H_0: \mu \leq \mu_0$  and  $H_a: \mu > \mu_0$  (right tailed test)

Or

$H_0: \mu \geq \mu_0$  and  $H_a: \mu < \mu_0$  (left tailed test)

When performing a single-tail hypothesis test, the alternative hypothesis looks a bit different. We use the symbols of greater than or less than. A single-tail hypothesis test also means that we have only one critical region because we put the entire critical region into just one side of the distribution.

When the alternative hypothesis is that the sample mean is greater, the critical region is on the right side of the distribution (see below). It is called Right tailed test. When the alternative hypothesis is that the sample is smaller, the critical region is on the left side of the distribution. It is called as left tailed test.



**Left tailed test**

**Right tailed test**

**Fig 16.1 Left and Right Tailed Test**

The critical region represents a probability of  $\alpha$ , where as rest of the area, i.e. acceptance region has a probability of  $1-\alpha$ .

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## 16.6 PROCEDURE FOR HYPOTHESIS TESTING

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A procedure is used to determine whether the hypothesis is a reasonable statement and should not be rejected, or is unreasonable and should be rejected.

Following is the procedure for testing a hypothesis.

### Steps in the Hypothesis Testing Procedure

#### 1.) State null and alternate hypothesis

Null Hypothesis – It is generally a statement about the value of a population parameter.

Alternate Hypothesis – Statement that is accepted if null hypothesis is proven to be false.

#### 2.) Select the appropriate test statistic and level of significance

When testing a hypothesis of a mean, we use the z-statistic or we use the t-statistic according to the following conditions. If the population standard deviation,  $\sigma$ , is known and the data is normally distributed or the sample size  $n > 30$ , we use the normal distribution (z-statistic). When the population standard deviation,  $\sigma$ , is unknown and either the data is normally distributed or the sample size is less than 30 ( $n < 30$ ), we use the t-distribution (t-statistic).

When testing a hypothesis of a proportion, we use the z-statistic or z-test and the

$$\text{formula } z = \frac{\bar{p} - \mu_{\bar{p}}}{\sigma_{\bar{p}}} = \frac{\bar{p} - p}{\sqrt{p(1-p)/n}}$$

Also a level of significance or alpha ( $\alpha$ ) level is selected for the hypothesis test. It is similar to the significance level used in determining sample size, this alpha level tells us how improbable a sample mean must be in order to call it as "significantly different" from the hypothesized mean. The most frequently used levels of significance are 0.05 and 0.01. An alpha level of 0.05 means that we will consider the sample mean to be significantly different from the hypothesized mean if the chances of observing that sample mean are less than 5%. Similarly, an alpha level of 0.01 means that we will consider the sample mean to be significantly different from the hypothesized mean if the chances of observing that sample mean are less than 1%.

#### 3.) State the decision rules

The decision rules state the conditions under which the null hypothesis will be accepted or rejected. The critical value for the test-statistic is determined by the level of significance. The critical value is the value that divides the non-reject (acceptance) region from the rejection region.

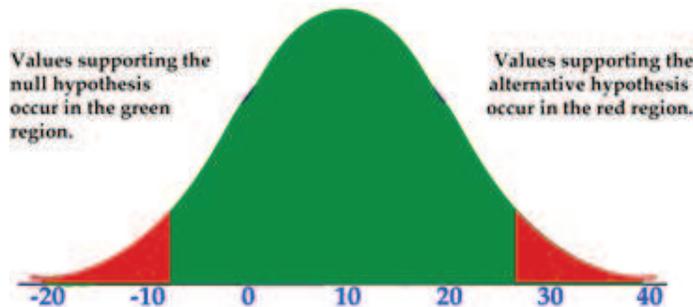
#### 4.) Compute the appropriate test statistic

A test statistic is a random variable used to determine how close a specific sample result falls to one of the hypotheses being tested. That is, the test statistic tells us, if  $H_0$  is true, how likely it is that we would obtain the given sample result. Often, a Z score is used as the test statistic.

When we use the z-statistic, we use the formula  $Z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}$

When we use the t-statistic, we use the formula  $t = \frac{\bar{x} - \mu}{s/\sqrt{n}}$

5.) Determine the critical region and make the decision



**Fig 16.2 Determination of critical region and make the decision**

The next step is to compare the computed value of test statistic with critical value. Critical values are the values that indicate the edge of the critical region. Critical regions describe the entire area of values that indicate to reject the null hypothesis. In other words, the critical region is the area encompassed by the values not included in the initial claim - the area of the 'tails' of the distribution. The "tails" of a test are the values outside of the critical values. In other words, the tails are the ends of the distribution, and they begin at the greatest or least value included in the alternative hypothesis (the critical values). In the graph below, the tails are in red and the rest of the distribution is in green. The critical values of the test in the image are -8 and 28, as these are the dividers between values supporting the alternative and null hypothesis. The area in red can also be seen as the rejection region, since an observed value in this region indicates that the null hypothesis should be rejected.

If the computed value is within the rejection region(s), we reject the null hypothesis; otherwise, we do not reject the null hypothesis.

6.) Interpret the decision

Based on the decision in Step 5, we state a conclusion in the context of the original problem.

**Example:**

The average score of all students in a school on a math exam is 85 with a standard deviation of 8.1. A random sample of 100 students of a class in the school was taken. The mean score of these 100 students was 81. Does this indicate that the students of this class are significantly

less skilled in their abilities than the average student in the whole school? (Use a 5% level of significance.)

**Solution:**

In this problem, we know the mean and standard deviation for the population,  $\mu = 85$  and  $\sigma = 8.1$  (all students in school). The mean for the sample of 100 students in a certain class in the school is 81.

This is a large sample because  $n > 30$  which is usually used to determine whether to use large or small sample techniques.

Since  $\sigma$  is known and  $n > 30$ , we use the z-test that is based on the normal curve or normal distribution.

**Step 1**

State the null hypothesis (contains =,  $\geq$ , or  $\leq$ ) and alternate hypothesis (usually contains “not”).

$$H_0: \mu \geq 75 \quad H_1: \mu < 75$$

**Step 2**

Select a level of significance.

Stated in the problem as 5% or  $\alpha = 0.05$

**Step 3**

Identify the statistical test to use.

Use z-test because  $\sigma$  is known and the sample ( $n=100$ ) is a large sample ( $n > 30$ ).

**Step 4**

Compute the test statistic.

$$Z = \frac{\bar{X} - \mu}{\sigma / \sqrt{n}} = \frac{81 - 85}{8.1 / \sqrt{100}} = -4.938$$

**Step 5**

Compare the computed value with critical value and make the decision.

Since the alternate hypothesis states  $\mu < 85$ , this is a one-tailed test to the left. For  $\alpha = 0.05$ , we find z in the normal curve table that gives a probability of 0.05 to the left of z. This means the negative of the z value (critical value) corresponding to a table value of  $0.5 - 0.05 = 0.45$  or  $z = -1.645$ . i.e. Critical value of z for left tailed test and 5% level of significance is -1.645

Since the computed  $z = -4.938 < -1.645$  (critical z value), we reject the null hypothesis.

**Step 6**

Interpret the decision.

Rejecting null hypothesis means that the students in the class are less skilled in their ability..

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## 16.7 ERRORS IN HYPOTHESIS TESTING

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Since the decision to reject or accept a null hypothesis is based on sample data and probability, there is a possibility of an incorrect decision or error. There are four possible scenarios:

- a. A true hypothesis is rejected.
- b. A true hypothesis is not rejected.
- c. A false hypothesis is not rejected.
- d. A false hypothesis is rejected.

If a hypothesis is true and it is not rejected (Option 2) or if a false hypothesis is rejected (Option 4), then the decision made is correct. But if a true hypothesis is rejected (Option 1) or a false hypothesis is not rejected (Option 3) then there is an error. Overall, one type of error is not necessarily more serious than the other. Which type is more serious depends on the specific research situation, but ideally both types of errors should be minimized during the analysis

Decision Made	Null Hypothesis is True	Null Hypothesis is False
Reject Null Hypothesis	Type I Error	Correct Decision
Do not Reject Null Hypothesis	Correct Decision	Type II Error

### 16.7.1 TYPE I ERROR

The acceptance of  $H_a$  when  $H_0$  is true is called a Type I error. The probability of committing a type I error is called the level of significance and is denoted by  $\alpha$ . At the 0:05 level, the decision to reject the hypothesis may be incorrect 5% of the time. The risk of making Type I error usually depends on the cost and goodwill loss. The complement ( $1 - \alpha$ ) of the probability of type I error measures the probability of not rejecting a true null hypothesis and is referred to as *confidence level*.

### 16.7.2 TYPE II ERROR

The type-II error is said to be committed if the null hypothesis ( $H_0$ ) is false but our test accepts it. The probability of committing a type II error is denoted by  $\beta$ . The probability of making a type II error varies with the actual values of the population parameter being tested when the null hypothesis  $H_0$  is false. The probability of committing a type II error depends on five factors: (i) the actual value of the population parameter being tested, (ii) the level of



Now compute the test statistic  $\Rightarrow Z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$

Now calculate  $|Z|$

Find out the tabulated value of Z at  $\alpha$  % level of significance i.e.  $Z_\alpha$

If  $|Z| > Z_\alpha$ , reject the null hypothesis  $H_0$

If  $|Z| < Z_\alpha$ , accept the null hypothesis  $H_0$

**Note:** if the population standard deviation is unknown then we can use its estimate s, which will be calculated from the sample.

c

**Example:** The scores on an aptitude test required for entry into a certain job position have a mean of 500 and a standard deviation of 120. If a random sample of 36 applicants has a mean of 546, test the belief that their mean score is different from the mean that is expected from all applicants. Use 5 % level of significance?

Solution: specifying Null and Alternative Hypothesis

**$H_0: M = 500$**

**$H_A: M \neq 500$**

Given  $n = 36$ ,  $\bar{x} = 546$ ,  $\mu = 500$  and  $\sigma = 120$ , computing the test statistic z

$$z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{546 - 500}{\frac{120}{\sqrt{36}}} = \frac{46}{20} = 2.3$$

At  $\alpha = 0.05$  for a two tailed test, critical value of  $z = \pm 1.96$ .

Since the calculated value of z is 2.3 which is more than the critical value at 5% level of significance and lies in the rejection region, hence we conclude that the population mean is not 500; that is we reject the null hypothesis and accept the alternate hypothesis.

Example:

A farmer is trying out a planting technique that he hopes will increase the yield on his pea plants. The average number of pods on one of his pea plants is 145 pods with a standard deviation of 100 pods. This year, after trying his new planting technique, he takes a random sample of his 144 plants and finds the average number of pods to be 147.

He wonders whether or not this is a statistically significant increase. What are his hypotheses and the test statistic?

Solution:

First, develop null and alternative hypotheses:

$$H_0 : \mu \leq 145$$

$$H_a : \mu > 145$$

This alternative hypothesis is > since he believes that there might be a gain in the number of pods.

Next, calculate the test statistic for the sample of pea plants.

$$z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}} = \frac{147 - 145}{100 / \sqrt{144}} = 0.24$$

If we choose  $\alpha=0.05$ , the critical value of  $z$  from the normal distribution table for a right tailed test will be 1.645. We will reject the null hypothesis if the test statistic is greater than 1.645.

The value of the test statistic is 0.24.

This is less than 1.645 and so our decision is to fail to reject  $H_0$ . Based on our sample we believe the mean is equal to 145.

## 16.10 HYPOTHESIS TESTING PROCEDURE FOR DIFFERENCE BETWEEN TWO POPULATION MEANS

If two random samples of size  $n_1$  and  $n_2$  are drawn from two normal populations with means  $\mu_1$  and  $\mu_2$ , variances  $\sigma_1^2$  and  $\sigma_2^2$  respectively

Let  $\bar{x}_1$  and  $\bar{x}_2$  be the sample means for the first and second populations respectively

$$\text{Then } \bar{x}_1 \sim N\left(\mu_1, \frac{\sigma_1^2}{n_1}\right) \text{ and } \bar{x}_2 \sim N\left(\mu_2, \frac{\sigma_2^2}{n_2}\right)$$

$$\text{Therefore } \bar{x}_1 - \bar{x}_2 \sim N\left(\mu_1 - \mu_2, \frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}\right)$$

For this test, the null hypothesis is  $H_0 : \mu_1 = \mu_2 \Rightarrow \mu_1 - \mu_2 = 0$  against the two tailed alternative hypothesis  $H_1 : \mu_1 \neq \mu_2$

$$\begin{aligned} \text{Now the test statistic } \Rightarrow Z &= \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{S.E(\bar{x}_1 - \bar{x}_2)} \\ \Rightarrow Z &= \frac{(\bar{x}_1 - \bar{x}_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} \quad [\text{since } \mu_1 - \mu_2 = 0 \text{ from } H_0] \end{aligned}$$

Now calculate  $|Z|$  and Find out the tabulated value of  $Z$  at  $\alpha$  % level of significance i.e.  $Z_\alpha$

If  $|Z| > Z_{\alpha}$ , reject the null hypothesis  $H_0$

If  $|Z| < Z_{\alpha}$ , accept the null hypothesis  $H_0$

**Note:** If  $\sigma_1^2$  and  $\sigma_2^2$  are unknown then we can consider  $s_1^2$  and  $s_2^2$  as the estimate value of  $\sigma_1^2$  and  $\sigma_2^2$  respectively, where  $s_1^2$  and  $s_2^2$  are the variances of sample 1 and sample 2 respectively.

**Example:**

The training department of a company wishes to determine if there is any difference in the performance between the workers that have completed a training program and those that have not completed the program. A sample of 100 trained workers reveals an average output of 74.3 parts per hour with a sample standard deviation of 16 parts per hour. A sample of 100 who have not been trained has an average output of 69.7 parts per hour with a standard deviation of 18 parts per hour. Is there evidence of a difference in output between the two groups? Use 5% level of significance.

**Solution:**

State Null and Alternative Hypothesis

$$H_0: \mu_1 = \mu_2$$

$$H_A: \mu_1 \neq \mu_2$$

Given values are arranged in the given table

	Training	No Training
Mean $\bar{x}$	74.3	69.7
Variance $\sigma^2$	$16*16 = 256$	$18*18 = 324$
N	100	100

$$\text{DIFFERENCE IN SAMPLE MEANS} = 74.3 - 69.7 = 4.6$$

$$\text{STANDARD ERROR} = \sqrt{\frac{256}{100} + \frac{324}{100}} = 2.408$$

$$\text{Calculated} \Rightarrow Z = \frac{(\bar{x}_1 - \bar{x}_2)}{S.E(\bar{x}_1 - \bar{x}_2)} = \frac{4.6}{2.408} = 1.91$$

Table value of z for a two tailed test at  $\alpha = 0.05$  is  $\pm 1.96$ .

Since calculated value of Z is less than critical value ( $1.91 < 1.96$ ). Therefore we can not reject  $H_0$ . It means the data does not support a difference in the production between trained and untrained.

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## 16.11 HYPOTHESIS TESTING PROCEDURE FOR SINGLE POPULATION PROPORTION

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Let  $x$  is number of success in  $n$  independent trails with constant probability  $p$ , then  $x$  follows a binomial distribution with mean  $\mu=np$  and variance  $\sigma^2 = npq$ . Where  $q= 1-p$

In a sample of size  $n$  let  $x$  be the number of persons possessing a given attribute then the sample proportion is given by  $\hat{p} = \frac{x}{n}$

For this test, the null hypothesis is  $H_0 : p = p_0$  against the two-sided alternative hypothesis  $H_a : p \neq p_0$

the test statistic is calculated as 
$$\Rightarrow Z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$$

Now calculate  $|Z|$

Find out the tabulated value of  $Z$  at  $\alpha\%$  level of significance i.e.  $Z_\alpha$

If  $|Z| > Z_\alpha$ , reject the null hypothesis  $H_0$

If  $|Z| < Z_\alpha$ , accept the null hypothesis  $H_0$

Example:

During a trial of the potential malaria vaccine, the effect of the drug was measured on the number of children infected. Without the malaria vaccine, the rate of severe malaria infection in the area of the study was 34.9 children per 1000, which gives a population proportion of 0.0349. 745 children were given the drug and 11 got severe malaria during the course of the study. Does this data suggest at 5% level of significance that the drug reduces the rate of severe malaria infections?

Solution:

Step 1:

Null hypothesis  $H_0: p = 0.0349$  (we assume that the drug does nothing)

Alternative hypothesis  $H_a: p < 0.0349$  (the drug will reduce the number of cases)

Step 2:

Find  $\hat{p}$  and the  $z$  test statistic

$$\hat{p} = \frac{11}{745} = 0.014765$$

$$z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} = \frac{\frac{11}{745} - 0.0349}{\sqrt{\frac{0.0349(1-0.0349)}{745}}} = -2.99453$$

Step 3:

Table value of z for left tailed test at  $\alpha = 0.05$  is -1.645.

Step 4:

Since the calculated value of z lies in the critical (rejection) region, we conclude that the null hypothesis is mostly likely not true. So we reject the null hypothesis and conclude that the drug will reduce the number of cases.

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## 16.12 HYPOTHESIS TESTING FOR DIFFERENCE BETWEEN TWO POPULATION PROPORTIONS

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Let  $x_1$  and  $x_2$  be the number of persons possessing a given attribute in a random sample of size

$n_1$  and  $n_2$  then the sample proportions are given by  $\hat{p}_1 = \frac{x_1}{n_1}$  and  $\hat{p}_2 = \frac{x_2}{n_2}$  the sampling

distribution of difference between sample proportions ( $\hat{p}_1 - \hat{p}_2$ ) is based on the assumption that the difference between two population proportions,  $P_1 - P_2$  is normally distributed. Therefore, the standard error can be calculated as

$$S.E(\hat{p}_1) = \sqrt{\frac{p_1q_1}{n_1}} \text{ and } S.E(\hat{p}_2) = \sqrt{\frac{p_2q_2}{n_2}} \Rightarrow S.E(\hat{p}_1 - \hat{p}_2) = \sqrt{\frac{p_1q_1}{n_1} + \frac{p_2q_2}{n_2}}$$

For this test, the null hypothesis is  $H_0 : p_1 = p_2$  against the two-sided alternative hypothesis

$H_a : p_1 \neq p_2$

The test statistic is calculated as  $\Rightarrow Z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\frac{p_1q_1}{n_1} + \frac{p_2q_2}{n_2}}}$

$$\Rightarrow Z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\frac{pq}{n_1} + \frac{pq}{n_2}}} \quad \text{Since } p_1 = p_2 \text{ from } H_0$$

$$\Rightarrow Z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{pq\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

When  $p$  is not known  $p$  can be calculated by  $p = \frac{n_1\hat{p}_1 + n_2\hat{p}_2}{n_1 + n_2}$  and  $q = 1 - p$

Now calculate  $|Z|$  and find out the tabulated value of  $Z$  at  $\alpha$  % level of significance i.e.  $Z_\alpha$

If  $|Z| > Z_\alpha$ , reject the null hypothesis  $H_0$

If  $|Z| < Z_\alpha$ , accept the null hypothesis  $H_0$ .

### Example

In a study of patients on sodium-restricted diets, 55 patients with hypertension were studied. Among these, 24 were on sodium-restricted diets. Of 149 patients without hypertension, 36 were on sodium-restricted diets. We would like to know if we can conclude that, in the sampled population, the proportion of patients on sodium-restricted diets is higher among patients with hypertension than among patients without hypertension.

Solution:

Patients with hypertension:  $n_1 = 55$      $x_1 = 24$

$$\hat{p}_1 = \frac{24}{55} = 0.4364$$

Patients without hypertension:  $n_2 = 149$      $x_2 = 36$

$$p_2 = \frac{36}{149} = 0.2416$$

$$\alpha = 0.05$$

Hypotheses-  $H_0: P_1 \leq P_2$

$H_a: P_1 > P_2$

The test statistic is  $z$  which is calculated as

$$z = \frac{(\hat{p}_1 - \hat{p}_2) - (p_1 - p_2)_0}{\sqrt{\frac{\bar{p}(1-\bar{p})}{n_1} + \frac{\bar{p}(1-\bar{p})}{n_2}}}$$

Decision rule

With  $\alpha = .05$  the critical z score is 1.645. We reject  $H_0$  if  $z > 1.645$ .

Calculation of test statistic

$$z = \frac{(\hat{p}_1 - \hat{p}_2) - (p_1 - p_2)_0}{\sqrt{\frac{\bar{p}(1-\bar{p})}{n_1} + \frac{\bar{p}(1-\bar{p})}{n_2}}}$$

$$z = \frac{(.4364 - .2614) - 0}{\sqrt{\frac{(.2491)(.7059)}{55} + \frac{(.2491)(.7059)}{149}}} = 2.71$$

Statistical decision

Reject  $H_0$  because 2.71 > 1.645

Conclusion

The proportion of patients on sodium restricted diets among hypertensive patients is higher than in nonhypertensive patients.



**Check Your Progress- A**

**Q1. What is hypothesis testing?**

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**Q2. Define null hypothesis, alternative hypothesis, level of significance, test statistic, and statistical significance.**

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**Q3. Define Type I error and Type II error.**

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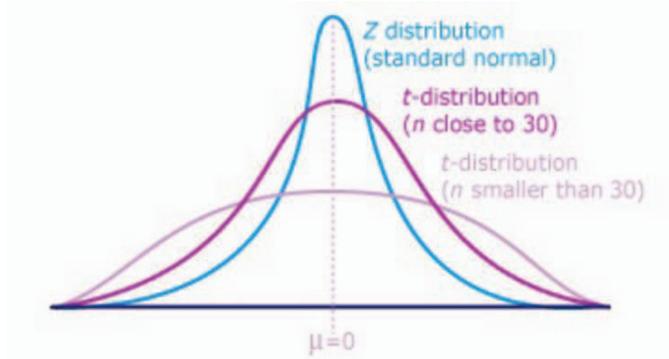
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### **16.13 HYPOTHESIS TESTING FOR POPULATION MEAN WITH SMALL SAMPLES**

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When sample size is small (less than 30), the sampling distribution of a sample statistic such as mean,  $\bar{x}$  and proportion  $\bar{p}$ , is not normal. In such cases while testing a null hypothesis it is assumed that the samples have to be drawn from a normally or approximately normally distributed population. However the critical values of sample statistic  $\bar{x}$  or  $\bar{p}$  depend on whether or not the population standard deviation  $\sigma$  is known, then its value is estimated by computing the standard deviation of sample,  $s$ , and the standard error of the mean is calculated by using the formula  $\sigma_{\bar{x}} = \frac{s}{\sqrt{n}}$ . but the resulting sampling distribution may not be normal even if sampling is done from a normally distributed population. In all such cases, Student's t-distributions is used to test a hypothesis.

The Student's t-distribution is similar to the normal distribution, except it is more spread out and wider in appearance, and has thicker tails. As the number of observations gets larger, the t-distribution shape becomes more and more like the shape of the normal distribution. In fact, if we had an infinite number of observations, the t distribution would perfectly match the normal distribution. It is the t-distribution that allows us to test hypotheses when we don't know the true population standard deviation, as we'll see below.



**Fig 16.3 Z distribution and t- Distributions**

The differences between the t-distribution and the normal distribution are more exaggerated when there are fewer data points, and therefore fewer degrees of freedom. Degrees of freedom are essentially the number of samples that have the 'freedom' to change without affecting the sample mean. It refers to the number of independent squared deviations in the variance of sampling distribution,  $s^2$  that are available for estimating population variance,  $\sigma^2$ . Degrees of freedom is always one less than the number of data points (sample size) i.e.  $df = n - 1$

In calculating the t-test statistic, we use the formula:

$$t = \frac{\bar{x} - \mu}{s / \sqrt{n}}, \quad s = \sqrt{\frac{1}{n-1} \sum (x - \bar{x})^2}$$

Where t is the test statistic and has n-1 degrees of freedom.

$\bar{x}$  is the sample mean

$\mu$  is the population mean under the null hypothesis.

s is the sample standard deviation

n is the sample size

$s / \sqrt{n}$  is the estimated standard error

#### **Assumptions of the single sample t-test:**

- A random sample is used.
- The random sample is made up of independent observations
- The population distribution must be nearly normal.

#### **Example:**

Duracell manufactures batteries that the CEO claims will last an average of 300 hours under normal use. A researcher randomly selected 20 batteries from the production line and tested these batteries. The tested batteries had a mean life span of 270 hours with a standard

deviation of 50 hours. Do we have enough evidence to suggest that the claim of an average lifetime of 300 hours is false?

**Solution:**

Step 1: Clearly state the Null and Alternative Hypothesis

$$H_0 : \mu = 300$$

$$H_A : \mu \neq 300$$

Step 2: Identify the appropriate significance level and confirm the test assumptions.

The standard significance level of 0.05, and a normal population distribution is assumed.

Step 3: Analyze the data and compute the test statistic.

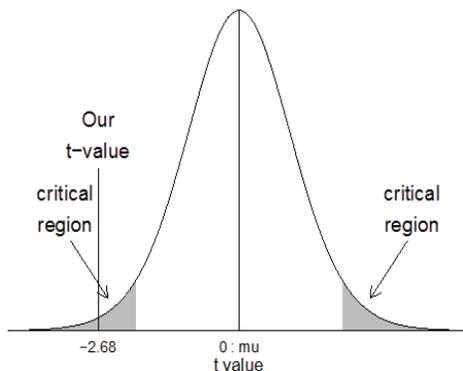
First, calculate the Standard Error:

$$SE\bar{x} = s/\sqrt{n} = \frac{50}{\sqrt{20}} = 11.18$$

Now, using t-test formula:

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{270 - 300}{11.18} = -2.68$$

Since  $n = 20$ , so degrees of freedom for this test is  $(20-1) = 19$ . Nineteen degrees of freedom at the 0.05 significance level gives a critical value of  $t$  as  $\pm 2.093$ .



Step 4: Interpret your results

Since the calculated t-test value is outside of the t-critical value –it lies in the critical region –we reject the Null Hypothesis. The average battery life of the sample is significantly different from the average battery life claim by the CEO.

**Example**

The high school athletic director is asked if football players are doing as well academically as the other student athletes. It is known from a previous study that the average GPA for the student athletes is 3.10. After an initiative to help improve the GPA of student athletes, the athletic director randomly samples 20 football players and finds that the average GPA of the sample is 3.18 with a sample standard deviation of 0.54. Is there a significant improvement?

Use a 0.05 significance level.

**Solution**

Step 1: Clearly state the null and alternative hypotheses.

$$H_0 : \mu = 3.10$$

$$H_a : \mu \neq 3.10$$

Step 2: Identify the appropriate significance level and confirm the test assumptions.

- a 0.05 significance level is used, and
- It is assumed that each football player is independently tested that their GPA is not related to another football player's GPA.
- It is also assumed that the sample is nearly normal (sample size less than 30).

Step 3: Analyze the data

Using t-test formula:

$$t = \frac{\bar{x} - \mu}{s / \sqrt{n}} = \frac{3.18 - 3.10}{0.54 / \sqrt{20}} = 0.66$$

Degree of freedom for this test is 19. Nineteen degrees of freedom at the 0.05 significance level gives us a critical value of  $\pm 2.093$ .

Step 4: Interpret your results

Since calculated t-test value is lower than our t-critical value, we fail to reject the Null Hypothesis. Therefore, the average GPA of the sample of football players is not significantly different from the average GPA of student athletes. Therefore, we can conclude that the difference between the sample mean and the hypothesized value is not sufficient to attribute it to anything other than sampling error. Thus, the athletic director can conclude that the mean academic performance of football players does not differ from the mean performance of other student athletes.

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## 16.14 F- TEST FOR DIFFERENCE IN TWO VARIANCES

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Many times population variances are required to be compared in certain statistical applications such as (i) product quality resulting from two different production processes, (ii) temperatures for two heating devices; (iii) rate of return from investment in two types of stocks and so on.

When independent random samples of size  $n_1$  and  $n_2$  are drawn from two normally distributed populations, the ratio

$$F = \frac{s_1^2 / \sigma_1^2}{s_2^2 / \sigma_2^2}$$

Follows F- distribution with degrees of freedom  $df_1 = n_1 - 1$  and  $df_2 = n_2 - 1$ , where  $s_1^2$  and  $s_2^2$  are two sample variances and are given by  $s_1^2 = \frac{\sum(x_1 - \bar{x}_1)^2}{n_1 - 1}$  and  $s_2^2 = \frac{\sum(x_2 - \bar{x}_2)^2}{n_2 - 1}$

If two normally distributed populations have equal variances, i.e.  $\sigma_1^2 = \sigma_2^2$ , then the ratio  $F = \frac{s_1^2}{s_2^2}$ ;  $s_1 > s_2$ , follows a probability distribution known as F- distribution with  $n_1 - 1$  degrees of freedom for numerator and  $n_2 - 1$  degrees of freedom for denominator. The larger sample variance is placed in numerator so that the ratio is always equal to or more than one.

### Example

Samples from two makers of Pipes are collected, and their diameters (in inches) are measured, with the following results:

Pipe A:  $n_1=80, s_1=0.0395$

Pipe B:  $n_2=120, s_2=0.0428$

Assuming that the diameters of the bearings from both companies are normally distributed, test the claim that there is no difference in the variation of the diameters between the two companies.

### Solution:

The hypotheses are:  $H_0: \sigma_1 = \sigma_2$

$H_a: \sigma_1 \neq \sigma_2$

Assuming  $\alpha=0.05$

The test statistic is  $F = \frac{s_1^2}{s_2^2} = 0.0428^2 / 0.0395^2 = 1.1741$

The table value of F with  $120-1 = 119$  and  $80-1 = 79$  degrees of freedom, at 5% level of significance is 1.413, since calculated value  $<$  table value. We fail to reject  $H_0$  or in other words, we can say that null hypothesis is accepted. It means, there is insufficient evidence to conclude that the diameters of the pipes in the two companies have different standard deviations.

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## 16.15 SUMMARY

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A hypothesis is a statement about the population distribution that may or may not be true. In other words, a hypothesis is a question with a “yes” or “no” answer; where “yes” means accepting, or not rejecting, the null hypothesis  $H_0$ . The question is answered by performing an experiment, that is, by sampling from the population. The decision about accepting or rejecting  $H_0$  is made using the test statistic, a function  $z$  (or  $t$  /  $F$ ) of the sample that takes large values if the null hypothesis does not hold. Mathematically, the null hypothesis is

rejected when  $Z > c$ , where  $c > 0$  is a number called critical value of the test and  $z$  is the value of the test statistic for the sample.




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## 16.16 GLOSSARY

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**Null Hypothesis (  $H_0$  )-** Statement of zero or no change. If the original claim includes equality ( $\leq$ ,  $=$ , or  $\geq$ ), it is the null hypothesis. If the original claim does not include equality ( $<$ , not equal,  $>$ ) then the null hypothesis is the complement of the original claim. The null hypothesis *always* includes the equal sign. The decision is based on the null hypothesis.

**Alternative Hypothesis (  $H_1$  or  $H_a$  )-** Statement which is true if the null hypothesis is false. The type of test (left, right, or two-tail) is based on the alternative hypothesis.

**Type I error-** Rejecting the null hypothesis when it is true (saying false when true). Usually the more serious error.

**Type II error-** Failing to reject the null hypothesis when it is false (saying true when false).

**Test statistic-** Sample statistic used to decide whether to reject or fail to reject the null hypothesis.

**Critical region-** Set of all values which would cause us to reject  $H_0$

**Critical value(s)-** The value(s) which separate the critical region from the non-critical region. The critical values are determined independently of the sample statistics.

**Significance level (  $\alpha$  )-** The probability of rejecting the null hypothesis when it is true.  $\alpha = 0.05$  and  $\alpha = 0.01$  are common. If no level of significance is given, use  $\alpha = 0.05$ . The level of significance is the complement of the level of confidence in estimation.

**Decision-** A statement based upon the null hypothesis. It is either "reject the null hypothesis" or "fail to reject the null hypothesis". We will never accept the null hypothesis.




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## 16.17 REFERENCES

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## 16.18 SUGGESTED READINGS

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## 16.19 TERMINAL QUESTIONS

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Q1. Write a short note on following:

- a. Degree of freedom
- b. Level of confidence
- c. Error in sampling
- d. Null & Alternate hypothesis

Q2. What do you understand by power of hypothesis test?

Q3. Explain the six step procedure of hypothesis testing.

Q4. A survey estimated that 20% of all Americans aged 16 to 20 drove under the influence of drugs or alcohol. A similar survey is planned for New Zealand. They want a 95% confidence interval to have a margin of error of 0.04.

(a) Find the necessary sample size if they expect to find results similar to those in the United States. Ans- 384]

(b) Suppose instead they used the conservative formula based on  $\hat{p} = 0.5$ . What is now the required sample size?

[Ans- 600]

Q5. A consumer advocacy group would like to conduct a survey to find the proportion  $p$  of consumers who bought the newest generation of an MP3 player were happy with their purchase. How large a sample  $n$  should they take to estimate  $p$  with 2% margin of error and 90% confidence? Use conservative formula  $p = 0.5$ .

[Ans- 1692]

Q6. Assuming the population standard deviation  $\sigma = 3$ , how large should a sample be to estimate the population mean  $\mu$  with a margin of error not exceeding 0.5? Use 95% confidence level. [Ans- 138]

Q7. The operations manager of a large production plant would like to estimate the mean amount of time a worker takes to assemble a new electronic component. Assume that the standard deviation of this assembly time is 3.6 minutes. How many workers should be involved in this study in order to have the mean assembly time estimated up to  $\pm 15$  seconds with 92% confidence?

[Ans-636]

**Block IV**  
**Data Analysis, Interpretation and  
Presentation**

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## **UNIT 17 DATA PROCESSING AND APPLICATION OF TESTS**

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### **17.1 Introduction**

### **17.2 Objectives**

### **17.3 Data Processing**

### **17.4 Process of Data Processing**

### **17.5 Testing for differences in data**

### **17.6 Summary**

### **17.7 Glossary**

### **17.8 Answer to Check Your Progress**

### **17.9 Reference/ Bibliography**

### **17.10 Suggested Readings**

### **17.11 Terminal & Model Questions**

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## **17.1 INTRODUCTION**

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Once the quantitative data is being collected either in the form of schedule or questionnaire, the next stage is to process it. Data processing can be done either with the help of computer or manually. The simple data processing package include excel or FoxPro spreadsheets and the statistical packages that are available include SPSS, SAS, STATISTICA, and SYSTAT etc.

Before starting the data processing, the researcher must ensure that reliable data is being collected. After checking the reliability, the data processing is done. Data processing is done very carefully to analyze the data effectively. Generally, researchers do not give sufficient attention to this process and not get the quality results. It is desirable to have well thought out framework for data processing and analysis during preparation of the data collection instrument. Generally, the analytical tool is decided at the time of setting up the research objectives. Although, certain changes may be ascertained at the later stages, the researcher should incorporate such changes to improve the quality of data tabulation and analysis.

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## 17.2 OBJECTIVES

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The learner shall be able to answer the following after understanding this unit:

- Nature, scope and process of data preparation.
- Editing, treatment of unsatisfactory responses, assigning missing values and basis of discarding the unsatisfactory responses.
- Guidelines for coding.
- Data cleaning process and methods used to treat missing responses.
- Tabulation, Graphical Presenttaion and calculating measures of dispersion and measures of central tendency.
- Statistical/analytical techniques: univariate, bivariate and multivariate tests of significance.

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## 17.3 DATA PROCESSING

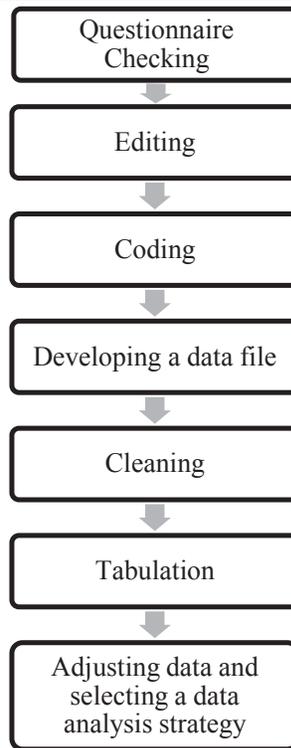
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The data processing is guided by the plan of data analysis that was pre-decided/formulated in the research design phase. It include- scrutinizing of acceptable questionnaires, editing of responses, coding and transcribing the responses/data. After the treatment and cleaning of data, appropriate data analysis strategy is selected (the data analysis tool may vary from the tool pre-decided in the research design phase due to the added information and insight gained at this stage).

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## 17.4 PROCESS OF DATA PROCESSING

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**Fig 17.1 Process of Data Processing**

### 17.4.1 QUESTIONNAIRE CHECKING:

The first step at this stage is to ensure the completeness and quality of responses in the questionnaire. Generally, these checks are made while the data collection is still going on because filled questionnaire may be unacceptable due to several reasons such as:

- (i) Incomplete questionnaire
- (ii) The respondent may not have followed the said pattern of responding
- (iii) Physically incomplete questionnaire i.e. one or more pages of the questionnaire are missing
- (iv) The questionnaire is filled by a person who does not qualify as respondent
- (v) Variation is not present in the responses such as, a respondent has checked only 1 for all statements on a 5 point scale.

The acceptable forms/questionnaires should be counted and classified before initiating the processing of data. If the sampling requirement is not met then further data collection should be done either by interviewing respondents or completing the incomplete ones.

### 17.4.2 EDITING:

The second step in data processing is editing. Editing is the process of excluding or removing the errors from the collected data. By doing so, the precision and accuracy of data will improve. The main purpose of editing is to complete the incomplete responses, removing the

inconsistency of the responses, and chucking out the illegible or ambiguous answers. Editing is a very subjective technique and the editor should be well trained and qualified to do the job of data/response editing. A few examples will help that how editing is done.

(i) The respondent has given answers which are inconsistent with each other. For Example: one question is asked that- Do you like shopping. Respondent answered: NO. Another question is- how frequently do you go shopping? The respondent replied- Daily. In such cases, the editor has to change one of the responses in accordance with the other answer to bring consistency.

(ii) The respondent has selected two responses for a particular question. In such a case, the more accurate answer should be selected by the editor after careful examination. If the editor is unable to make a choice, the response is coded as “No Information.”

(iii) The filled questionnaire may contain imaginary/fictitious responses due to the cheating of the interviewer. Many a time, when the researcher is dependent on someone else for data collection, then the chances of cheating usually increases. It may be possible that the questionnaires are fraud filled by the hired interviewer without meeting and talking to the respondent. The error may happen even if the questionnaire is being posted to the respondent via mail and the respondent fill the form without even reading the questions. These kinds of filled questionnaires should be dropped to maintain the legibility of the data.

Editing is of two types:

- A. Field Editing
- B. Central Editing

Field editing is done during the process of data collection/field survey. The editor/interviewer must look into the questionnaire immediately after getting it filled so that the misleading/incomplete information can be rectified immediately on the spot.

Central editing is done after collecting all the filled questionnaires. Usually, a single editor completes the task to maintain the consistency of the data. An editor must deal with three points during this process of editing: Completeness, uniformity and accuracy.

### **17.4.3 TREATMENT OF UNSATISFACTORY RESPONSES:**

Unsatisfactory responses can be handled by adopting one of the following methods:

- (i) Returning to the field
- (ii) Assigning the missing values
- (iii) Discarding unsatisfactory responses

Returning to the field: In such a case, the interviewer re-contacts the respondent which is called returning to the field. This approach is feasible where probability sampling has been used and the sample size is small and respondents are easily identifiable.

Assigning the missing values: The editor can fill the missing values, in case, it is not possible to go back to the field and get the correct response because of large sample size or due to use of convenience sampling in data collection. This method can be applicable if the respondents with unsatisfactory responses are small.

Discarding unsatisfactory responses: In this method, the unsatisfactory responses/questionnaires are discarded simply. This method is usually used when the researcher has collected data from a very large sample size and the unwanted questionnaires (questionnaires with correct information) are small in number. The number of discarded responses should be reported in the report with the specific reason.

#### 17.4.4 CODING:

Coding is a procedure of classifying the data into meaningful categories. The numbers used to represent these categories are known as codes. Coding is required to run various descriptive and statistical tools as well as tabulation of data. Without coding, the quantitative analysis of the large heterogeneous data is not possible.

Pre coding and post coding depends on the researcher. If the questionnaire has only structured questions then it is pre coded i.e. the codes are assigned before starting the field work i.e. data collection. If the questionnaire contains more unstructured questionnaires then the codes are assigned after the completion of field work.

According to Sidel, code construction is an art and the final categories show the interest of the researcher. The codes should be rational and most important thing is that the categories must be 'all inclusive' and 'mutually exclusive'. The '*all-inclusive*' point means that the categories like 'other', 'no information' and 'none' should be added and '*mutually exclusive*' means that overlapping and ambiguity should not be present. It should be possible to classify each response through one category only. But many a times, researcher violates this requirement due to short sightedness or carelessness while designing the questionnaire. For example: a person may, by occupation, be an engineer as well as unemployed. Here the two dimensions are used; first to know the occupational category and the second to know the employment status. In this case, the different categories are not mutually exclusive. That is why, it is always advisable to use two category sets. For example, in the above case, the two categories may be- one for occupation and the other for current employment status.

The researcher can use any number of categories or classes as per requirement. In large sample size, usually the surveys are done using structure questionnaires where the categories are pre-determined and are contained in questionnaire itself. For example: the respondent is asked- To which age category do you belong? Options are:

- 1) 15-30 years;                      2) 31-45 years;                      3) Above 45 years

Here, three distinct categories are given where each category is assigned a numeric code such as 1, 2, 3 for easy data entry, analysis and interpretation.

In multiple choice questions, the respondent is permitted to select more than one of the given options. Such questions may be related to brand preference, product/service usage, readership or channel surfing etc.

For example: Which fast food do you like to consume? (Select as many as apply)

Burger                      [ ]                      (21)

Pizza                        [ ]                      (22)

Hotdog [ ] (23)

Chips [ ] (24)

Cold-drink [ ] (25)

French Fries [ ] (26)

In this question, suppose a respondent has selected pizza and chips. On record #1 will be entered in the column numbers 22 and 24. All the other columns (21, 23, 25 and 26) will be marked 0. More clarity will come once the next topic is discussed.

#### 17.4.5 DEVELOPING A DATA FILE:

The categorized and coded data is entered into a spreadsheet (example: Excel, SPSS or SAS etc.). The input follows a matrix format where the variable name appears as column heading and the responses of respondents/case is one row i.e. data for respondents number 1 will be entered in row 1. Similarly, the answers given by respondent number 1 for question is entered in row 1 column 1 and for question 2, the data is entered in row 1 column 2 and likewise. The following table provides a pretest sample of 7 respondents on preference related to restaurants.

- Preference to eat in a familiar restaurant: Weak Preference 1----4----7 Strong preference
- Quality of food: Poor 1----4----7 Excellent
- Quantity of food: Poor 1----4----7 Excellent
- Value of food: Poor 1----4----7 Excellent
- Service quality: Poor 1----4----7 Excellent
- Income of respondent: Less than Rs. 5 lakh [ 1 ]; 5 Lakh to 10 Lakh [ 2]; More than 10 Lakh [3]

The codebook will be as follows:

	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	
	Preference to eat in a familiar restaurant	Quality of food	Quantity of food	Value of food	Service quality	Income of respondent	
Row 1	Respondent 1	6	5	6	5	5	1
Row 2	Respondent 2	4	4	6	4	3	2
Row 3	Respondent 3	7	7	5	6	7	3
Row	Respondent	1	2	5	2	4	1

4	4						
Row 5	Respondent 5	3	2	2	3	4	1
Row 6	Respondent 6	4	5	6	5	6	2
Row 7	Respondent 7	5	7	6	5	6	3

The above table gives the data collected from a sample of respondents to check SERVQUAL model on Restaurants.

#### 17.4.6 DATA CLEANING:

Once the data is coded and filled on a spreadsheet, the next stage is data cleaning. Data cleaning is process to check the consistency of responses and to is consistency check and correctly handle the missing answers. Data editing also does the same thing done manually but here in data cleaning, the responses are checked more thoroughly and extensively with the help of computer software.

a. **Consistency check:** Consistency check is to identify and remove basically three issues from data: out of range data, extreme values and logical inconsistencies. Out of range data are not acceptable as they may distort the whole analysis and can present false results. That is why, the out of range data should be identified and removed. For example: respondent is asked for preference on scale of 1 to 7 and one of the entries under this column is 9. So it may create problem while data analysis. So the correct response should be collected from the questionnaire.

Extreme values results from errors and point towards problem with dat. For example: a respondent has marked only 1s on all attributes of a brand. These kinds of Responses should be discarded.

Logical consistencies are related to presence and absence of one thing on the same response. For example: one respondent says that he is unaware of credit cards and using the same very frequently while shopping. The corrective actions should be taken prior to start data analysis.

b. **Treatment of missing responses:** one of the below mentioned methods may be used to treat the missing responses:

(i) Substitute a neutral value: A neutral value is one whose presence does not affect the overall output of data during data analysis, for example: correlation. Generally the mean value of the responses for a variable is used to replace the missing values.

(ii) Substitute an imputed response: The other responses of the respondent are used to impute a suitable response for the missing answer. This can be done by determining the relationship of the variable with the other variables present in questionnaire.

(iii) Case wise/ list wise deletion: The case with missing values is deleted i.e. the row of the respondent providing incomplete information is deleted. The disadvantage of this method

is that if many respondents are with missing responses then it may lead to reduction in sample size.

(iv) **Pair wise deletion:** Pair wise deletion means that if one respondent's data is missing for one question, then the software threat the sample size one less than the given number of responses for that variable alone and do the analysis. All other variable are treated as usual.

### 17.4.7 DATA TABULATION

How many cases or observations are entered in the given variables, that counting is done using data tabulation. In marketing research projects, usually two common forms of data tabulation are used: one-way tabulations and cross-tabulations. A one-way tabulation is the categorization of single variables existing in the study. For example: In past one week, which fast food restaurant in your area have you visited for food? The number of respondents is 260. So the one-way tabulation will be:

S. No.	Restaurant Name	Count/Frequency	Percentage
1	Burger King	48	18.46
2	Pizza Hut	22	8.46
3	Domino's	40	15.38
4	KFC	38	14.62
5	McDonald's	72	27.69
6	Others	28	10.77
7	None	12	4.62
	<b>Total</b>	260	100

One-way tabulations are multipurpose tools for the researchers; (i) it is functional in determining the number of missing responses for a question, (ii) it can calculate the summary statistics for various questions like averages, standard deviation and percentages etc., (iii) it is utilized to communicate the results of the research like profile of respondents, percentage of people behaving differently in a given situation, (iv) provide percentage of the variation in responses of the respondents (e.g., the percentage of people who purchase clothes from On-line or off-line).

Whereas, Cross-tabulation is a method of treating two or more variables simultaneously. For example: a researcher is conducting research on males vs. females for their frequency of visit in restaurants every month. So in this condition, the researcher will make cross tabulation in the following manner:

#### Visit to restaurant vs. Gender

Visit to Restaurant	Female (1)	Male (2)	Row Total
None	1	1	2

1 visit	27	23	50
2 visits	25	33	58
Column Total	53	57	110

Cross-tabulation is extremely useful when the researcher wants to study relationships between variables. The motive behind using cross-tabulation is to know/calculate the difference in a variable when compared among different subgroups of the total sample. It is a very useful technique for data presentation in marketing research.

### 17.4.8 DATA ANALYSIS:

The refined data is converted into meaningful information with the help of data analysis techniques. The data collected from questionnaire is of no use until it is processed (editing, coding etc.) and analyzed for drawing conclusion. Many data analysis techniques and softwares are available, but the researcher has to carefully select a technique to solve the problem on hand. Usually, data analysis technique is decided at the time of setting objectives and formation of questionnaires, but changes may occur due to new information gathered during field survey process.

Types of analysis: depending upon the number of variables present, the analysis can be classified into three categories:

- (i) **Univariate Analysis:** Analysis where one variable is involved at a time. For example: Proportion of smokers in university students.
- (ii) **Bivariate Analysis:** Analysis where two variables are involved for the purpose of determining the empirical relationship between them. For example: Effect of advertisement on sales. In this case, two variables are involved: Advertisement and sales.
- (iii) **Multivariate Analysis:** It involves three or more variables simultaneously. For example: factors (Age, gender, culture, diet, genetics etc.) affecting height of a person. In this case multiple variables are involved.

To choose, which type of data analysis is to be used, researcher has to consider at least these three factors:

- a) The measurement scale
- b) Research design
- c) Assumption about test statistics

**Measurement of scale:** If nominal scale (Non-metric data) is used to collect data like age, income, gender etc. then simple statistics like tabulation, cross tabulation, frequency distribution etc. can be used. The multivariate techniques such as discriminant analysis, factor analysis or multivariate mapping can be used in case of non-metric data. Even simple statistics like mean has no meaning. Even on ordinal scale (non-metric), multivariate statistics has severe limitation and mostly univariate and bivariate analysis is used. Most of the

Multivariate techniques and tools are applicable on metric data. The data collected on interval scale and ratio scale is known as metric data.

In case of metric data, the parametric tests are used and in case of non-metric data, non-parametric tests are used. There are a few characteristics of metric data such as data is normally distributed and equal variance is assumed between variables and if data is not normally distributed or equal variance is not assumed then non-parametric test statistics are used.

**Research Design:** The second determinant is research design to select the appropriate statistical tool. Two things are to be considered while selecting the statistical tests: Whether the researcher has considered one sample or two samples for data collection; and whether any set of measurement is independent or dependent of the other. For example: a researcher is studying 'Attitude towards a brand' and collected data from two samples: (i) Users; (ii) Non-users. Both samples are independent; that is why, 't-test for independent samples' is used to measure the difference of mean attitude between users and non-users (if the attitude is measured on interval scale). If the sample is more than 3 instead of two (Example: Heavy Users, Medium users and non-users), in such a case ANOVA (Analysis of variance) is calculated to study the difference of mean attitude between the three groups.

**Assumption about the test statistics:** This is the third determinant affecting the choice of statistical tool. It is a set of assumptions made while using a particular test. For example: while conducting Chi-square test, the assumption is that the responses are collected using nominal scale, whereas, for multivariate statistics (cluster analysis, discriminant analysis, factor analysis, linear regression etc.), the researcher collects the responses on interval scale.

In the same way, different tests draw different conclusions. Example: 'Independent sample t test' assumes that the two populations from which the data is collected are independent, normally distributed and have equal variance. If these characteristics are not present then the test cannot be applied and non-parametric test will give some solution.



### *Check Your Progress- A*

#### **Q1. What softwares are available for data editing and coding?**

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**Q2. What are the qualities of a metric data?**

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**Q3. What is cross tabulation?**

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**Q4. What are methods available to treat missing responses?**

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**Q5. What are the methods to treat unsatisfactory responses?**

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**Q6. What is difference between field editing and central editing?**

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**Q7. Fill in the Blanks**

- i. The data processing is guided by the plan of data analysis that was .....in the research design phase.
- ii. Before starting the data processing, the acceptable ..... should be counted and classified properly.

**Q8. MCQs**

- i. The process of removal of errors in the collected data to increase the accuracy and precision of responses is known as:
  - a) Coding
  - b) Editing
  - c) Cleaning
  - d) Tabulation
- ii. The analysis that involves three or more variables simultaneously is known as:
  - a) Univariate
  - b) Bivariate
  - c) Multivariate

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**17.5 TESTING FOR DIFFERENCES IN DATA**

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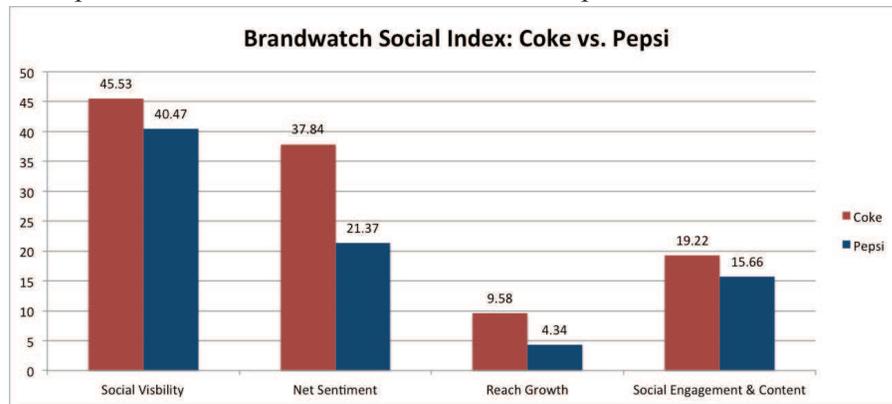
When the data is collected and coded, the data sets are so much disaggregated that it become difficult to figure out any information or what is the meaning of these numbers. That is why; basic analysis and descriptive statistics are developed to get a summary of responses/information from the given data set. Once the data is prepared for analysis, every marketing researcher wants to have a glance of the overall response set and performs basic statistical procedures. Some of the popular and advantageous statistical techniques are discussed in this unit such as:

- Guidelines for graphics
- Measures of central tendency
- Measures of dispersion
- Hypothesis testing

**17.5.1 GUIDELINES FOR GRAPHICS:**

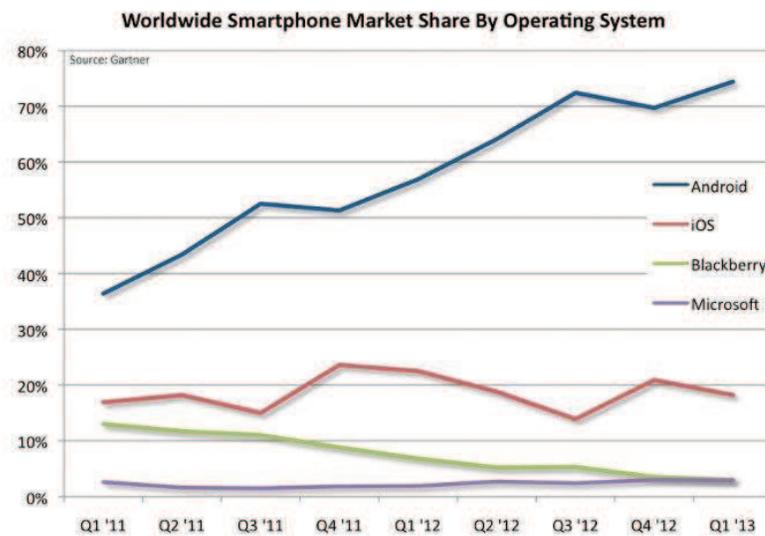
Graphical representation is the easier way to present the data and similarly, the viewers also can quickly understand the information shared. Graphics should be used in marketing whenever possible and practical. It helps the users to easily get the information from the research project. These enhance the communication process, add clarity and increase the impact of the project report. Some common graphics are:

- (i) **Bar Charts:** Bar charts are used to depict the absolute and relative magnitude, change and differences among the present variables. In bar charts, the facts presented appear as bars that are either horizontally or vertically oriented. For Example: Brandwatch social index: Coke vs. Pepsi.



**Fig 17.2 Bar Charts**

- (ii) **Line Chart:** Line charts are used to present the trends in longitudinal studies. Example: revenue growth of a company in last ten years. A line chart is a series of data points on different times, where the data points are attached with a continuous line to show the ups and downs. The two or more variables also can be presented through line chart. For Example: Worldwide smartphone market share by operating system. So several lines can be displayed to allow multiple comparisons but in case of multiple comparisons, each line should be of different colour to avoid the confusion of viewer.



**Fig 17.3 Line Charts**

- (iii) **Pie- Charts:** The relative proportions are clearly displayed by the pie charts. For example: Market share of different categories of biscuits etc. every portion of the pie chart presents a relative percentage of one variable in the total area

of the pie. Pie charts should be avoided in case of more option as it may not be very clear and quiet confusing.

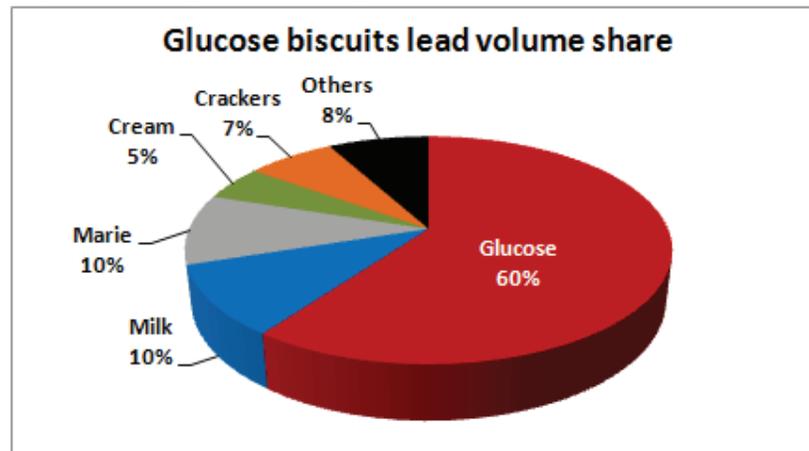


Fig 17.4 Pie Charts

### 17.5.2 MEASURES OF CENTRAL TENDENCY:

Frequency distribution is a useful tool to examine different values of the given variables, are easy to understand and provide great deal of basic information. But sometimes, the amount of data is too much that it becomes difficult to summarize it with the help of frequency tables or frequency tables are not practical. In such situations, the researcher wants to condense all the information to get the underlying meaning. For this, descriptive statistics are usually used to accomplish the task. Descriptive statistics includes mean, median, and mode etc. these three methods are used as measures of central tendency as these presents the centre of the distribution of the data.

- (i) **Mean:** Mean is the most commonly used measure of central tendency. It is calculating by averaging the values present in a variable divided by the total number of responses. For example: Average number of tea cups consumed by the graduating student during final exams. This average can be calculated by mean. Mean can only be calculated if the data is collected on interval or ratio scale. Generally, due to central tendency, most of the responses will be distributed close to the mean; and if any extreme value is present then it can subject to information distortion.
- (ii) **Mode:** Mode is the value in a distribution that appears most often. Maximum of the companies take benefit of mode to get the exact size of the product that is most sellable in the market or that is most acceptable by the consumers. For example: Pet bottle size for all soft drinks is 500 ml, Maximum variants of male sports shoes are available in number 7 and 8, maximum designs among male trousers are available in size 32 and 34; reason being the demand/sale is maximum for these in Indian market.

- (iii) Median: When the distribution is arranged in ascending or descending order (order of magnitude), the middle value in the arrangement is known as median. Median is commonly used measure of the properties of a data set and the advantage of using median is that it is not skewed extremely by the presence of extreme values as was case with calculating mean. For example: Understanding household income: mean may be skewed due to presence of extremely high or low values but median will provide a typical income without much skewness.

$$\text{Mean} = \frac{9 + 10 + 12 + 12 + 10 + 11 + 12 + 13 + 16 + 38}{10} = 14.3 \text{ days}$$

Ordered data values:

9, 10, 10, 11, 12, 12, 12, 13, 16, 38

↑

Median = 12 days (not influenced by extreme values)

Mode = 12 days

All the discussed methods of measuring central tendency have their own benefits and drawbacks. For nominal data, mode can be used and for ordinal data, median is generally used. For ratio and interval data, usually, mean is used and if mean is providing distorted information then median or mode may be used.

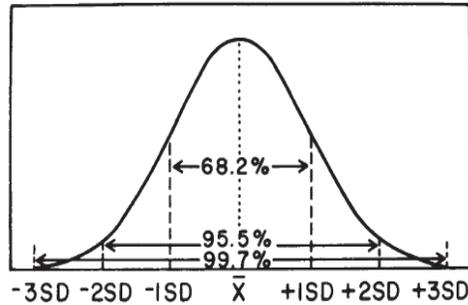
### 17.5.3 MEASURES OF DISPERSION:

Measure of dispersion is used when measure of central tendency is unable to present the adequate distribution and direction of responses. Mean, median and mode can tell about the consumer's attitude towards a particular brand but to know whether the respondents have similar opinion for the brand then these tolls may not work. To know this answer, measure of dispersion associated with distribution of responses would be examined. Measure of dispersion includes two techniques: Standard deviation and range. Measure of dispersion represents that how close or dispersed are all the responses from the mean or other measures of central tendency.

- (i) Standard Deviation: SD is calculated by scheming the average distance of all distributions/ responses from the mean value. Deviation is the difference between a particular response and distribution mean. If standard deviation is small then the responses in a distribution are very close to mean i.e. opinion of the respondents about a particular variable is almost same. And if the standard deviation is large then it can be interpreted that the responses in a distribution do not fall close to the mean i.e. the opinion of the respondents about a particular variable varies and not similar.

$$S = \sqrt{\frac{\sum (X - \bar{X})^2}{N}}$$

where  $S$  = the standard deviation of a sample,  
 $\Sigma$  means "sum of,"  
 $X$  = each value in the data set,  
 $\bar{X}$  = mean of all values in the data set,  
 $N$  = number of values in the data set.



**Fig 17.5 Standard Deviation**

- (ii) **Range:** Range is the spread of data i.e. the distance between the smallest and largest value of the variable. For example: if the respondents are asked that how much they would pay to buy customized music player; then the difference between the smallest quoted value and the largest quoted value be counted as range. Suppose, for the above example the lowest value is US\$ 25 and highest value is US\$ 74, then the range will be US\$ 49. Range is the indication of statistical dispersion of responses.

$$\begin{array}{l}
 \bullet \quad 25 \quad \text{-----} \quad \bullet \quad 74 \\
 \text{Range} = (\text{Highest Score} - \text{Lowest Score}) \\
 = (74 - 25) \\
 = 49
 \end{array}$$

#### 17.5.4 HYPOTHESIS TESTING:

Hypothesis is a preconceived notion of relationship between variables. Usually, marketing researchers formulate hypothesis before conducting their research and it is always based on either theories or previous researches. For example: A hypothesis may be 'The final year graduating students' average expenditure on tea consumption is Rs. 50 per week'. This hypothesis or preconception can be checked by using hypothesis tests. Few of the tests are:

- (i) **Univariate tests of significance:** Univariate tests of significance conduct hypothesis testing on one variable at a time. The univariate tests may be descriptive or inferential. Descriptive includes frequency distribution, graphical presentation, mean, median, mode or standard deviation. Inferential statistics deduce from a sample to a population i.e. population mean is based on sample

data. Univariate tests of significance can be calculated using different parametric and non-parametric tests. Few of the tests are as follows:

- (a) One Sample T Test: One sample t-test is a kind of parametric test where population mean is known. This test is applied to know that the sample taken is true representative of the population or not. For this test, the responses are collected using metric scale (interval or ratio scale) and variable are distributed normally i.e. the pattern follows normal distribution curve. For example: in a customer satisfaction survey, 70 percent were extremely satisfied with courteousness of the customer representative. But in northern region only 60 percent were extremely satisfied. Therefore, to determine the statistical significance difference at a desired confidence level (say 95%), one sample t test of significance is generally applied. T-test is also known as Z-test only with a few differences. For example, if the research is conducted on a sample less than 30 where population's standard deviation is unknown, t-test is used; and when the SD of population is known and the sample size is more than 30 then z-test is applicable. The formula of t-test is:

$$t = \frac{\bar{X} - \mu}{\frac{s}{\sqrt{N}}}$$

Where X = sample mean

$\mu$  = Population mean

s = Sample Standard Deviation

n = Sample size

- (b) Chi-square goodness-of-fit test: Goodness of fit test is the only single sample non-parametric test available in statistics and is also known as Pearson's chi-square goodness of fit test. This is used when one categorical variable is tested from a single population. For example: Suppose a company print t-shirts. It claims that 40 percent of the t-shirts were having Superman, 30 percent were Ben-Ten and rests 30 percent were Slogans. To test this claim, a random sample of printed t-shirts can be collected and one sample goodness-of-fit test can be used to measure whether the sample distribution differed significantly from the claim made by the company.

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

*O* = the frequencies observed

*E* = the frequencies expected

$\sum$  = the 'sum of'

(ii) Bivariate Tests of significance: Bivariate tests of significance are used when two variables or two samples are present. These two variables or samples can be independent or can be related. Independent samples where the variables are not dependent on each other; whereas, related samples mean when one variable is dependent on other variable. That means, the value of dependent variable can be predicted by the independent variable. Some of the common bivariate tests are available for both independent as well as relative samples:

(a) Independent Samples T Test: this test is also known as Mann-Whitney U Test. It is a kind of parametric test which is used to weigh against the mean of one group with another unrelated group on the similar dependent variable. For example the hypothesis is: The average tea consumption is same in Male and female final year graduating students. In this, the researcher tries to compare the mean of two independent samples (Male and female) on same dependent variable (Tea Consumption). The two assumptions is of this tests are: (i) the dependent variable is normally distributed and (ii) date is measured on continuous scales.

$$t = \frac{M_x - M_y}{\sqrt{\left[ \frac{\left( \sum X^2 - \frac{(\sum X)^2}{N_x} \right) + \left( \sum Y^2 - \frac{(\sum Y)^2}{N_y} \right)}{N_x + N_y - 2} \right] \cdot \left[ \frac{1}{N_x} + \frac{1}{N_y} \right]}}$$

$\Sigma$  = sum the following scores

$M_x$  = mean for Group A

$M_y$  = mean for Group B

X = score in Group 1

Y = score in Group 2

$N_x$  = number of scores in Group 1

$N_y$  = number of scores in Group 2

Mann-Whitney U Test is a non-parametric test. This test is a replacement of independent sample T test and is used when the collected data is non-metric. It also compares the differences between the two independent groups for a dependent variable where the data is not distributed normally.

$$U = n_1 n_2 + \frac{n_2(n_2 + 1)}{2} - \sum_{i=n_1+1}^{n_2} R_i$$

Here:

U = Mann-Whitney U test

$n_1$  = sample size one

$n_2$  = Sample size two  
 $R_i$  = Rank of the sample size

- (b) Paired Samples T Test and Wilcoxon signed-rank test: Paired sample T-test is known as dependent T test and is a kind of parametric test. This test is conducted to compare the mean of the two related samples/groups on the same dependent variable. Dependent variable is measured on continuous scale and data is normally distributed. For example: Difference in fast food consumption before and after 1 week counseling programme. Fast food consumption is dependent variable and two related groups will be consumption level 'before' and 'after' the counseling sessions.

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\left( \frac{(N_1 - 1)S_1^2 + (N_2 - 1)S_2^2}{N_1 + N_2 - 2} \right) \left( \frac{1}{N_1} + \frac{1}{N_2} \right)}}$$

Where  $\bar{X}_1$  bar: mean of sample 1

$\bar{X}_2$  bar: mean of sample 2

$N_1$ : Number of subject in sample 1

$N_2$ : Number of subject in sample 2

$S_1$ : Variance of sample 1

$S_2$ : Variance of sample 1

The substitute for Paired Samples T Test is Wilcoxon signed-rank test for non-metric data. Wilcoxon signed-rank test is a non-parametric test and it does not assume normality and can be used when data violates the conditions of using paired sample t test.

- (c) Linear Regression: When one of the variable is predicted (to some extent) by another variable present in the study then linear regression is used. In this, independent variable may be continuous or categorical and dependent variable is continuous variable. For example: Relationship between expenditure on advertisement vs. sales where sales is dependent variable (y) and expenditure on advertisement is independent variable (x).

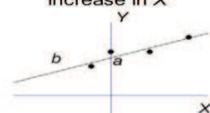
So regression equation will be: Sales (y) = constant (a) + B \* expenditure on advertisement (x).

Constant is kept because; even if expenditure on advertisement is not done then also some minimal sales will be there.

**Linear regression equation**  
 (without error)

$$\hat{Y} = bX + a$$

predicted values of Y      slope = rate of increase/decrease of Y hat for each unit increase in X      Y-intercept = level of Y when X is 0.



(iii) **Multivariate tests of significance:** These tests of significance are used when the researcher wants to know the statistical mean difference between three or more unrelated/independent samples. Few of the multivariate tests of significance are discussed below.

(a) **Analysis of variance (ANOVA):** This test is also famous as F-test. The application of this test is to statistically analyze the difference between the group means of three or more groups. ANOVA calculates the population variance based in between the groups and compares it with the population variance based on within the group. If between the groups variance is significantly greater than within the group variance, as indicated F ratio, the means of the groups are significantly different. For example: To calculate the mean tea expenditure for: Students, Teaching Staff and Non-teaching staff.

$$F = \frac{\text{Estimate of population variance based on between sample variance}}{\text{Estimate of population variance based on within sample variance}}$$

ANOVA can tell that at least two groups are significantly difference but cannot tell specifically that which specific group was significantly different from the other groups present in study and the kind of difference between the means of the unrelated groups. Since three or more than three groups are present in study design then determining which of these group differ from each other is important and this is possible by further conducting post hoc tests like LSD (Least significance difference) or Tukey or Tukey's B Etc.

(b) **Kruskal-Wallis H test:** It is also known as H Test and is a rank based non-parametric test. This test is applied to calculate the significant statistical difference between the three or more unrelated groups on a dependent variable (continuous or ordinal scale). It is an alternative of One way ANOVA and can be used when assumption of using ANOVA are violated like normal distribution.

$$H = \frac{12}{N(N+1)} \sum_{i=1}^k \frac{R_i^2}{n_i} - 3(N+1)$$

Where N = Sum of sample sizes in all groups

K = Number of groups

R = Sum of Ranks in i<sup>th</sup> group

n = size of the i<sup>th</sup> group

The statistical tests are not limited to these tests only. These were simple descriptive statistics and statistics for hypothesis testing. Many other multivariate techniques are available that are necessary to know for a marketing researcher. These include test statistics like conjoint analysis, discriminate analysis, factor analysis, cluster analysis, regression etc. These tools will be discussed in next unit along with data compilation, tabulation and classification.



**Check Your Progress- B**

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**Q1. Explain the use of bar graph and pie chart.**

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**Q2. Differentiate between mean, median and mode.**

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**Q3. What do you understand by standard deviation?**

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**Q4. Differentiate independent sample T test from Paired sample T test?**

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**Q5. What do you understand by linear regression? What is its marketing use?**

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**Q6. When to use ANOVA?**


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**Q7. Fill in the Blanks**

- i. ....are used to depict the absolute and relative magnitude, change and differences among the present variables.
- ii. Companies take benefit of calculating ..... to get the exact size of the product that is most sellable in the market or that is most acceptable by the consumers.

**Q8. MCQ**

- i. The average distance of distribution from the mean is known as
  - a. Mean
  - b. Median
  - c. Standard Deviation
  - d. Range
- ii. Mann-Whitney U Test is a substitute of one of the following:
  - a. Paired sample T test
  - b. Independent sample T Test
  - c. One sample T Test

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## 17.6 SUMMARY

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Market research is a very important concept to be aware of now days for the success of any business as it provides an impending view of the market, business competitors and perception and satisfaction customers. It is able to provide information for better decision making for the client. It's the responsibility of the researcher to convert raw data into meaningful information by using appropriate procedure of data preparation and analysis. The data processing consists of seven steps including questionnaire checking, editing, coding, developing the data file, cleaning, tabulation and analysis & interpretation.

Data analysis can be done through simple descriptive using graphical presentation, measures of dispersion, measures of central tendency and tabulation & cross tabulation; or it can be done through statistical tools if some hypotheses are developed. In hypothesis testing, Univariate tests such as one sample t-test or Chi Square Goodness-of-fit test; Bivariate tests such as Independent sample T test, Paired T Test, and linear Regression; and Multivariate Techniques such as ANOVA or Kruskal-Wallis test can be used.




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## 17.7 GLOSSARY

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**Editing** is the process of excluding or removing the errors from the collected data.

**Coding** is a procedure of classifying the data into meaningful categories. consistency check is to identify and remove basically three issues from data: out of range data, extreme values and logical inconsistencies.

**Mean** is the most commonly used measure of central tendency. It is calculated by averaging the values present in a variable divided by the total number of responses.

**Median-** When the distribution is arranged in ascending or descending order (order of magnitude), the middle value in the arrangement is known as median. (i) Standard

**Deviation:** SD is calculated by scheming the average distance of all distributions/ responses from the mean value. Deviation is the difference between a particular response and distribution mean.

**Goodness of fit test** is the only single sample non-parametric test available in statistics and is also known as Pearson's chi-square goodness of fit test.




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## 17.8 ANSWERS TO CHECK YOUR PROGRESS

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### Check Your Progress –A

Q7. Fill in the Blanks

- i. pre-decided/formulated
- ii. questionnaires

Q8. Answers

- iii. b. Editing
- iv. c Multivariate

### Check Your Progress –B

Q7. Answers

- i. Bar charts
- ii. Mode

Q8. Answers

- i. c. Standard Deviation
- ii. b. Independent sample T Test

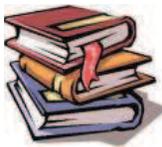


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## 17.9 REFERENCES

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- Research Methodology by CR Kothari, New Age International Publisher
- Marketing Research by Hair, Bush, Ortinau, McGraw Hill Publishers
- Marketing Research by Naresh Malhotra, Pearson Publication
- Strategic Market Research: A Guide to Conducting Research that Drives Businesses by Anne E. Beall, iUniverse
- <https://statistics.laerd.com/statistical-guides/one-way-anova-statistical-guide.php>



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## 17.10 SUGGESTED READINGS

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1. Malhotra Naresh, Marketing Research, Pearson Publication
2. Kothari CR, Research Methodology, New Age International Publisher
3. Hair, Bush, Ortinau, Marketing Research, McGraw Hill Publishers.



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## 17.11 TERMINAL QUESTIONS

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- Q1. Describe the guidelines for the coding of a questionnaire.
- Q2. What considerations are involved in selecting a data analysis strategy?
- Q3. Differentiate between data editing and data coding?
- Q4. Differentiate between one-way tabulation and cross-tabulation.
- Q5. Why are graphic approaches to reporting marketing research better than simply reporting numbers?
- Q6. Why do we use hypothesis testing?
- Q7. Under what conditions, one sample t-test and paired sample T test are used for hypothesis testing?
- Q8. What are the conditions of using Kruskal Wallis H test and what is its use in marketing research?

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## **UNIT 18 DATA ANALYSIS AND INTERPRETATION**

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### **18.1 Introduction**

### **18.2 Objectives**

### **18.3 Relationship between variables**

### **18.4 Use of Covariation to describe relationship between variables**

### **18.5 Tests of Association**

### **18.6 Value of Multivariate Techniques in Data Analysis**

### **18.7 Summary**

### **18.8 Glossary**

### **18.9 Answer to Check Your Progress**

### **18.10 Reference/ Bibliography**

### **18.11 Suggested Readings**

### **18.12 Terminal & Model Questions**

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## **18.1 INTRODUCTION**

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The main aim of marketing is to identify future needs of customers and guide firm's activities accordingly. Only an appropriate information system can make it possible. The information system gathers the suitable data, analyze and process it properly and give final interpretation on the basis of which effective marketing decisions are possible to take. To collect important and effective market information, Multivariate analysis tools are of high use. Multivariate statistical tools can provide a new insight into the data collected through market research. The learner will be able to understand the application of various multidimensional/ multivariate tools such as correlation, regression, factor analysis, cluster analysis, multidimensional scaling and perceptual mapping etc. after reading this chapter

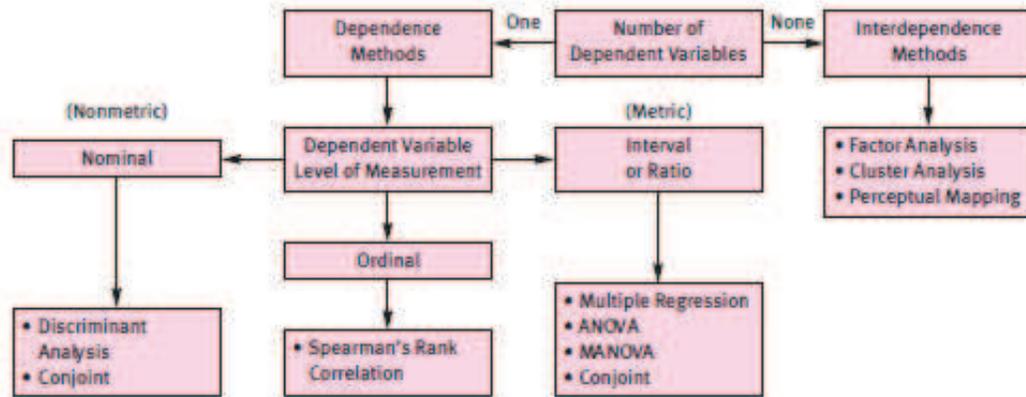


Fig 18.1 Classification of Multivariate Methods

Source: Hair et al- Marketing Research, second edition

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## 18.2 OBJECTIVES

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After reading this unit you would be able;

- To understand various types of relationships and associations between variables
- To study the multivariate techniques for marketing research
- To understand different statistical tools available for studying association between variables
- To explore the various multivariate methods of dependence and independence.

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## 18.3 RELATIONSHIP BETWEEN VARIABLES

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Why we conduct research? Research is conducted to establish or find out the kind of relationship existing between the variables present under study. This relationship may be based on the type of relation, direction of relation or strength of association. All these kinds of relationships will be discussed in this chapter.

**Presence of relationship:** Before conducting any analysis, it is very important for the researcher to study the type of relationship existing between the variables. If a systematic relationship exists then this is referred as presence of relationship. The concept of statistical significance tells about the presence of relationship. If the test applied is statistically significant, it means that some relationship exists between the variables.

**Direction of relationship:** Once, it is confirmed that a relationship is present between two variables, and then it is important to know the direction of the relationship. The direction can be either negative or positive relationship. Positive relationship means that if one variable increases then the other variable will also increase. Negative relationship is vice-versa of this i.e. when the value of one variable will increase then the value of second variable will decrease.

**Strength of association:** strength of association means whether the relationship is non-existent, weak, moderate or strong. The strength is nonexistent if a systematic and consistent relationship does not exist between the variables. If the probability of relationships between variables is low then it can be interpreted as weak relationship and a strong relationship means that probability of high consistency and strong systematic relationship is present.

**Type of relationship:** Once we are aware of the strength of the relationship, then the next stage is to test the type of relationship. Three types of relationship usually exists between variables; linear, inverse or curvilinear. A linear relationship means that the relationship between variables i.e. nature of relationship and strength between variables is going to remain same at any given range. The linear relationship is best presented by a straight line. An inverse relationship means that the strength and nature of relationship between variables will be inversely related over a range and this relationship is also best described by an inverse straight line. Curvilinear relationship means that till some point of range, the relationship will be positive and linear and over the range, the relationship between the variables will be inversely related. The next section describes it more precisely.

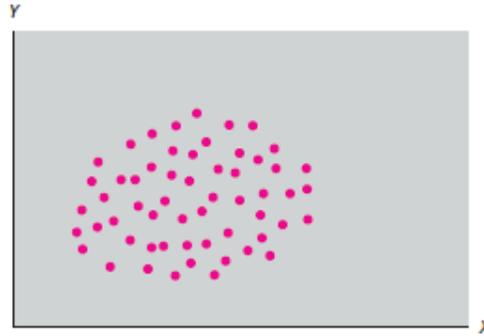
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## 18.4 USE OF COVARIATION TO DESCRIBE RELATIONSHIP BETWEEN VARIABLES

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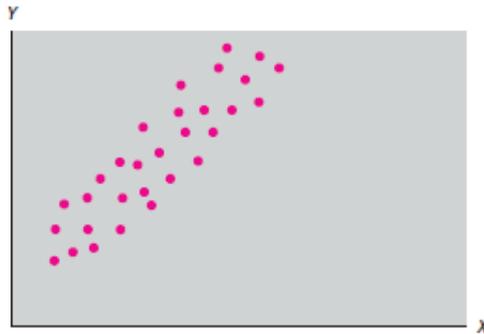
Covariation means correlated variation. Covariation/covariance determines the extent to which the two variables under study are related linearly. Covariance means related variance between two variables i.e. what will be the change in one variable present under study if another variable is changed by certain degree. For example: Researcher knows that YouTube usage is related to age and want to know the extent to which the youngsters use YouTube. It is easy to measure the degree of association present between two variables with the help of calculating covariance. For example: Change in consumer attitude (light, medium and heavy consumers) towards McDonald's burger advertising campaign. The relationship or covariation is easily presented by scatter plots. A scatter plot presents the relative positions of the variables on two axis i.e. horizontal axis and vertical axis.

**No Relationship between X and Y:** No relationship means that neither systematic nor consistent relationship exists between the variables under observation. In the below mentioned graph, it is clearly visible that no relationship exists between variable x and variable y.



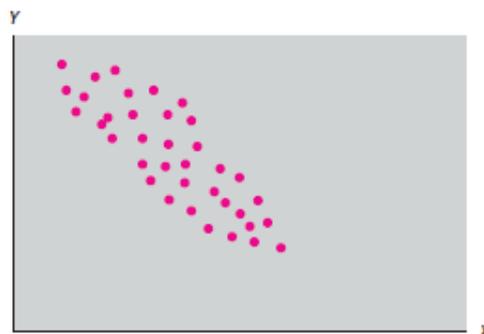
**Fig 18.2 No Relationship between X and Y**

**Positive Relationship between variables:** If a consistent and systematic relationship exists between the variables under observation and the increase in value of one variable is associated with the increase in value of other variable, then this type of relationship is known as positive relationship. Positive relationship means presence of linear relationship. The below mentioned graph is a true presentation of linear/positive relationship.



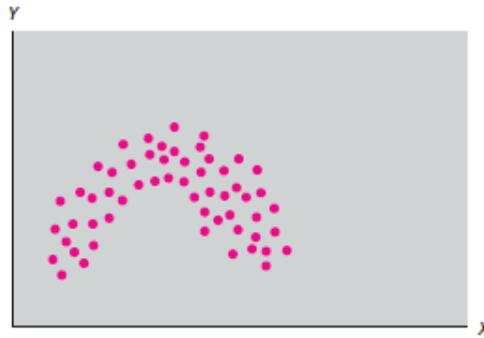
**Fig 18.3 Positive Relationship between variables**

**Negative Relationship between variables:** This also seems to be a linear pattern but in opposite direction. The increase in value of y is associated with decrease in value of x. It means, if the value of one variable increases then the value of other variable present will change in opposite direction. The covariance is still high but inversely related.



**Fig 18.4 Negative Relationship between variable**

**Curvilinear Relationship between variables:** as the name suggests, curvilinear relationship is a kind of relationship that is different at different ranges i.e. part of relationship is positive and part of it is negative/inverse. To some extent, the increase in value of y will be associated with the increase in value of x and after a certain range, increase in value of y will be now associated with the decrease in value of x).



**Fig 18.5 Curvilinear Relationship between variables**

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## 18.5 TESTS OF ASSOCIATION

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Following are statistical tools available to study association between variables:

- (i) Correlation
- (ii) MANOVA
- (iii) Multiple Regression
- (i) Correlation**

Scatter plots visually presents the relationship of variables and a sense of the amount of covariance these variables share. But scatter plots are not the quantitative measures to calculate the covariance between the present variables under study. To calculate the covariance, Pearson Correlation Coefficient is calculated. Pearson Correlation Coefficient value varies between -1 to +1 at the given significance level and it measures the degree of linear relationship present between the variables. The value 0 represents that no association exists between the variables. Pearson Correlation Coefficient is also used as Pearson R test. Before conducting any statistical test between two variables, it is always suggested to run Pearson Correlation Coefficient for variables to know the kind of relationship existing between them.

The null hypothesis is stated as ‘No association exists between the two variables in the population’ for the Pearson Correlation. The statistically significant higher correlation

coefficient means that stronger association is present between variables. The direction of relationship decides the kind of relationship between the variables i.e. either positive or negative. The positive value of Pearson correlation coefficient means existence of linear relationship and the negative value of Pearson correlation coefficient means presence of inverse relation. Let's look at the formula for conducting the Pearson correlation coefficient value.

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Where n = Number of pairs of scores

x = Sum of x scores

y = Sum of Y scores

xy = Sum of the products of the paired scores

x<sup>2</sup> = Sum of squared x scores

y<sup>2</sup> = Sum of squared y scores

Some rules of thumb has been provided by many researchers/ authors, such as, correlation coefficient value between +.80 to +1 are considered as strong association and null hypothesis is rejected in such cases; and correlation coefficient value between 0 to +.2 are considered as weak i.e. the null hypothesis will not be rejected.

To apply Pearson Correlation Coefficient, few assumptions are to be considered about the nature of data before running the test. The assumptions are:

- a) Both the variables (x and y) are measure using continuous scale (i.e. interval and ratio scale).
- b) Pearson Correlation Coefficient is able to explain the linear relationship only among the variables.
- c) It assumes that the variables come from a bivariate normally distributed population.

When the above assumptions are not met then other options are available. For example: if the data is collected on ordinal scale then **Spearman rank order correlation coefficient** is recommended by the authors. If any of the two variables is measured on ordinal scale or both the variables are measured on ordinal scale then Spearman rank order should be used not the Pearson Correlation Coefficient.

(ii) **MANOVA**

MANOVA (Multivariate analysis of variance) is an ANOVA technique with multiple dependent variables instead of one as in ANOVA. For example: a pharmaceutical company introduces two new drugs to check the improvement on Blood Pressure and Diabetes. Similarly, an FMCG company may introduce new variants of shampoos and conditioners for different hair types and want to see the improvement in hair texture, strength and hair fall. In this case, Variants of shampoos and conditioners are independent variables and hair texture, strength and hair fall are dependent variable. In MANOVA, a researcher obtains a multivariate F value (Wilks' lambda) instead of univariate F value. This Multivariate F value is obtained by comparing the error variance matrix and the effect variance matrix of the variables.

**Multivariate Analysis of Variance**

$$Y_1 + Y_2 + Y_3 + \dots + Y_n = X_1 + X_2 + X_3 + \dots + X_n$$

(metric) (nonmetric)

MANOVA is very useful in marketing experimental situation where some of the independent variables are manipulated. The advantages of using MANOVA are:

- a) A truly important factor can be discovered by measuring several dependent variables in a single experiment.
- b) MANOVA can reduce the chances of Type I error that might occur when multiple ANOVA's are conducted.

However, researcher needs to be cautious while running MANOVA. It is comparatively more complicated tool than ANOVA as the Independent variables may affect each dependent variable. The basic assumption for running MANOVA is that the dependent variables should be uncorrelated but this is not always possible because if the dependent variables are strongly correlated then the results are not at all worthy. As stated in earlier example, the dependent variables hair texture, strength and hair fall may be closely associated. In such cases, ANOVA should be used for all cases individually. Some of the assumptions for running MANOVA are:

- a) The dependent variables should be normally distributed within groups.
- b) Because MANOVA assumes homogeneity of variance, the dependent variables should show equal level of variance across predictor variables.
- c) As above, the homogeneity of covariance is also expected across all predictor variables as multiple dependent variables are present.

### (iii) MULTIPLE REGRESSION ANALYSIS

In this vulnerable environment, there are so many independent variables present that affect the marketing strategies of companies. In such scenario, a marketing researcher/company wants to examine the influence of these independent variables on a dependent variable of their interest and multiple regression analysis is the appropriate technique to do so. The tool is just an extension of linear/bivariate regression in which one dependent variable and multiple independent variables are present.

Multiple regression analysis is run in the same way as of linear regression and separate regression coefficient is calculated for each variable that examine the relative influence of each independent variable on the dependent variable. The calculated regression coefficient signifies the degree of change in dependent variable if the independent variable is manipulated by one unit. It also tells whether the relationship is positive or negative between independent and dependent variable which is also linear in case of multiple regression like bivariate regression.

As discussed above, the regression coefficient describes the average amount of change to be expected in dependent variable if independent variable is changed by one unit. In other words, if we the independent variable is changed by one unit, then regression coefficient represents the expected change in dependent unit. For example: a marketing manager wants to study the influence of characteristics of sales person on the sales of the products. The characteristics he considered are: Age, gender, qualification, communication skills and personality. In this example: Sales of the product is dependent variable and characteristics of Salesperson (Age, gender, qualification, communication skills and personality) are independent variables.

One problem can arise in this case is that all the present variables are measured on different scales. For example: age is in years, gender and personality are categorical data (nominal scale such as gender is measured as male/ female and personality has many traits to be measured such as extrovert, introvert, innovative, challenge taking etc.), qualification (High School, Graduate, Post Graduate) and communication skills (measured on a five point scale from 'very poor' to 'excellent') are also categorical data.. In such a case, when multiple independent variables are measured on different scales then it is not possible to do relative comparison between regression coefficients to check which independent variable is most influencing the dependent variable.

To resolve this kind of issues, the researchers calculate standardized regression coefficients which are also know also beta coefficients. This beta coefficient is also calculated from the normal regression coefficient. Standardization is used to remove the effect of different scales of measurement and the mean of standardized beta coefficients is always zero and standard deviation is one. The value of beta coefficient always ranges from .00 to 1.00.

*The following example is from the book 'Marketing Research by Hair et al' to study the interpretation of regression table. Satisfaction level of customer is the dependent variable in*

this study which is measured on Likert seven point scale, Food Quality (X4) and Food Variety (X5) are independent variables to predict the level of satisfaction which are measured on Likert 10 point rating scale. Here the null hypotheses are ‘No relationship exists between Level of satisfaction and Food Quality’ and ‘No relationship exists between satisfaction and Food Variety’. These both hypotheses will be checked on the confidence interval of 95%. In the below mentioned table, we can see that the Correlation coefficient is significant between satisfaction level and Food Quality (.441) and Satisfaction level and Food Variety (.311). Other than that, Food Quality and Food Variety are also strongly correlated (.745).

		Correlations		
		Satisfaction Level	X4- Food Quality	X5- Food Variety
Pearson Correlation	Satisfaction Level	1.000	.441	.311
	X4- Food Quality	.441	1.000	.745
	X5- Food Variety	.311	.745	1.000
Sig. (1-tailed)	Satisfaction Level		.001	.014
	X4- Food Quality		.001	.000
	X5- Food Variety		.014	.000

**Table 18.1 Correlations**

**Source:** Hair et al- Marketing Research, second edition

The next table is Model summary which presents R-square. The value of R square presents multiple correlation that presents the percent of variance in dependence variable explained collectively by all the independent variables present under study i.e. how much percent, all the independent variables are able to predict the dependent variables. Following is the formula of calculating regression coefficient:

$$r^2 = \frac{\sum (Y_i - \bar{Y})^2 - (Y_i - Y_c)^2}{\sum (Y_i - \bar{Y})^2}$$

Where

$Y_i$  is the value of  $i$ th item in Y series

$\bar{Y}$  is the mean of the Y series

$Y_c$  is the computed value of the  $i$ th item in Y series on the basis of the regression

In the model summary table, R square for this model is .195 i.e. 19.5 % of the variance in Satisfaction level is explained by food quality and food variety (81.5% of variance is still unexplained). If one more independent variable is added, the R square value will further increase and consequently it become quite difficult to determine the best model that explain the variance in most suitable manner. That is why; adjusted r square is used instead of r square in multiple regression. Adjusted r square value increase only when the additional

independent variable contributes to predict the variance of dependent variable; otherwise the value of adjusted r square decreases if the additional independent variable is not contributing in explaining the variance of the dependent variable. In this case, the adjusted r square value is .161.

Model	R	R-Square	Adjusted R-Square	Std. Error of the Estimate
1	.442 <sup>a</sup>	.195	.161	.87

a. Predictors: (Constant), X5–Food Variety, X4–Food Quality.

**Table 18.2 Model Summary**

*Source: Hair et al- Marketing Research, second edition*

The next table is ANOVA table which shows that overall model is significantly different from zero i.e. whether the null hypothesis is accepted or not. In this case F ratio is 5.703 significant at .006 probability level. The further analysis of independent hypothesis is done by studying beta values in coefficient table.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.706	2	4.353	5.703	.006 <sup>b</sup>
	Residual	35.874	47	.763		
	Total	44.580	49			

a. Dependent variable: Satisfaction Level.  
b. Predictors: (Constant), X5–Food Variety, X4–Food Quality.

**Table 18.3 ANOVA Table**

*Source: Hair et al- Marketing Research, second edition*

Beta coefficient for food quality is .471 that is significant at 0.020 level i.e. the null hypothesis is rejected and we can conclude that food quality can predict customer satisfaction. On the other hand, the beta coefficient of food variety is -0.040 and is not significant which means we cannot reject null hypothesis and conclude that food variety and level of satisfaction are unrelated.

		Coefficients <sup>a</sup>						
		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	2.727	.620		4.396	.000		
	X4–Food Quality	.398	.166	.471	2.400	.020	.444	2.250
	X5–Food Variety	–4.47E-02	.218	–.040	–.205	.839	.444	2.250

a. Dependent variable: Satisfaction Level.

**Table 18.4 Beta values in coefficient table**

*Source: Hair et al- Marketing Research, second edition*

The multiple regression equation is written as:

$$y = a + b_1x_1 + b_2x_2 + \dots + b_nx_n$$

- Where y is dependent variable which is to be predicted
- $x_1, x_2$  and  $x_n$  are the known independent variables and n is the number of independent variable present
- a,  $b_1, b_2$  and  $b_n$  are the parameters and the value of these parameters is determined by the method of least square.

Assumptions of Multiple Regressions:

- Linearity of relationship between independent and dependent variables should be present
- The data should be collected on Continuous scale (Interval and ratio scale)
- There should not be presence of any outlier
- The model being tested should be clearly specified i.e. which one is dependent variable and which are independent variable.



***Check Your Progress- A***

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**Q1. What do you understand by ‘presence of relationship between variables’?**

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**Q2. Define covariation with the help of a suitable example.**

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**Q3. What are the statistical tools available to study the association between multiple variables?**

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**Q4. Differentiate between Pearson correlation coefficient and Spearman rank order correlation coefficient?**

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**Q5. What does regression coefficient presents?**

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**Q6. Fill in the Blanks**

- i. A ..... means that the strength and nature of the relationship between the variables will remain same over the range and is best presented by a straight line.
- ii. The ..... presents the relative influence of each independent variable on the dependent variable

**Q7. MCQs**

- i. It is a measure to define the amount of change in one variable is related to the change in another variable under study.
  - a. Covariance
  - b. Standard Deviation
  - c. Correlation
  - d. Regression
- ii. While calculating regression coefficient, the relationship between independent and dependent variable should be
  - a. Positive
  - b. Negative
  - c. Linear
  - d. curvilinear

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## 18.6 VALUE OF MULTIVARIATE TECHNIQUES IN DATA ANALYSIS

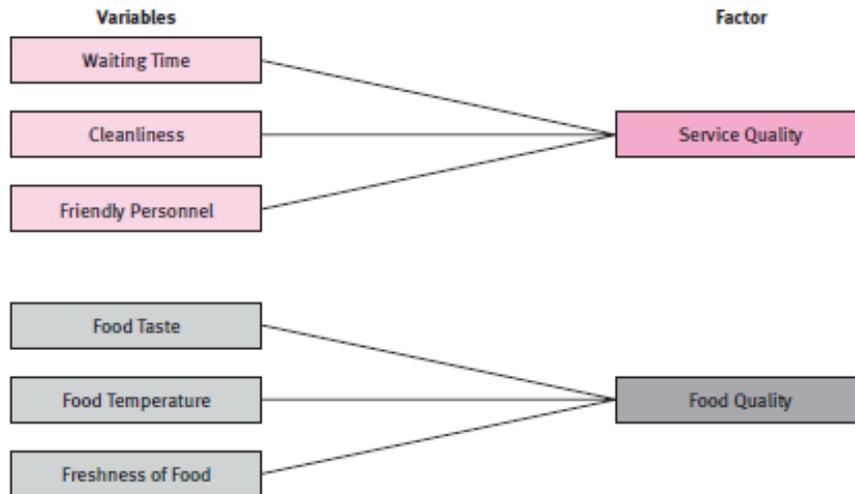
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Multivariate techniques are of two types: independent techniques and dependent techniques. The independent techniques include Factor Analysis and Cluster Analysis; and dependent techniques include Discriminant Analysis, Conjoint Analysis and Perceptual Mapping. All these are discussed in detail in the following section:

**(i) Factor Analysis**

The factor analysis is defined in the literature as being *a method that researches the interdependence relations among several variables whose help, a certain phenomenon is defined, by reducing the amount of information comprised in initial variables and establishment of a smaller set of dimensions (called factors), aiming to a minimum loss of information and focusing on the analysis of the interdependence between them.* Factor analysis is also known as dimension reduction technique as it converts large number of variables into a few factors that are easy to study and interpret. The purpose of factor analysis is to simplify large complicated data. Factor analysis does not differentiate between independent and dependent variables. Now the question arises that what is the need of factor analysis. The answer is: demand of today's business environment. For example: A restaurant wants to measure the customer satisfaction and conducted a survey. A large number of variables affect customer satisfaction in case of a restaurant such as food taste, food

freshness, hygiene and cleanliness, waiters/personnel, food temperature, waiting time to serve, food quantity etc. Suppose the customer gave high rating to food freshness, food taste, food temperature higher ratings and give low score to hygiene and cleanliness, waiting time to serve and behavior of personnel. On the basis of the said responses, two factors generate: Food Quality (food freshness, food taste, food temperature) and Service Quality (hygiene and cleanliness, waiting time to serve and behavior of personnel). Therefore, in conclusion, data reduction technique is to summarize the information into a few factors from a large number of variables under study.



#### Factor Loadings for the Two Factors

Variable	Correlation with:	
	Factor 1	Factor 2
A <sub>1</sub> (waiting time)	.79	.07
A <sub>2</sub> (cleanliness)	.72	.10
A <sub>3</sub> (friendly personnel)	.72	.05
A <sub>4</sub> (food taste)	.09	.85
A <sub>5</sub> (food temperature)	.11	.70
A <sub>6</sub> (freshness of food)	.04	.74

**Fig 18.6 Factor Analysis**

*Source: Hair et al- Marketing Research, second edition*

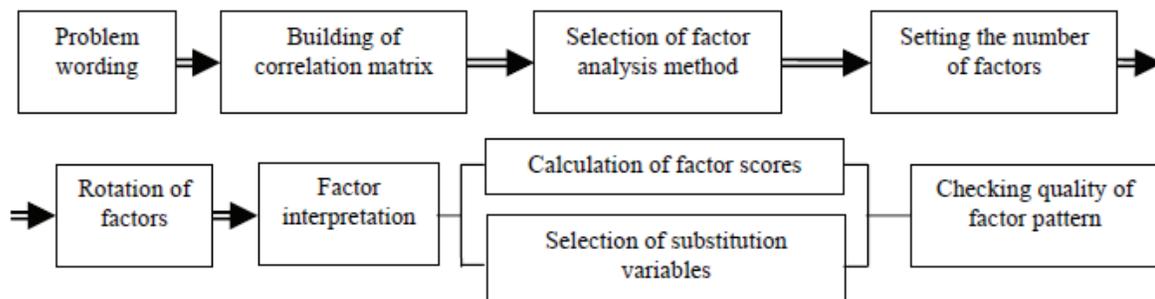
The factors are decided on the basis of factor a loading value which is correlation between each of the original variable and the newly developed factors. Factors loading value represents the importance of the variable; the higher the factor loading value, more is the importance of variable into factor. Factor loading value varies from -1 to +1 like correlation. In the above example, waiting time has highest factor loading value (.79) in first factor and

food taste has highest factor loading value (.85) in second factor. This means that these variables are important for their respective newly developed factors.

Further, it can be noted that waiting time, cleanliness and friendly personnel are highly correlated and form the first factor. Similarly, food taste, food temperature and freshness of food are highly correlated and form the second factor. Now the third stage is to name the factors. This depends upon the choice and understanding of the researcher that what name they want to give to these factors. Here we have two factors which are named as Service Quality and Food Quality and clearly representing all the original variables. Naming of the factor is easy if we have few factors, but the same can become tedious if number of factors is more. In such cases, the researcher should take help from literature and should find names which are familiar to market and equally represent all the variables present under that factor. In the stated example, there are six variables under study and formulated two factors; sometimes the research may have many variables such as SERVQUAL model containing 21 variables that usually constitute 6 factors depending upon the area of study.

The next most important step in factor analysis is to decide how many numbers of factors researcher wants to obtain. This is decided by the researcher on the basis of total variance explained by each factor and the cumulative variance explained by all the factors. Generally, the factors explaining more than 60 percent of cumulative variance are acceptable.

Factor analysis can be used in several ways such as: to bring out hidden dimensions of relevance, to find out relationship between observed values and to simplify and condense the large data into meaningful factors. The application process of conducting factor analysis is as follows:



**Exhibit 18.7 Application process of conducting factor analysis**

**Source:** Malhotra Naresh, *Marketing Research using SPSS, 4<sup>th</sup> edition*, p. 512.

#### Use of Factor analysis in marketing research:

1. To identify product/brand attributes that influence customer decision making.
2. To get an in-depth understanding of media habits of various clients.

3. To identify psychographic attributes of customers to understand their buying preferences.
4. For market segmentation on the basis of preference.
5. To understand the media consumption habits of the customers i.e. types of movies, advertisements etc; liked by customers.

Wherever, multiple variables are used to study the characteristics of a particular attribute, marketer can use factor analysis. Most important thing to consider is that any statistical tool is applicable on the factors achieved through this technique. The researcher can use regression, ANOVA, Structural equation modeling etc. as these factors contains ratio data and represents all the variables present under study.

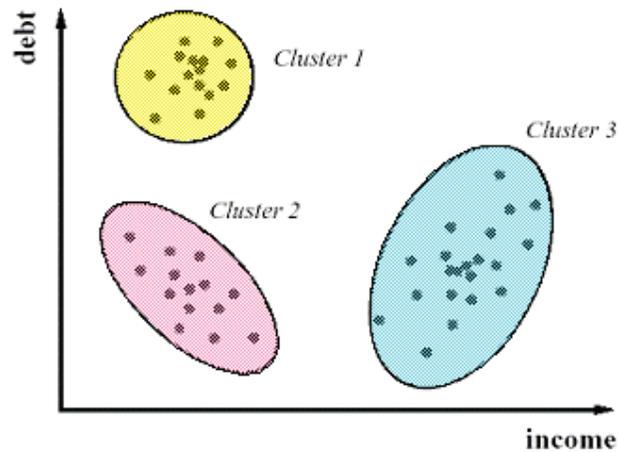
#### **(i) Cluster Analysis**

Factors analysis is a data/variable reduction technique and cluster analysis is a technique of segmenting the sample respondents. It is a technique of classifying respondents or objects into smaller number of mutually exclusive groups. In the formed clusters, the association is strong within the cluster and weak between the different clusters.

Like factor analysis, cluster analysis is a multivariate technique and interdependence technique as it does not distinct variables between independent and independent variables. As cluster analysis reduces the number of observations/cases/respondents into smaller sets of cluster by grouping, it is used for various purposes in business. Cluster analysis is used for segmentation, new product development, positioning of product in market, selecting target market or selecting market for conducting consumer researches.

Cluster analysis is also a subjective technique like factor analysis. Here proper care should be taken while clustering the objects so that meaningful clusters can be obtained instead of arbitrary clusters that or of no use to the marketer.

Cluster analysis is a technique of segmenting the respondents into homogenous sets of groups. These groups are mutually exclusive i.e. no correlation exists between the formed clusters but high correlation exists within the group. The below presented graph shows three types of clusters present in Indian urban population where the variables present are, income level and dept level.



**Exhibit 18.8 Cluster analysis**

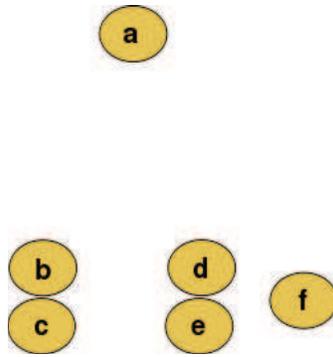
Clustering is done to segment the consumers/market on the basis of demographics, behavioural attributes, buying behavior or transaction behavior.

**Need of Cluster Analysis:** For example, Big Bazar surveys their existing customers to know their buying criteria. As this supermarket has a huge number of customers, so to identify a few patterns, cluster analysis was used to group the customers with similar buying pattern. In such a way, by using cluster analysis, Big Bazar segmented their customers into various meaningful categories. Now it is easy for the manager to make appropriate decisions to satisfy all segments. Clusters might include: Quality focused customers, price-sensitive customers, elite class users, indifferent customers or non-frequent buyers.

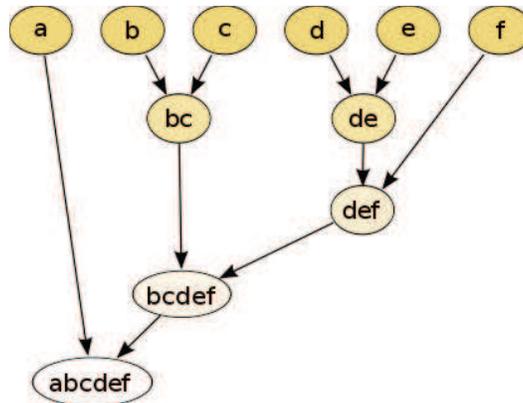
**Available techniques for clustering:**

Many techniques are available to generate clusters, but in this section, we will discuss only two most popular techniques of cluster analysis; first is Hierarchical clustering and second is k-mean clustering.

**(a) Hierarchical Clustering :** this technique of clustering make the clusters on the basis of close proximity, i.e. the data points closer to base point will behave similarly in comparison to rest of the data points. The data points with proximity will form separate groups with similar traits/characteristics/attributes/behavior. For example: in the following figure, we have six data points – a, b, c, d, e and f. Here b and c are close to each other; d and e are forming another group but a and f are not forming any group because of large distance from both the base points. There the question arises that how the clusters will form?



In Hierarchical clustering, the groups will form until converts the whole sample data points into a single group. Therefore, the researcher has to see that how many clusters he wants and accordingly can stop the clustering process when he has attained the desired number of clusters. In the above example, b & c; d & e have formed the group and a and f are not into any cluster. The sequential technique of hierarchical clustering will make group of d, e and f because f is comparatively closer to base data point of group 2. This sequential technique of hierarchical clustering will continue until all the data points are clustered into a single cluster. Now it's the decision of the researcher to take a halt at some given point where he is satisfied with the amount of clusters formed.



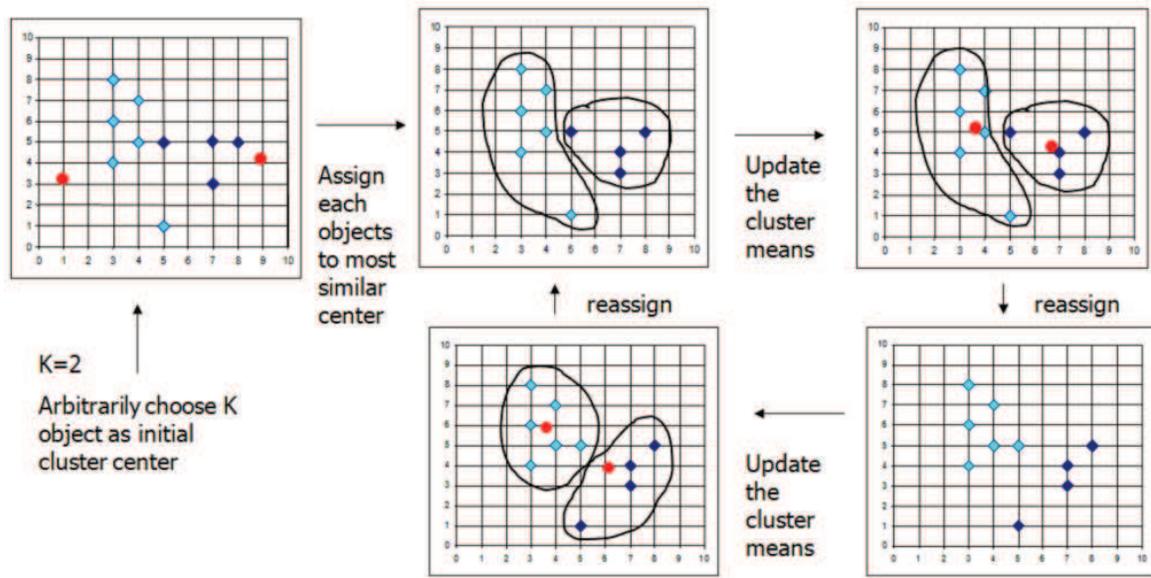
**Fig 18.9 Hierarchical Clustering**

So, if the researcher wants 4 clusters then the required clusters are bc, de, a and f; and if 3 clusters are to be formed then the clusters will be a, bc and def. That is why; this technique is very simple and provides stable clusters. Although it is a very simple technique, but carries few limitations also; (i) time consuming, (ii) can control small sample size i.e. clusters are formed clearly if data points are small in number. This technique is more time consuming as takes decision to combine two points in a group on the basis of the distance between data points. So first it gauges the space between all data points and then starts grouping them.

**(b) k-means Clustering :**

This is most frequently used technique of clustering in market research. This technique is very fast in calculating and making clusters and can control very large sample size/data

points. Here  $k$  stands for number of clusters to be formed by the researcher. The analysts draw clusters with the help of computer software where he first decides that how many clusters to be formed and afterwards put the desired figure in the statistical tool package. Now the question arises that how to decide on the numbers in advance? The researcher take the idea for number of clusters to be formed from hierarchical clustering or by seeing the pattern of data, researcher simply run the test with approximate idea of number and type of clusters to be formed.



**Fig 18.10 Hierarchical clustering**

In the above figure, the researcher has defined  $k = 2$  i.e. two clusters to be formed. After selecting  $k$ , the algorithm takes two random seed points and map all the data points to these seed points. The iteration continues till the final clusters are not formed.

One more benefit of k-means clustering technique is that the initial clusters formed are not final and data points can be allocated to other base points (to reduce penalty) if found more suitable in other groups in comparison to the initially formed groups (the above figure has shown this change). **Steps**

(ii) **Discriminant Analysis**

Regression is used to predict the metric dependent variable through metric independent variables. But how to run regression analysis when the dependent variable is non-metric in nature, and is categorical? In such cases, discriminate analysis is applied by the researchers. Categorical variables usually have two mutually exclusive categories. For example: one group wants to play music and second group doesn't want to play music. Another example

may be that one group is having good credit rating and the other has a bad credit rating. So these are actually variables which are not measurable. These are the categories in which either one happens or the other. So categorical data is the data in which presence of one variable automatically shows the absence of other. Therefore, the predicting variables/independent variables are metric and dependent variable is non-metric then the best technique to predict the categorical dependent variable is discriminate analysis. Although some other statistical techniques are also present such as classification tree, neural networks, logit regression etc. but discriminate analysis happens to be the most commonly used predicting technique.

Discriminant analysis is like k-means clustering or MANOVA. It is used to model differences in groups. Its purpose is to separate two or more classes, objects or categories. It's a classification technique like probit or logit model. For example: a researcher wants to categorize the newly wedded couples in three groups on the basis of their priority of location for honeymoon and formed three categories:

- (i) Overseas Location
- (ii) Within country location
- (iii) Will not go anywhere

There are 3 categories, some pattern must be present between the categories of the couple which we can use in discriminant analysis to analyze and categorize them. In this example, the pattern may be Income group or family background and use discriminate analysis to find out that which option the couple will select for honeymoon.

Discriminant analysis is done by comparing means of the independent variables present in study to predict the dependent variable. Assumption of discriminate analysis is that the independent variable should be normally distributed and homogeneity of variance should be present.

The major problem while handling such data is misclassification of groups. In Discriminant analysis the misclassification is minimized by selecting best set of variables/combinations/weightage in order to ensure that misclassification is minimized.

The equation is as follows:

$$d = a_1 * x_1 + a_2 * x_2 + \dots + a_i * x_i + b$$

where; d = Discriminant factor

x = Response score for the variable

a = discriminate coefficient

$b = \text{constant}$

$I = \text{number of discriminant variables}$

Discriminant analysis is to find out what is the difference in mean of different groups on the basis of expectation. The utility of discriminant analysis is to segment customers, patients, products, image research, advertising research and direct marketing.

#### (iv) **CONJOINT ANALYSIS**

Conjoint analysis is a multivariate technique. Conjoint analysis is also stated as preference analysis and is widely used in the area of marketing, product development, consumer choice/preferences and operation research. Conjoint analysis tries to measure the relative importance that a consumer place on the different attributes of a product or service. Simultaneously, conjoint analysis measures the utilities or value the consumer attach to the various levels of each attribute. This method assumes that a customer prefer any product/service after evaluating overall use/value of it. This value is a combination of the individual utilities of all attributes present in the product. So conjoint analysis helps to estimate the combination of attributes or options of a product/ variants are more preferred by the consumers. This will help the companies to change the product as per consumer preference or choice. The companies seek help of conjoint analysis in new product development also to know the options of attributes/qualities a consumer demands in his/her product. For example: A customer went to a shop to buy a phone. The shopkeeper gave two options: (i) phone with 16 GB is available in the shop and (ii) phone with 64 GB is not currently available, it will be available in a week time. Now the question arises “what is consumer’s preference?”

The preference is a combination (conjoint) of attributes that reveal the ‘part worth’ utilities of individual attribute. In the above mentioned example, attribute 1 is ‘memory’ and attribute 2 is ‘waiting time’. When the consumer choose the first option that means, the customer is giving more emphasis on delivery time and if the customer select second option then the emphasis is on large memory size. In cluster analysis, the part-worth utilities of individual attributes (waiting time and memory size) are calculated based on the selection or ranking of a defined set of combinations of attribute values. Let us add one more attribute to the above mentioned example. Now we have three attributes of the phone- colour, memory and waiting time.

Attributes:	Colour	=	Black, Golden
	Memory	=	16 GB, 64 GB
	Waiting time	=	one day, one week

By combining all the attributes, it will result in 8 different combinations:

- |                             |                             |
|-----------------------------|-----------------------------|
| (i) Golden, 8 GB, 1 Week    | (v) Golden, 8 GB, 1 Day     |
| (ii) Black, 8 GB, 1 Week    | (vi) Golden, 8 GB, 1 Day    |
| (iii) Golden, 64 GB, 1 Week | (vii) Golden, 64 GB, 1 Day  |
| (iv) Black, 64 GB, 1 Week   | (viii) Golden, 64 GB, 1 Day |

To know the possible number of combinations, the formula is k attribute:  $2^k$  combinations. Therefore, in the above example, the researcher will have 8 combinations with three attributes ( $2^3 = 8$ ).

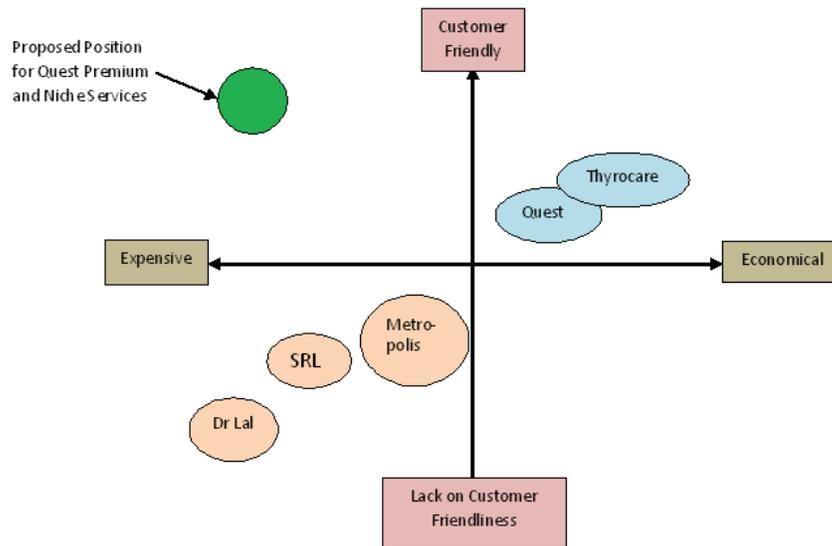
In marketing, the conjoint analysis is used to identify the best combination selected by the sample respondents. Here, the respondents are presented with all the possible options (say 8 in the above example) and asked to rank. 1 for the most preferred option and  $k^{\text{th}}$  for the least preferred. Then the researcher apply the linear model function to define part-worth utilities of the attributes.

Ranking = part-worth of attribute 1 (colour) \* attribute 1 level (rank) + part-worth of attribute 2 (memory) \* attribute 2 level (rank) + part-worth of attribute 3 (waiting time) \* attribute 3 level (rank) + Constant

$$Y = \beta_{\text{colour}} * X_1 + \beta_{\text{memory}} * X_2 + \beta_{\text{waiting time}} * X_3 + \mu \quad \text{where } \beta \text{ is part worth utility}$$

### (v) Perceptual Mapping

Perceptual mapping is a graphical representation of the perception of consumers about the company/product in comparison to its competitors. This is presented through a 2D map i.e. two attributes' extremes are placed on two axis and the centre point is zero, are used to position the product in comparison to the competitors' products. Perceptual mapping is also known with many other names such as positioning map or competitive positioning in marketing. These two attributes can be anything like price (high/low), quality (high/low), service (good/poor) etc. For example, a diagnostic company (Quest Diagnostic) wants to position itself into consumer diagnostic market. But before venturing into it, it wants to conduct a survey of the current position of the players available in market and their positioning map through the eyes of the users/consumers. It took two attributes to map: Customer friendly (Customer friendly/ Lack of customer friendliness) and price (expensive/economical).



**Fig 18.11 Perceptual Mapping**

The company collected the data from 1200 respondents. The perception of the customers/respondents was then plotted on the grid or two-dimensional (x axis and y axis) map using the extremes of the two attributes. By analyzing the map, it can easily be concluded that respondents perceived Thyrocare as customer friendly and economical; whereas Dr Lalpath labs were considered expensive and non-user friendly.

Although, perceptual mapping measure the relative position of products/companies on the basis of two attributes, but it has several usage into marketing management and marketing research; (i) to identify the current gap present in market and accordingly position its new product/service, (ii) also help companies to identify the image of the brand or company in comparison to its competitors, (iii) help companies to assess advertising effectiveness and accordingly positioning of the brand.



**Check Your Progress- B**

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**Q1. What is your understanding with the term ‘Factor analysis’? Explain various marketing applications of factor analysis.**

.....  
.....  
.....

**Q2. Cluster analysis is a very useful tool for companies in marketing research. Why?**

.....  
.....  
.....

**Q3. What is perceptual mapping? Why it is important to study even if it does not give any quantitative information to companies?**

.....  
.....  
.....

**Q4. Fill in the Blanks**

- i. ....is a dimension/variable reduction technique. This technique helps in reducing large number of variables into a smaller number of groups.
- ii. ....is based on the simple technique of close proximity, i.e. the data points closer to base point will behave similarly in comparison to rest of the data points.

**Q5. MCQ**

- i. It is a technique of classifying respondents or objects into smaller number of mutually exclusive groups.
  - a. Factor Analysis

- b. Cluster Analysis
  - c. Conjoint Analysis
  - d. Discriminant Analysis
- ii. This technique tries to measure the relative importance that a consumer place on the different attributes of a product or service.
- a. Perceptual Mapping
  - b. Cluster Analysis
  - c. Conjoint Analysis
  - d. Discriminant Analysis

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## 18.7 SUMMARY

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The companies are competing in a very turbulent environment; an environment where these have to face only the competitors but consumer behavior, their choices, preferences, ever changing requirements, advancement of technology, policies, market fluctuations, effect of global market and so on. That is why; companies need to get involved in intensive research to predict the unpredictable future with the involvement of multiple variables (independent as well as dependent) simultaneously to study the effects, associations and impact on each other. Multiple statistical tools are available in market to help companies studying the behavior and movement of these variables. To study the association, correlation, MANOVA and multiple regression techniques are available. It is possible to predict the sales of next quarter with the help of a few independent variables such as advertisements, salesperson, and price of product etc. using multiple regressions. Marketing research is incomplete without multivariate techniques. Factor analysis is a dimension reduction technique. Its main purpose is to simplify large complex data by converting multiple variables into few factors. Similarly, cluster analysis is a technique of segmenting the sample respondent which classifies respondents or objects into smaller number of mutually exclusive groups. Perceptual mapping is a graphical representation of the perception of consumers about the company/product in comparison to its competitors and is also known as competitive positioning. Conjoint analysis tries to measure the relative importance that a consumer place on the different attributes of company's offerings. This technique is helpful to companies in finding the choice of the consumers; what attributes consumers seek in products or services of their choice. Accordingly the company can modify their product to provide better experience to customers.



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## 18.8 GLOSSARY

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**Covariance** means related variance between two variables i.e. what will be the change in one variable present under study if another variable is changed by certain degree.

**Curvilinear relationship** is a kind of relationship that is different at different ranges i.e. part of relationship is positive and part of it is negative/inverse.

**Scatter plots** visually presents the relationship of variables and a sense of the amount of covariance these variables share.

**MANOVA** (Multivariate analysis of variance) is an ANOVA technique with multiple dependent variables instead of one as in ANOVA.



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## 18.9 ANSWERS TO CHECK YOUR PROGRESS

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### Check Your Progress –A

#### Q6. Answers

- i. Linear relationship
- ii. Regression coefficients

#### Q7. Answers

- i. a Covariance
- ii. c Linear

### Check Your Progress –B

#### Q4. Answers

- i. Factor analysis
- ii. Hierarchical clustering

Q5. Answers

- b. Cluster Analysis
- c. Conjoint Analysis



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## 18.10 REFERENCES

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- Lehmann, D. R. Gupta, S., and Seckel, J. (1997). Market Research. Reading, MA: Addison-Wesley.
- Marketing Research by Hair, Bush, Ortinau, McGraw Hill Publishers
- Marketing Research by Naresh Malhotra, Pearson Publication
- Research Methodology by CR Kothari, New Age International Publisher
- Strategic Market Research: A Guide to Conducting Research that Drives Businesses by Anne E. Beall, iUniverse



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## 18.11 SUGGESTED READINGS

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1. Hair, Bush, Ortinau, Marketing Research, McGraw Hill Publishers
2. Malhotra Naresh, Marketing Research, Pearson Publication
3. Kothari CR, Research Methodology, New Age International Publisher.



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## 18.12 TERMINAL QUESTIONS

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Q1. What is the use of calculating variance? Explain the different kinds of relationships between variables that can be studied with the help of calculating covariance.

Q2. When covariance is able to present the kind of relationship between variables then why researchers rely more on correlation coefficient? Give reasons to justify your answer.

Q3. Multiple regression analysis is considered as the most powerful statistical tool present in multivariate techniques. Why? Explain with suitable example.

Q4. Factor analysis and cluster analysis both are multivariate tools to simplify complicated data. Differentiate between the two approaches and what are their practical applications for a researcher?

Q5. How conjoint analysis works and what are the benefits a company can enjoy by using conjoint analysis? Explain the process of running conjoint analysis.

Q6. Explain the differences and similarities between discriminate analysis and MANOVA.

Q7. Differentiate between hierarchical clustering and k-means clustering techniques. Which technique of clustering is more beneficial for marketing research and why?

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# UNIT 19 ANALYTICAL TECHNIQUES IN MARKETING RESEARCH

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## 19.1 Introduction

## 19.2 Objectives

## 19.3 Introduction to Hypothesis Testing

## 19.4 Univariate Analysis

## 19.5 Bivariate Analysis Techniques

## 19.6 Multivariate Analysis Techniques

## 19.7 Summary

## 19.8 Glossary

## 19.9 Answer to check your progress

## 19.10 Reference/ Bibliography

## 19.11 Suggested readings

## 19.12 Terminal & Model Questions

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## 19.1 INTRODUCTION

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In the previous units you have learnt how the data have been classified, summarized, and presented in an appropriate form. The next task in front of the researcher is to analyse the data and interpret the findings. We have studied that how the results based on the study of sample can be used to estimate of the value of unknown population parameters.

In this unit, you will study that since the exact value of a parameter is unknown, there is some hypothesis about the true value. There are four different sections of this unit, first section provides an overview, describes the procedure involved in hypothesis testing and discusses the its role in data analysis; second section deals with the Univariate analysis with the help of T-test and Z-test; section three covers regression and co-relation as a tool of bivariate analysis; last section of the unit discusses the different methods used for investigating the interrelationship among multiple variables i.e. multivariate analysis. This unit discuss following methods of analysis: factor analysis, cluster analysis, conjoint analysis and multidimensional scaling under multivariate analysis.

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## 19.2 OBJECTIVES

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After reading this unit you will be able to:

- Formulate null and alternative hypotheses related to marketing decision situations requiring formal hypothesis testing.
- Learn the different steps involved in hypothesis testing.
- Understand the different scales that are used to measure attitudes.
- Distinguish between descriptive and inferential analysis.
- Learn the hypothesis tests used for Univariate analysis.
- Understand the concept of bivariate analysis.
- Understand simple regression analysis and state the difference between dependent and an independent variable.
- Learn the concept of multivariate analysis.
- Use factor, cluster, and conjoint analysis techniques for data analysis purpose.
- State the purpose of multidimensional scaling and use the results from such an analysis

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## 19.3 INTRODUCTION TO HYPOTHESIS TESTING

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In your earlier units, you would have studied several measures of central tendency and dispersion. The measures covered would be mean, median, mode etc. The research analysis conducted to determine measures of central tendency and dispersion, as well as constructing one-way tables are known as descriptive analysis. This analysis helps the researcher to summarize and provide valuable insights regarding the study. However, not all research problems can be answered with descriptive analysis alone. At times we have to go beyond to verify the sample estimates or hypotheses for the entire population of interest. Data analysis used to test the specific hypotheses is known as inferential analysis.

You can understand the concept of hypothesis testing with the help of following example:

Mayank, product manager for a cellular phone service, is wondering whether to introduce the service in to the new market area. To decide for the launch of this service, he conducted a survey of a random sample of 400 households in that market. The survey revealed that mean income per household is that of Rs. 25,000. On the basis of past experience and comprehensive studies in current market areas, Mayank strongly believes that the product line will be adequately profitable only in markets where the mean household income (across all households) is greater than Rs. 24,000. What should be the decision of Mayank?

Now in the situation given above, to reach a final decision Mayank has to make a general inference from the sample of 400 families. However, making generalizations from sample data is a feature implicit in virtually all conclusive research projects. The distinctive feature of the situation given above is that to reach at a final decision the criterion/ hypothesis need to be tested. In our example the parameter based on which Mayank is supposed to take decision is mean income of the households in the area this service is to be launched. Specifically, if the mean population household income is greater than Rs. 24,000, Mayank should introduce the service into the new market. Thus, in this case Mayank's decision will depend upon accepting or rejecting the following hypothesis: 'The population mean household income in the market to be served is more than Rs. 24,000.' Hence, we can say that a situation calling for formal hypothesis testing will usually stipulate a specific criterion for choosing between alternative inferences or courses of action. You also need to know that final decisions in many real-life situations depend on several factors, rather than one single, clear-cut criterion.

In case of formal hypothesis testing, after deciding upon the criterion the next thing is to state a null hypothesis and an alternative hypothesis.

The further steps of hypothesis testing are discussed in the section given below.

### 19.3.1 PROCEDURE OF HYPOTHESIS TESTING

Now, we will see the steps involved in the process of hypothesis testing. The generic process for hypothesis testing is described below.

#### 1. Hypothesis formulation

Hypothesis formulation deals with assumptions made by the researchers. Researchers formulate two kind of hypotheses. These are known as Null hypothesis and Alternative hypothesis. Meaning of null hypothesis is that there is no significant difference between the sample parameters and population. Whereas alternative hypothesis means that the difference between sample and population parameters is significant.

The symbol used for null hypothesis is 'H<sub>0</sub>' and we use 'H<sub>a</sub>' to represent alternative hypothesis. The hypotheses are always formulated for population parameters or characteristics rather than sample parameters. To denote it numerically for the situation given above:

$$H_0: \mu = \text{Rs. } 24,000$$

$$H_a: \mu > \text{Rs. } 24,000$$

Thus in the scenario given above, Mayank will not be introducing the cellular services in to the new market area if H<sub>0</sub> is not rejected.

## 2. Selection of appropriate test

Once the researcher has established both null and alternative hypothesis the next step is to select the statistical techniques to prove or reject them. There are multiple techniques which can be classified in to univariate, bivariate and multivariate analysis based on the number of variables to be analyzed. You should make use of univariate analysis tools if the research is focus upon only one variable. Bivariate and multivariate analysis tools are used for analysis purpose when a researcher is dealing with two or more than two variables. All these three statistical techniques are explained in detail in the subsequent sections of the unit.

## 3. Selecting desired level of significance

The researcher has to accept or reject a hypothesis for the entire population by analysing it based on the results obtained from the sample. The chances of the variation between the responses of the two groups are possible. The relevance of variation between the responses of two groups is analyzed in terms of significance of this difference i.e. Whether this difference is statistically significant or insignificant. If the difference between sample and population statistic is significant it means that the differences are not just because of random sampling fluctuations. Suppose for a research to identify mobile usage among males and females, a null hypothesis could be: 'there is no significant difference between males and females mobile usage'. After collecting data we found that the males use a mobile phone for 5 hours per day and the females have the usage of 6.5 hours/ per day. Now, can we assume that there is a meaningful difference in their usage pattern? This difference is defined and measured in terms of significance testing.

Two types of errors take place in significance measurement. These errors are known as type I error and type II error. If a researcher rejects a true null hypothesis, this error is known as type I/ alpha ( $\alpha$ ) error. And in case a false null hypothesis is accepted by the researcher this is termed as type II/ beta ( $\beta$ ) error.

## 4. Calculating difference value

Once hypothesis are formulated and research instruments are prepared the data collection starts. Marketing researchers then use different statistical techniques suitable for the given data and measure the significance level of data collected.

## 5. Critical value

The critical value is the parameter used to indicate the region based on which a researcher can either accept or reject a null hypothesis. After conducting appropriate univariate tests such as t-test or z-test, the researcher look for the critical value in t-distribution or z-distribution table. These distribution tables are easily available both on the internet and in the research books.

## 6. Comparison of the calculated and critical values

We have studied the meaning of critical value above. The calculated value which is computed by the researcher is compared to the table value for the given significance level. The null hypothesis is rejected if the calculated value of test statistic is greater than its critical value.

The test statistics such as t-test and z-test are discussed in detail in the next few sections of the unit.

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## 19.4 UNIVARIATE ANALYSIS

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In the above section, we have studied the concept of hypothesis testing and how this helps the researcher to choose between conflicting hypotheses, when he has to estimate the value for the population. Hypothesis testing is used by the researcher to help him to decide ‘whether a hypothesis about the population is likely to be true or false’ based on the sample data. While moving ahead two factors are most relevant in choosing an appropriate analysis procedure: number of variables to be analysed and nature of data collected on each variable.

Univariate analysis is appropriate to use when the focus of our analysis is just one variable. As in the opening example of this unit we have discussed that the introduction of cellular services in a new market were dependent upon the monthly household income.

Bivariate and Multivariate analysis are appropriate to use if there are two or more than two variables. We will discuss these analysis techniques in detail in subsequent section of this unit.

Researcher and statisticians have developed several kinds of tests for testing hypothesis. These tests are developed based on the type and scale on which data is collected. These tests can be classified as parametric tests and non-parametric tests. We have studied four kind of measurement scales i.e. nominal, ordinal, interval and ratio scale in earlier units. Parametric tests are used to analyze the data collected based on interval and ratio scale. Whereas, non-parametric tests are suitable for the data collected on nominal and ordinal scale.

The commonly used Univariate Hypothesis Tests are:

Type of Test	Primary Purpose of Test	Example of Research Question Test is Designed to answer
Chi-square contingency test	When the association between two categorical (nominal or ordinal) variables is to be	Is there a significant relationship between customers’ highest level of schooling (measured as ordinal variable) and whether they would recommend a

	examined	particular product to a friend (measured as an ordinal variable)?
Test for single mean	To test hypotheses that compare the population mean of a variable to a prespecified value	Is the average waiting time for customers at Bigbazaar's checkouts significantly greater than 10 minutes?
Test for a single proportion	To test hypotheses that compare the population proportion of a variable to a prespecified value	Is the proportion of households using broadband Internet service in Bangalore significantly less than .3?
Test of two means	To test hypotheses that compare the population mean of a variable for two separate populations	Is the average per-household expenditure of eating out significantly higher in Mysore than in Bangalore?
Test of two means when samples are dependent	To test hypotheses that compare two population means of the same variable when the data for the test are collected from the same set of sample units	On the basis of data collection from a panel of households before and after the special ad campaign for Ariel detergent, is the mean purchase volume of Ariel per household significantly higher after the campaign than before?
Tests of two proportions	To test hypotheses that compare the population proportion of a variable for two separate populations	Is the proportion of two-income households significantly lower in eastern states than in western states?

Source: (Parsuraman, Grewal, Krishnan 2009)

In this unit we have covered just t-test and z-test in detail. You will study these two tests in the section below.

### 19.4.1 T-TEST

One of the commonly used univariate test statistic is t-test. Use of t-test is done to measure the significance of difference either between a sample and a population or between two small samples (small sample is one with a size less than 30 respondents). We make use of t-distribution table for this test. In this test, researcher can estimate the variance of the population based on the variance of two samples. If these two samples are related to each other than we make use of paired t-test. The researcher calculates 't' value from the data collected from the sample and then the calculated 't' value is compared with the critical 't-value' from the t-distribution table for a given level of significance.

Example to explain the use of t-test

An engineering company hired a new batch of trainee engineers and conduct a test to measure their technical skills. From this batch it chose a random sample of 26 engineers and observed that they have scored 458 on this test with a standard deviation of 20. The task here is to determine that if the difference of this sample score is significant from that of the batch i.e. population or not. It is given that population mean i.e.  $\mu = 440$ .

Solution:

Step 1: There are certain assumptions as discussed above to be considered here, these are:

- Sample is selected randomly
- Data used in this case is either on interval or ratio scale
- Sample size is small (<30)
- Population variance is not known

Step 2: Formulate null and alternative hypotheses

$H_0$ : null hypothesis  $\mu = 440$  (or  $H_0: \mu = \mu$ )

$H_a$ : alternate hypothesis  $\mu \neq 440$

Step 3: Sample distribution selection

All the above mentioned three assumptions hold true in case of this example. Thus, we will use *t*-test.

Alpha ( $\alpha$ ) = .05

Degrees of Freedom =  $n-1 = 26-1 = 25$

Critical  $t = \pm 2.060$

Step 4: *t*-test formula

$$t = \frac{\bar{X} - \mu}{\frac{S}{\sqrt{n-1}}} = \frac{458 - 440}{\frac{20}{\sqrt{26-1}}} = 4.5$$

In this example the calculated *t*-value is more than critical *t*-value from the table. Thus, the null hypothesis i.e.  $H_0$  is rejected.

- This means a sample outcome of 458 is not possible with the given  $H_0$ .
- Therefore, the  $H_0$  is false and must be rejected.

Thus, we can say that trainee engineers have a score that is significantly different from the overall batch at ( $t = 4.5$ ,  $df = 25$ ,  $\alpha = .05$ ).

### 19.4.2 Z-TEST

The normal probability distribution is the basis of z-test. This test is used to measure the significance of different statistical measures of central tendency such as mean. As we studied in t-test, while using z-test also the researcher first calculate the z-value from the data collected and then this calculated 'z-value' is compared with the critical 'z-value' obtained from the normal distribution table for the given level of significance. It is one of the commonly used test in research studies with large sample size. It is used to compare the mean of a sample with the hypothesized mean for the population or in case the population variance is known. Similarly, it is also use to compare the means of two large independent samples when the population variance is known. z-test is also use to measure the sample proportion to a theoretical value of population proportion or for comparing the difference in proportions of two independent samples when 'n i.e. sample size' is large. We can use z-test for measuring the level of significance for median, mode and correlation coefficient as well.

In nutshell we can say that, z-test is capable of explaining the differences between the two samples drawn from the populations of same mean as well.

z-test is based on following assumptions:

- Sample size is more than 30. It is considered to be a large sample size.
- It is calculated only on quantitative data.
- Normal distribution is present.

Example for z-test:

While conducting a survey, it was found that 55% of the population is aware of HIV. Another random sample of 150 persons from an urban area reflected that 49% of these respondents are aware of this. Find out whether the difference between two is significant or not?

Solution:

Step 1: All the three assumptions given above are true in this case. Thus we will use z-test as the sample size is more than 30 and it is selected randomly.

Step 2:

$$H_0: P_u = .55 \text{ (in terms of proportion)}$$

$$(H_0: P_s = P_u)$$

$$H_a: P_u \neq .55$$

Step 3:

We will use Z distribution as the sample size is large

$$\text{Alpha } (\alpha) = .05$$

$$\text{Critical Z} = \pm 1.96$$

Step 4

$$Z = \frac{P_s - P_u}{\sqrt{P_u(1 - P_u) / n}} = \frac{.49 - .55}{\sqrt{.55(1 - .55) / 150}} = -1.48$$

Step 5

Compare Z (calculated) with Z (critical) obtained from the table.

If calculated value is more than critical value then null hypothesis is rejected. This means the difference between the population and the sample is significant.

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## 19.5 BIVARIATE ANALYSIS TECHNIQUES

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Bivariate analysis is used by the researcher when it is evaluating two variables. Bivariate analysis means researching on two variables at the same time as for example a researcher want to measure the change in sales with the change in amount spend on advertising. The researchers make use of bivariate analysis to establish a relationship between the two variables which could be tested empirically such as increase in advertising spend results in increase in sales. Another way to look at bivariate analysis is that, it helps in determining the value of one variable (known as dependent variable) in terms of another variable (known as independent variable). As in case of our example, sales is a dependent variable and advertising spend is an independent variable. And bivariate analysis will help in determining sales in terms of advertising spend.

Bivariate analysis helps to determine the association (i.e. degree of linearity among the variables) and the strength association (i.e. how strong is the line). There are different types of bivariate analysis techniques use to examine the association between two variables. The snapshot is given below:

Technique	When the technique is appropriate
Spearman correlation coefficient	When degree of association between two sets of ranks i.e. pertaining to two variables is to be determined.
Pearson correlation coefficient	When degree of association between two metric-scaled i.e. interval or ration variables is to be examined.
Simple regression	In simple regression a mathematical equation is developed which represents the relationship between two variables. Simple regression analysis is calculated on the data collected based on interval or ratio scale. One variable is expressed as a function of another variable. This means value of one variable is dependent upon another variable.

Multiple regression	Just like simple regression, in this more than two variables are involved wherein one variable is assumed to be dependent on the others.
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Source: (Parsuraman, Grewal, Krishnan 2009)

For the purpose of this unit, we will focus upon simple regression analysis and multiple regression analysis.

### 19.5.1 REGRESSION

Regression is the attempt to explain the variation in a dependent variable using the variation in independent variables. Regression analysis is used to explain the cause and effect relationship between two variables. Regression analysis model is use for the purpose of prediction if the independent variable or variables can statistically explain the variation in dependent variable.

Simple regression analysis: As explained above, it is a statistical tool which helps the researcher to express the relationship between dependent variable ‘represented as y’ and independent variable ‘represented as x’ in the form of a mathematical equation. Simple regression analysis model is use to predict the value of ‘y’ for different values of ‘x’.

Thus, the output of a regression equation is to predict the value of dependent variable on the basis of independent variables’ value. Simple regression fits a straight line to the data.

The output of a simple regression is the coefficient  $\beta$  and the constant A. The equation is then:

$$y = A + \beta * x + \varepsilon$$

In this equation ‘A’ is known as Y-intercept and it represents the value of ‘y’ i.e. dependent variable for a ‘zero’ value of independent variable. This  $\beta$  represents the coefficient of ‘x’. This  $\beta$  is known as the slope of regression equation. The slope has a very important interpretation: this slope means what will be the unit change in the predicted value of dependent variable for a unit value change in independent variable, assuming that all other variables likely to influence the dependent variable measure the same. Mathematically:

$$\beta = \frac{\Delta y}{\Delta x}$$

and where  $\varepsilon$  is the residual error.

Let us understand it with the help of following example: Suppose Ghadi detergent currently spends Rs. 2,00,000 on advertising the detergent in Utarakhand market. It is considering a 20 percent reduction in its advertising budget and wants to know by how much sales revenue might decline in this market as a result. The information the firm desires can be obtained from the slope  $\beta$  of the regression equation. For example:

$B = 1.210$ , this means sales revenue will decline by Rs. 1210 for every Rs. 1000 reduction in advertising expenditures. Also, the proposed reduction in advertising expenditures = Rs. 2,00,000  $\times .2 =$  Rs. 40000.

Anticipated decline in sales revenue =  $1210 \times 40000 / 100 =$  Rs. 48400

Let's take another example, in case of retail store the annual sales can be expressed in terms of the total floor area. This means the sales from a retail store are dependent upon its floor size. This means if the size of the floor increases, sales will also increase. Thus in this case the regression equation will be:

$$\text{SALES} = A + \beta * \text{Area} + \epsilon$$

Here, the slope  $\beta$  again represents a corresponding rate of change in the sales with the change in area in square foot.

The intercept 'A' is needed to describe the line. In our example it has no statistical importance as no store can ever have 'Zero' i.e. no square foot place.

Further, we will see that it not just the space on the floor which can completely predict the sales of any store. The term residual error ' $\epsilon$ ' is used to define the difference in the sales of individual stores with same size of floor space. In our example, we can understand residual in terms of store's location or quality of employees.

Multiple regression: This statistical technique is used by the researcher when they are trying to explain one dependent variable as a function of multiple variables capable of explaining this dependent variable. This technique is used to measure the variability in a dependent variable based on its covariance with other independent variables. We can understand the concept of multiple regression with the help of simple example such as, sales for a product can be determined in terms of its prices, advertising, product design and sales efforts. Thus, in this case sales 'S' is a function of price 'P', advertising 'A', product design 'PD' and sales efforts 'SE'. The relationship between these variables can be expressed in the form of a regression equation,  $S = f(P, A, PD, SE)$ . Where, 'S' is dependent upon 'P', 'A', 'PD' and 'SE'.

In multiple regression, a linear relationship is form between dependent and independent variables in a manner that there need to exist maximum correlation between independent variables.

We have not covered the calculation part of multiple regression over here as it is beyond the scope of this unit.

**Check Your Progress- A**

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**Q1. Distinguish between:**

- a. Null hypothesis vs. alternative hypothesis
- b. Simple regression vs. multiple regression

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**Q2. The procedure of testing hypothesis requires a researcher to adopt several steps. Describe in brief all such steps.**

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**Q3. What is a t-test? When it is used and for what purposes?**

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**Q4. True and False**

- i. Descriptive analysis is sufficient in itself to be used for any decision making situation.
- ii. Non-parametric tests are best suitable for nominal and ordinal data.
- iii. Z-test and t-test can be used interchangeably.

**Q5. Fill in the Blanks with appropriate word or words.**

- i. \_\_\_\_\_ means the formal statements which are expressed in a form that they can be tested.
- ii. \_\_\_\_\_ is capable of explaining the differences between the two samples drawn from the populations of same mean as well.
- iii. \_\_\_\_\_ is appropriate to use when the focus of our analysis is just one variable.

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## 19.6 MULTIVARIATE ANALYSIS TECHNIQUES

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Multivariate analysis techniques consists of those techniques which are capable of analysing two or more than two variables for a given sample of observations. Thus, the use of multivariate analysis techniques is done to study the objects for which several observations are possible. Such as we wish to study the consumer behaviour, it can be studied in terms of different factors such as personality, perception, demographics, motivation etc. Thus there are different variable of consumer behaviour and several observations can be collected for each factor from a large number of sample respondents. Most of the studies in which a researcher is measuring the association between one dependent and two or more independent variables are termed as multivariate analysis. Thus we can say that multivariate techniques are used to explain the relationship among variables.

At present large number of researchers in the field of marketing, human behaviour, economics etc. make use of multivariate analysis techniques as they can save their time and have accurate results. In case of univariate analysis, researcher are required to carry separate analysis for each variable which will be not only time consuming but will also result in inaccurate interpretation. These techniques help the researchers to study the variables which are highly correlated with each other and when it is not possible for them to use probabilistic models. Availability of high speed computers and softwares have also helped in the development and usage of multivariate techniques. These techniques enable a researcher to present and interpret huge data in a simple manner. The major contribution made by these techniques is in the representation of the large and voluminous information in the presentable and understandable form.

### 19.6.1 CLUSTER ANALYSIS

As the name suggest, this method is use to form or classify the variables in to different clusters such as segmenting the customers in to segments. The cluster analysis is based on the correlation between different variables. In this analysis, the variables which have high correlation among themselves and a low correlation with one another variable are grouped together in a cluster. Thus, we can say the main aim of performing cluster analysis is to develop clusters/ groups which are mutually exhaustive in terms of different criterion such as demographic profile of consumers, consumers' psychographic profiles among the consumer groups in the given population. These groups or clusters are not predefined and they are naturally formed and named later.

**Procedure:** The procedure followed to perform cluster analysis consists of following steps:

(i) The first step is to identify the variables which have positive correlation as a whole.

(ii) Once the positive correlation is identified then the variables with highest correlation are segregated. And these variables with highest positive correlation forms the core of the very first cluster.

(iii) Once the core of the cluster is formed with the help of two variable, the next thing is to determine the variables which are reflecting high correlation with these two variables. Now, these variables are grouped with the core and they form the first cluster.

(iv) We can now proceed with the formation of our second cluster. Here we have to look for the variables which are highly correlated with each other but they show a very low correlation with cluster 1 variables. After identifying these two variables, we will repeat the same process as we did while forming cluster 1 i.e. identify the variables highly correlated with these two variables and grouping them in cluster 2.

(v) And the cluster formation continues so on.

The cluster analysis is easy to use but is often criticized for its limitation of making statistical inferences. Several statistical methods are used by the researchers to locate and form clusters out of large number of variables. Several elaborate computational routines are identified by McQuitty for forming clusters.

As mentioned above, the cluster analysis is a popular tool used by the market researchers for segmentation studies. They use this technique to form market segments for product based on different variables such as: consumption habits of customers, their psychological factors, personality, economic conditions etc.

### **19.6.2 FACTOR ANALYSIS**

Social and behavioural researchers commonly make use of factor analysis for conducting multivariate analysis. Researchers make use of this technique, if there exists systematic interdependence between the observed and manifest variables. The researchers also use this method to study about the latent relationship among these variables.

You can understand the procedure of factor analysis with the help of this hypothetical situation, Inalsa, a manufacturer of a variety of home appliances and electronic in the survey was to find out how customers felt about Inalsa in general and about specific Inalsa products in particular. The survey involved numerous evaluative statements that respondents answered by using 7-point scale on which the higher the number, the more favourable the evaluation.

Use of factor analysis is done by the researcher to summarize a large number of measured variables in to less number of categories. These measured variables are expressed in the form of statements. Researchers perform factor analysis in the set of these measured variables i.e. statements and based on their correlation these variables are grouped in to new category variable known as latent. The researcher will identify this new variable with a new name based on the measured variables this new variable consists of. These factors are the linear combination of earlier variables, thus a value known as factor loadings for measured variable is considered. These factor loadings also help to exhibit the correlation between the new variable/ factor formed and the earlier variables.

Some basic terms relating to factor analysis are:

- **Factor:** A new variable or a category formed on the basis of correlation between measured variables is termed as factor. Researcher can form any number of factors from the measured variables/ statements depending upon the nature of study and variables.
- **Factor-loadings:** This is the numeric value which measure the relationship between the factor formed and the variables from which it is formed.
- **Communality ( $h^2$ ):** This represents that, what is the contribution or accountability of each measured statement in the given factor. The mathematical equation to represent this is:  
$$h^2 \text{ of the } i\text{th variable} = (\text{ith factor loading of factor A})^2 + (\text{ith factor loading of factor B})^2 + \dots$$
- **Eigen value (or latent root):** It is the sum of squared values of factor loadings for a particular factor. The use of eigen value is done to understand the relative importance of each factor for analysing a set of variables.
- **Total sum of squares:** This is the sum total of eigen values for all the factors.
- **Rotation:** This is the process of having different views of the same data. However, these different views have same value in terms of statistics. Orthogonal and oblique are the two kinds of rotations possible.

- Factor scores: This represent the extent to which individual respondent has obtained a high score on those variables which constitute high loading for each factor. These scores help in understanding the meaning of a factor.

### **19.6.3 CONJOINT ANALYSIS**

This technique is use to derive the utility value that customers presumably attach to different levels of an object's attributes. This involves comparison of hypothetical profiles of products, brands and so on by the respondents. While using this technique, the researcher needs to define factors and their values in advance. The respondents rank the hypothetical combinations and the various combinations of the factor values are obtained. It is possible to derive metric partial utilities from the ranking results with the help of conjoint analysis and the summation of these partial utilities therefore results in metric total utilities. In conjoint analysis, independent variables are the object attributes and preferences of the respondents for hypothetical combinations are dependent variable.

### **19.6.4 MULTIDIMENSIONAL SCALING**

Multidimensional scaling (MDS) is used by a researcher if he wants to measure the same item in multiple dimensions at the given point of time. The logic behind using MDS is that, the consumers often compare a set of products with one another based on multiple dimensions than one and these dimensions are not always correlated with each other.

There are a variety of MDS techniques which are used to reveal patterns in the interdependent data by reducing the dimensions. While using MDS for non-metric data, the researcher can ask the respondents to rank order each pair of research objects based on the similarity between them. The similarities identified in the data are expressed in distance form based on statistically manipulated and represented in n-dimensional space in a manner that the distance between these points protect the original proximity between these points. Researcher then perform mapping and interpret and label these dimensions.

The significance of MDS lies in the fact that it enables the researcher to study “The perceptual structure of a set of stimuli and the cognitive processes underlying the development of this structure. MDS provides a mechanism for determining the truly salient attributes without forcing the judge to appear irrational.” MDS is use to scale both objects and individual even if the information provided is not sufficient. This technique helps the researcher to identify the most relevant factors/ attributes which influences a particular decision.

**Situation for Multidimensional Scaling:** A customer is asked to consider a set of mobile phones and describe how similar each mobile phone is to others. Specifically, the customer is asked to compare pairs of mobile phones and rank the pairs from most similar to least similar. Since there are six mobile phones, 15 distinct pairs of mobile phones are possible. The customer’s rankings could further be analysed using multidimensional scaling.



**Check Your Progress- B**

**Q1. What are the advantages of multivariate techniques?**

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**Q2. Discuss the basic terms relevant for factor analysis.**

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**Q3. Explain how multi-dimensional scaling and cluster analysis differ.**

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**Q4. Fill in the blanks-**

- i. \_\_\_\_\_ technique is suitable for segmenting the market for automobiles.
- ii. \_\_\_\_\_ technique is use to derive the utility value that customers presumably attach to different levels of an object’s attributes.

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## 19.7 SUMMARY

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In this unit, we have studied that analysis goes beyond descriptive analysis and researchers have to make decisions based on sample data by using inferential analysis. Inferential analysis involves hypothesis testing. The decisions calling for hypothesis testing will have a prespecified criterion on which decision is dependent. There are two type of error which a researcher can do while testing hypothesis they are known as type I and type II errors. We have studied a step by step procedure for hypothesis testing is this unit. The different kind of analysis such as univariate, bivariate and multivariate analysis are discussed in this unit. We have also studied different types of parametric and non-parametric tests. The specific tests explained in this unit are:

We have covered the use of t-test for small sample size and use of z-test for a single mean when the sample size is large.

This unit has given a snapshot of the different bivariate techniques. The use of simple regression technique is explained in this unit. Meaning of multiple regression is explained in this unit. An overview of multivariate techniques such a factor, cluster, conjoint analysis and multidimensional scaling is provided in this unit.



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## 19.8 GLOSSARY

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**Descriptive analysis:** In this analysis researchers compute various central tendency measures such as mean, media and mode etc. It is also used to construct one-way tables to provide insights to the researcher.

**Inferential analysis:** Data analysis used to test the specific hypotheses is known as inferential analysis.

**Hypotheses:** These means assumptions stated by a researcher in a form that they can be tested.

**Null Hypothesis:** It states there is “no significant difference.” it means that there is no significant difference between the population mean and the sample mean.

**Univariate analysis:** It is appropriate to use when just one variable is the focus of the analysis.

**Bivariate analysis:** Analysis techniques used to measure the relationship between two variables.

**Multivariate analysis:** This type of analysis is used when two or more variables are to be analysed simultaneously.

**t-test:** It is done to measure the significance of difference either between a sample and a population or between two small samples (small sample is one with a size less than 30 respondents). We make use of t-distribution table for this test.

**z-test:** This test is used to measure the significance of different statistical measures of central tendency such as mean.

**Simple regression analysis:** It is a statistical tool which helps the researcher to express the relationship between dependent variable 'represented as y' and independent variable 'represented as x' in the form of a mathematical equation.

**Multiple regression analysis:** This generates a mathematical relationship known as regression equation between one variable designated as dependent variable 'Y' and two or more designated independent variable 'X<sub>1</sub>, X<sub>2</sub>...X<sub>3</sub>'.

**Factor analysis:** It is a data and variable reduction technique that attempts to partition a given set of variables in to groups known as factors of maximally correlated variables.

**Cluster analysis:** This technique is use to segment customers, markets, or products in to groups. The purpose is of this analysis is to group objects in a way that objects within each group are similar to one another on a variety of characteristics.

**Conjoint analysis:** This technique is use to derive the utility value that customers presumably attach to different levels of an object's attributes. This involves comparison of hypothetical profiles of products, brands and so on by the respondents.

**Multidimensional scaling:** It is intended to infer the underlying dimensions from a series of similarity or preference judgments provided by customers about products, brands and so on within a given set.




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## 19.9 ANSWERS TO CHECK YOUR PROGRESS

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### Check Your Progress –A

#### Q4. True and False

- i. Descriptive analysis is sufficient in itself to be used for any decision making situation. **False**
- ii. Non-parametric tests are best suitable for nominal and ordinal data. **True**
- iii. Z-test and t-test can be used interchangeably. **False**

**Q5. Fill in the Blanks with appropriate word or words.**

- i. Hypotheses means the formal statements which are expressed in a form that they can be tested.
- ii. Z-test is capable of explaining the differences between the two samples drawn from the populations of same mean as well.
- iii. Univariate analysis is appropriate to use when the focus of our analysis is just one variable.

**Check Your Progress –B****Q4. Fill in the blanks-**

- i. Cluster analysis technique is suitable for segmenting the market for automobiles.
- ii. Conjoint analysis technique is use to derive the utility value that customers presumably attach to different levels of an object's attributes.



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**19.10 REFERENCES**

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## 19.11 SUGGESTED READINGS

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## 19.12 TERMINAL QUESTIONS

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- Q1. What is the inferential analysis in marketing research?
- Q2. List and explain different univariate analysis techniques.
- Q3. What does intercept and slope represent in a regression equation? Explain with example.
- Q4. Define conjoint analysis and state its potential applications.
- Q5. Name the important multivariate techniques and explain the important characteristic of each one of such techniques.
- Q6. Write short notes on:
  - (i) Cluster analysis; (ii) Multidimensional scaling;
  - (iii) Factor analysis

(iv) Conjoint analysis

Q7. What do you mean by multivariate techniques? Explain their significance in context of research studies.

Q8. Explain in your own words what factor analysis is and describe its potential benefits.

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## **UNIT 20 RESEARCH REPORT PREPARATION AND PRESENTATION-I**

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### **20.1 Introduction**

### **20.2 Objectives**

### **20.3 Marketing Research and Research Report**

### **20.4 Advantages of writing Research Report**

### **20.5 Types of Reports**

### **20.6 Criteria for a Good Report**

### **20.7 Contents of a Research Report**

### **20.8 Research Proposal**

### **20.9 Essential elements of Research Proposal**

### **20.10 Summary**

### **20.11 Glossary**

### **20.12 Answer to Check Your Progress**

### **20.13 References**

### **20.14 Suggested Readings**

### **20.15 Terminal Questions**

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## **20.1 INTRODUCTION**

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In this unit, we will discuss the various principles with regards to writing research report and proposals. We will also study various types of reports and essential elements of an effective proposal.

Whatever is to be included in the report—the study’s purpose, methodology, results, conclusions, or recommendations for management—should be presented clearly, accurately, and honestly. The key attributes of a report are completeness and conciseness. The report should be designed and outlined in detail at the outset. Since the report needs to focus on information needs, this outline can be an invaluable aid in planning the other stages, such as the plans for analysis, measurement, and so forth.

This unit provides information and guidelines that may be invaluable in preparing and presenting reports, both written and oral. Research report is probably the only part of the project others will ever get to see. If it is not presented properly, then every effort of yours done up to that point will go in vain.

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## 20.2 OBJECTIVES

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After reading this unit you will be able to:

- Understand the meaning of marketing research reports
- Explain their types and importance.
- Prepare research reports and proposals.
- Analyse the various principles with regards to report and proposal writing.

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## 20.3 MARKETING RESEARCH AND RESEARCH REPORT

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Marketing over the period of years has become quite a dynamic and volatile business activity. The importance and role of marketing itself has changed a lot because of several factors that includes – resource constraints (be it capital, human or material resources), pressure of unemployment, high inflation rate, cross-border infiltration, terrorism, sickness of industries, old school thoughts of companies, economic recession etc. Apart from this, rapid changes in the technological world including the new revelations like – **Big Data and Data Analytics** have gradually forced marketing managers of modern generation to become more agile and market driven in their approach and strategy formulation. All this requires a structured and formal means of gathering accurate data and timely information about products, customers and market places and above all the overall marketing environment. The only way of doing this and accomplish success is – *Marketing Research*.

Marketing Research is generally been defined as the process of gathering information to know more about something less known or to explore about things which are still unexplored. Every business organization engages in research in some form or the other. In fact research is something which is not only used by organizations but also by individuals across all professions. From the highly expert doctors investigating new and complicated medical diseases and ailments, to the archaeologists gaining insights into newly found excavations to an adventure traveller, everyone is generally driven by the quest for gathering relevant information.

For marketing managers, research is not only important for the purpose of shared learning or gathering information. It is also used for making sound marketing and business decisions that ensures success for an organization. Market research does this work for marketers by giving them a picture of what is going on in the market, what is likely to occur, what all things a company is doing good which is liked by the customers and what all things it needs to change to cater to customers in a better way. A good research also provides various alternatives and suggests innovative options of launching new products or entering into new markets. Marketing decisions, in majority of the cases prove to be less risky, when they are backed by proper market research.

Marketing research has been viewed (by many authors) as the foundation of marketing. Using the traditional analogy of constructing a house, that requires a strong foundation to remain sturdy, marketing decisions also need support of research to face competition and to be accepted by customers in a favourable manner. All domains and all areas of marketing, therefore, need to be supplemented by some level of adequate market research.

To provide a list of ways/points in which marketing research assists decision makers and organizations, one can consider following points -

1. **Facilitates information and valuable data** – Market research provides data pertaining to demand and supply of products, consumer attitude and behaviour, likeability towards particular products and services, level and nature of competition etc. This data is of immense use for marketers which assist them in improving the quality of decision making.
2. **Analyses consumer behaviour** – Marketing research analyses data about consumer behaviour by examining demographic elements like age, income, location, education and evaluating their likes and dislikes towards products and services. It also assists by finding out the perception of consumers about a company & its products.
3. **Helps in selecting proper promotional techniques** – Marketing research helps organizations in selecting appropriate marketing and promotional technique and also facilitates decision making while identifying and selecting proper media channels for advertising.
4. **Helps in evaluating marketing performance** – Market research help companies in evaluating their market performance in terms of the decisions taken with respect to pricing of the product, its packaging, promotional methods and techniques used etc.

## **RESEARCH REPORTS**

Research reports are documents that present the overall research work in a systematic and comprehensive manner that allows organizations and decision makers to make sound business decisions. Written and oral, reports can come in all sizes, shapes, and lengths. The nature of the problem studied, how it was studied, and the company's identity will influence the type of report to be prepared. The length of a report on qualitative research, for example, can run from as short as eight pages to more than 100 pages, and is influenced by learning garnered, company's requirements, writing style, and formatting. Also, it is important to remember that for many projects two reports are prepared. There is always need for a report to management. This so-called popular report tries to minimize technical details and puts a premium on simplicity. Quiet, frequently, the simpler reports written in the marketer's language are most understood, read, and, thus, acted upon. However, there also may be a need for a more detailed *technical* report. This type of report can be a valuable resource for researchers, as well as managers, for future studies.

There are two key dimensions to the report-writing process: (a) rigorous analysis of the data; and (b) the report writing. Analysis in been generally defined as the presentation of the data obtained to provide useful and meaningful insights into the problem at hand. Writing takes the learning and expresses it in a coherent, logical, and succinct way (Greenberg, 1999). For both analysis and writing there are many ways in which data can be presented visually.

Successful report breathes life into the statistical and logical findings and wins the acceptance of those who will translate the findings into action. The report serves three main functions. First, it is the means whereby the data, analyses, and findings are placed in an organized and permanent form. It serves as an essential reference for future research along related lines. Second, the quality of the research work is likely to be judged mainly by the report. The key decision-making persons whom the research serves seldom have much personal contact with a researcher within their firm and still less with an outside research agency. Since the report is their index of the researcher's skill and performance, the time, thought, and effort spent on it are vital to his or her future.

Third, and most important, the effectiveness of the report may determine the action taken. Properly organized and lucid reports lead to appropriate action or policies which is the goal of all commercial or administrative research. In urgent situations, the convincing reports may inspire decision makers to promptness.

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## 20.4 ADVANTAGES OF WRITING RESEARCH REPORTS

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- **Report facilitates comprehensive and accurate information** – a research report gives you comprehensive and accurate information about a particular problem, matter or subject. This information is well structured and can be retrieved any time and used for decision making.
- **It is an effective means of communication** – Research report is quite an effective means of communication not only for the stakeholders outside the organization but also for employees within the organization. It can also be used as a tool for giving feedback and guidance.
- **Report writing enables effective planning and sound decision making** – One of the biggest advantage of writing reports is that it enables and facilitates effective planning within the organization and helps decision makers in taking sound business decisions.
- **Helps in making well defined organizational policies** – Reports pertaining to employees are extremely useful in making policies regarding leaves, absenteeism, promotion, training and other welfare related issues of the employees.
- **Provides information to shareholders** – Reports like annual reports, annual general meeting report, special reports etc are very useful in providing important information to the shareholders of the company.

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## 20.5 TYPES OF REPORTS

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To write an effective report, it is essential to plan its contents well. Each report is a tailor-made job that is adapted to the very nature of the problem, the information contained therein, and to the thought modes and preferences of those who will be utilizing the report. Progress Reports, are submitted when administrators want intermediate statements on progress of a project under way, but these are mere memoranda. The findings may be reported in any or all of these forms:

1. **Basic report:** This is the first report prepared on the project's findings, written by the researcher for his or her own use, composed of working papers and preliminary drafts. It provides the basis for the final report and then becomes a record for the files.
2. **Reports for publication:** Often such reports are prepared from research findings for articles in trade and professional journals, popular magazines, bulletins, or monographs. Publications and their audiences vary, so no single description can cover this category of

report. Normally, these are relatively condensed reports and only in very technical periodicals or special monographs would much detail on procedures be included.

3. **Technical reports:** These reports are usually intended for scientific or technically trained persons. They would be interested typically in specific descriptions of the entire procedures employed, which usually would follow the initial description and introduction of the problem and hypotheses researched. These reports may have complicated technical appendices.

4. **Reports for executives:** These are reports intended for decision makers. These are the busy people who want only the summary of the research project, its findings, recommendations and conclusion

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## 20.6 CRITERIA FOR A GOOD REPORT

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Before turning to what should be included in the report and what the format for presentation should be, we turn to a brief discussion of the criteria for a good report. The most basic criterion is how well the report communicates with the reader. Was the communication effective, in the way defined previously? Practitioners believe that reports written with clarity, brevity, and concreteness get action and commitment. The major concerns are that a research report be *complete*, *accurate*, *concise*, and *clear* in what is being said. All these are a reflection of writing style.

### *Completeness*

A report is complete when it gives all the needed information in a language understood by the intended audience. The writing must be done on the level of the reader's understanding;

This is fundamental! A report may be incomplete because it is too long *or* too short. Not all information obtained is significant or relevant enough to be reported. In the end, completeness is always defined by the person(s) who will be reading the report and asked to act upon it.

### *Accuracy*

Obviously, accuracy is related to completeness. But it goes further. A report may not be completely accurate because the data (or the information in general) upon which it is based are not accurate. There may have been flaws in research design, measurement and scaling, sampling, and analysis that led to inaccurate results being presented. In addition, carelessness in handling data, interpretation of analyses, or writing style may also lead to inaccuracy. The preparation of a research report calls for attention to detail, including attention to the meaning of every word used, punctuation, and so forth.

### ***Conciseness***

Being concise means being selective. Thus, as we said above, not all information obtained needs to be reported. When writing a report, one should write not only so the reader can understand, but can also do so as quickly and easily as possible. Conciseness refers to what is included and how it is included. Sentences should be kept as short as possible. A concise report is not the same as a brief report. A brief report usually contains only the highlights or base essentials of what the researcher has to report. In contrast, a concise report may contain any amount of detail and be very long. A concise report may be very complete. But it is efficient; that is, it conveys all the researcher wants to present in the shortest, most direct way.

### ***Clarity***

Clarity may be the most misunderstood criterion for evaluating a research report. Clarity derives from clear and logical thinking and organization. Clarity involves connections between words, sentences, paragraphs, topics, or ideas. There is always some logical connection between, say, a topic or idea and the one that preceded it. For example, there are different structural ways to organize material in a logical framework, as illustrated in the list below:

1. **Time order.** Ideas are presented in chronological time, either forward or backward.
2. **Space order.** The relationship among places and locations determines organization.
3. **Cause and effect.** Cause may precede effect or the opposite may hold. A report may stress one or the other.
4. **Increasing difficulty.** Structure involves going from the simple to the complex or from the familiar to the unfamiliar, useful when the audience lacks expertise in the topic.
5. **Established category.** When a basic framework is understood, content can be organized in recognized categories. In a market segmentation report, using accepted categories for any of the demographic bases is useful.
6. **Comparison or contrast.** Readers grasp differences or similarities more easily when this structural organization is used.
7. **Pros and cons order.** Presenting arguments for and against something, usually without favoring one or the other is another common structure.

The most important rule is that the report be well organized. At the same time, it must be written clearly. This means that researchers who prepare reports should develop a writing

style conducive to clarity in presentation. Many different sets of rules for clear writing are available. Most say the same things, but perhaps in different ways. One such set is shown in Exhibit 1.

### **EXHIBIT 1. Some Rules for Developing a Writing Style**

1. **Use concrete words.** Such words are clear and specific. Be willing to specify, itemize, give details or examples, define, and illustrate.
2. **Keep sentences short.** Shorter sentences usually are more readable, all other things being equal. Lengthy sentences are more likely to cause confusion or complexity.
3. **Vary sentence types and structures.** Use declarative (assertion), interrogative (question), imperative (command) and exclamatory sentences. Do not limit a report, but use all types where appropriate. Also, vary structure among simple, compound, complex, and compound complex sentences. Varying sentence types and structure increases interest and reduces monotony.
4. **Maintain unity.** Try to build each paragraph around one idea or topic.
5. **Use active verbs.** Active sentences tend to be more forceful and more direct. This does not mean that the passive voice should never be used. Use it sparingly, however.
6. **Avoid wordiness.** Say what is to be said in as few words as possible.
7. **Use varying means of emphasis.** There are different ways to emphasize certain points made in the report: space, repetition, position, and mechanical means (e.g., arrows, color, or underscoring).
8. **Write and speak naturally.** Often it is difficult to identify what is natural. A helpful guide is to use conversational language, but this is only a guide.
9. **Write on the level of readers' understanding.** Do not overestimate the reader's understanding and confuse him or her with highly specialized technical jargon. Also, do not underestimate the reader by using overly simplistic and childish terms.
10. **Watch the pace.** Avoid trying to say too much in too few words. In the same light, it is bad to stretch out an idea by using too many words.
11. **Keep the tone appropriate.** The way in which words are put together says a great deal about the writer. Thus, tone of writing implies something about the personality of the writer and of the writer's organization or company. While it is rare for a person to have complete control of the tone of his or her expression, it is indispensable to acknowledge that it has many shades: positive or negative, helpful or indifferent, courteous or impertinent, humble or arrogant, and so forth.



### Check Your Progress- A

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**Q1. How do we define a research report?**

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**Q2. Explain the various types of research reports.**

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**Q3. Which of the following is a criterion of a good research report?**

- a) Brevity   b) Clarity   c) Varied Structure

**Q4. Fill in the Blanks with appropriate word or words.**

- i. Accuracy of research report is related to its \_\_\_\_\_.

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## 20.7 CONTENTS OF A RESEARCH REPORT

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It is extremely important for the researcher to keep in mind that his/her research report should contain following things:

1. Clearly defined purpose of the research study undertaken
2. Significance of the research study
3. Literature Review
4. Methodology used for carrying out the research work
5. Data Interpretation
6. Valid conclusion and recommendations
7. Bibliography and Annexure

All these points can be discussed as follows-

1. **Purpose of the Research Study** – It is very important for the researcher to clearly define the purpose of the research work being undertaken by him/her. A clearly defined purpose is extremely important to keep the pace and direction of the research work intact and in one direction. Researcher must also formulate and propose valid hypothesis statements indicating the exact nature of the research problem.
2. **Significance of the research study** – Once the purpose of the research study is been defined by the researcher, next comes the significance of the research work. Researcher will be able to explain and present the significance of his research work only when he/she has gone through the research work of several other authors/researchers and tried to identify gaps in the existing work which can be filled through his/her research work.
3. **Literature Review** – Clear and thorough study of earlier research work is absolutely indispensable for the successful completion of the research study. Literature review helps the researcher in getting relevant guidelines for his research work. Researcher should enlist the information gathered through literature review in a systematic manner – **author/researcher, title of his/her research, publication year, objectives and conclusions.**
4. **Methodology used in the research work** – Methodology primarily refers to the method of data collection, scales of measurement used, sampling methods and techniques employed etc. All these elements are necessary for the researcher to keep in mind because accordingly it will help him/her in designing a valid questionnaire for his research study.
5. **Data Interpretation** – Data analysis and its interpretation is an important step in the research process. The data analyzed must be tabulated and presented in a systematic manner. The researcher has to be selective in interpreting and presenting data. Everything is not essential to be analyzed and presented in the research report.
6. **Valid Conclusions and Recommendations** – Another important part of research report is the conclusion and the recommendation part which is usually presented in the later part of the report once the data analysis and interpretation is complete. Conclusion is extremely important as it presents the entire summary of the research work in a short and crisp manner. That helps the reader to gauge through the research work in a one go. Recommendations on the other hand are vital for any research work. There has to be some valid recommendations which a researcher must give to highlight areas of improvement and how things can be improved for future directives.
7. **Bibliography and Annexure** – The list of references must be systematically and alphabetically arranged. The pattern of presentation of bibliography must be according to the satisfaction and convenience of the reader.

Annexure must be used to place a copy of the questionnaire used. Researcher may also used appendices to present all other tabular data and information used during the research process.

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## **20.8 RESEARCH PROPOSAL**

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The research proposal is a document containing points of importance and other relevant information regarding a particular research work. It is a valid rationale for a researcher to undertake a research project. The research proposal should be written in such a manner that it is persuasive in nature, easy to understand and comprehend by the reader and absolutely thorough and comprehensive in its analysis. The marketing research proposal's foremost objective is to state the various questions that the research work will attempt to answer. The proposal may attempt to answer questions like – introducing a new product or service in the market, determining why sales are falling for a particular product category, understanding why a particular brand is losing its significance in the market etc. The research proposal should clearly describe the usefulness and importance of the research work and what gaps it will try to fill. Ideally, it should also include tentative details of the total cost (if involved) of the research work.

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## **20.9 ESSENTIAL ELEMENTS OF RESEARCH PROPOSAL**

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### **Opening Title Page**

A good title page should be the opening highlight of your research work. For a reader, it is the first impression on his/her mind and a researcher must try hard to leave an indelible expression on the minds of the reader. Title page is also important in the sense that it provides focus and direction for your research work. A key to write an impressive title page is the choice of words and syntax used, arrangement of the matter and its overall presentation.

### **Introduction**

The most important part of any research proposal is its introduction. In fact it is so crucial that it guarantees success or failure of your research proposal in terms of its acceptance or rejection. A good introduction gets the attention of the reader and ensures that they will stay with you throughout the research proposal. Introduction must be written in such a manner that it discusses the importance of the research work and tries to present the research problem or issue in a lucid manner. In majority of the cases, introduction may also serve the purpose of an argument that validates the need of the research study and which gives a practical and clear insight of your research intentions. It is imperative for a researcher to understand the inherent significance of writing a good introduction so that the chances of your research proposals acceptance can be enhanced.

### **Statement of the Problem**

Statement of the problem is important to be kept in the research proposal as it determines the clarity of the research study being undertaken. It should state – what are you going to study,

whether your investigation is experimental or non-experimental and what the ultimate purpose of your research study is.

### **Purpose of the Study**

Next in line while writing a research proposal is a well defined purpose of study. Purpose of study should be written in such a manner that it clearly presents why and for what reason this research work is being undertaken. This describes the goals and objectives that are targeted by the researcher and the outcomes that he/she intends to achieve.

### **Review of Literature**

Review of literature is essential because it allows you to have a broad idea of what is already existing and known in a particular field and what are the pertinent questions that are still unanswered. This process further assists the researcher in narrowing down the actual problem of investigation and will highlight all supporting theories and concepts that exist in support of developing a valid hypothesis by the researcher. Thorough review of literature is also important for understanding how relevant your research is in the current context and what additional it will contribute in the sphere of future research activities.

### **Questions or Hypotheses**

Questions and hypotheses are generally defined as those explanations which are testable and proposed before the methodology of the research work is being conducted. Though research questions and hypotheses are different in their structure and purpose, they both seek to predict and establish relationships. For a researcher to decide whether to use questions or hypotheses it is important for him/her to rely on facts such as purpose of the research work, research approach and methodology and the targeted audience /readers of the research work.

A research question proposes a distinctive relationship between two or more variables. A research question is always structured in nature and tries to find answers that have immense implication and usage for future course of actions.

Broadly speaking, there are three types of research questions-

- First one is the **descriptive** research question that seeks to identify and clearly describe a particular phenomenon.
- Second is the **differences** research question that asks if there is any difference between groups on some particular phenomenon.
- And third is the **relationship** question that tries to ask if two or more phenomena are related in some particular manner or not.

All the elements described above makes a proper and well defined research proposal. Some of the contents may vary according to the need and scope of the research but generally majority of them remains the same.

Some authors in the field of marketing research also lay emphasis on the need of presenting the research work in a systematic layout. **Layout** is generally been defined as the

arrangement of the entire research work and research content in a proper and sequential manner. In other words, a research layout is generally defined what a research work should include and in what manner it should be presented. Basic elements of contents of a well defined layout includes –

- A preliminary page
- Main text
- End or final matter

**Preliminary Page** – Just like the opening title page of the research proposal, a well written preliminary page is absolutely inconsequential for a good research work. It sets the pace and tone of the research work and allows the researcher to focus on the research work in a systematic manner. Another usefulness of the preliminary page is that it binds the reader and keeps him/her glued to the research content. Generally what happens is that a normal reader loses interest after some time in the research work owing to number of reasons, but a good preliminary page solves that problem to a large extent.

**Main text** – Main text is what the total research work is all about. It includes the entire work that a researcher has done in his/her study. Main text too has different components like – Introduction, Review of Literature, Data Analysis, Research Methodology, Findings and Conclusion etc.

**End Matter** – End matter comprises of all those things that are to be included in the latter stages of the research work like recommendations, limitations, bibliography, appendices and annexure etc.

### **Hypotheses Testing** (Statistical method)

When a researcher finds probable correlation between two studied or observed phenomena, the hypotheses that a relationship between them exists cannot be examined or analysed in the same manner one may propose a new concept or a new law of nature. In such cases, if the analyses and tests show no effect then it is not to be construed that the hypotheses is false. In such cases statistical methods of hypotheses testing are used to determine the likelihood of the overall effect. If that likelihood is sufficiently small (less than 1%), it may be assumed that a relation exist. Otherwise, any observed effect may have occurred randomly by chance.

In the use of statistical hypothesis testing, two hypotheses are generally compared. These are referred as the null hypotheses and the alternate hypotheses. A null hypotheses is defined as that hypotheses in which there is absolutely no relation between the phenomena whose relationship is under observation. Alternate hypotheses, as the name suggests is the alternative to the null hypotheses; it states that there is some kind of relation between the observed phenomena.

The alternative hypotheses may be of several forms, depending on the nature of the hypothesized relation; generally, it can be two-sided (effect is there but the direction is unknown) or one sided (direction of hypothesized relation – whether positive or negative is

fixed in advance). Generally, the significance levels for testing the hypotheses are .10, .05 and .01. Which hypotheses is accepted and which is rejected must be determine in advance, before the observations are collected or inspected. If these criteria are left for determination afterwards, the test is invalid.

The entire process mentioned above is dependent on the number of the participants included in the research study. For example, the sample size may be too small to reject a null hypotheses and in such cases it is highly recommended to specify the sample size in the beginning itself.



***Check Your Progress- B***

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**Q1. What are the contents of a Research Report?**

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**Q2. Enumerate the various elements of the layout of a research report.**

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**Q3. Define Research proposal.**

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**Q4. What is the significance of statistical hypotheses testing?**

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## 20.10 SUMMARY

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Marketing Research is an extremely useful and important subject of study that has wide applications and used in all areas of marketing. Research, be it of any form provides valuable insights into any matter of consideration and allows you to take better decisions which guarantee success in future. Marketing Research is used by Marketing Managers for taking decisions regarding – launching of new products and services in the market, analyzing situations of demand and supply, understanding consumer behaviour, measuring brand preference etc.

Over the period of years, the importance of marketing research has increased tremendously. Various factors behind this are – rapid changes in the tastes and preferences of consumers regarding products and services used by them, increased proliferation of foreign players eventually making the market place more competitive and difficult to survive, decrease in the shelf life of products and services (especially in the case of technological product category) etc. All these factors have forced strategic planners and experts to put a lot of premium of marketing research so that they are in a position to assess the marketing environment and situation in a better way and take relevant and profitable business decisions.

Significantly adding to the expanding horizon of marketing research is the introduction of new technologically advance interventions like big data, data analytics and use of artificial intelligence that have improved the quality of decision making by business organizations in a much better and refined way.



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## 20.11 GLOSSARY

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**Research** - research is a process of steps used to collect and analyze information to increase our understanding of a topic or issue.

**Research reports** - Research reports are documents that present the overall research work in a systematic and comprehensive manner that allows organizations and decision makers to make sound business decisions.

**Basic report:** This is the first report prepared on the project's findings, written by the researcher for his or her own use, composed of working papers and preliminary drafts.

**Technical reports:** These reports are usually intended for scientific or technically trained persons. They would be interested typically in specific descriptions of the entire procedures employed, which usually would follow the introduction of the problem and hypotheses researched. These reports may have complicated technical appendices.




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## 20.12 ANSWERS TO CHECK YOUR PROGRESS

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### Check Your Progress –A

Q3. Clarity

Q4. Completeness




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## 20.13 REFERENCES

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## 20.15 TERMINAL QUESTIONS

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Q1. Carrying out a research work requires optimum amount of expertise and dexterity on the part of the researcher. It is very important for a researcher to carry out the research work in a systematic manner so that the findings and the results of the research work can be used in a proper and effective manner by the organization.

**In the light of the information provided in the above paragraph, explain in details the various elements to be used by the researcher to carry out a proper research study.**

Q2. Research Reports are an effective tool for business organizations to take sound and logical business decisions. Therefore, it is advisable that the research work must be presented in such a manner that is easy to comprehend by all levels of management.

**Explain the significance of the process of report writing. Also explain the various points a researcher should keep in mind while writing a research report.**

Q3. Research proposal is an important component of any research work. It sets the pace of the research study and communicates the relevance of the research work to the reader.

**What are the various elements of an effective research proposal? Also explain the due importance of a well written research proposal.**

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## **UNIT 21 RESEARCH REPORT PREPARATION AND PRESENTATION-II**

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### **21.1 Introduction**

### **21.2 Objectives**

### **21.3 About Research Report**

### **21.4 Structure of Research Report**

### **21.5 Sample Structure**

### **21.6 Literature Review**

### **21.7 Research Question**

### **21.8 Referencing**

### **21.9 Preparation of Report**

### **21.10 Features of a good report**

### **21.11 Summary**

### **21.12 Glossary**

### **21.13 Answers to check your Progress**

### **21.14 References**

### **21.15 Suggested Readings**

### **21.16 Terminal Questions**

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## **21.1 INTRODUCTION**

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The ultimate task of any research work or market analysis is to summarise and present the research outcomes in the format of a written report. In the earlier modules, you might have had an insight into the techniques of various analytical techniques. In this unit, we will explore how to draft quality research reports to present and substantiate your findings. The various components of a report and the approach to writing them will be discussed in this unit.

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## 21.2 OBJECTIVES

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Upon successful completion of this unit you should be able to:

- Understand the significance of a proper research report.
- Appreciate the significance of literature review and how to undertake it.
- Prepare a well structured report to present any research work.
- Assess your own contribution to the existing literature.

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## 21.3 ABOUT RESEARCH REPORT

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Research reports are usually a comprehensive and accurate draft of the conducted studies which have achieved it's objective to identify or solve a research issue.

Research report drafting is mostly a written work of the research evidences in a manner and structure which can be easily be understood by the reader and also confirms the legitimacy of the conclusions.

As per American Marketing Society, “the purpose of a research report is to communicate the reader the complete result of the research in appropriate detail and to make the reader understand the data and to verify himself the validity of the conclusions. It disseminates knowledge and presents the findings by a research to others. It can also serve to check the validity of the generalizations and to motivate other researchers to conduct research on the same or related topic.”

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## 21.4 STRUCTURE OF RESEARCH REPORT

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Irrespective of the field of study, the basic elements of any research report remains the same. Generally, a research report, whether it is called dissertation or thesis, has three parts:

1. Introduction
2. Review of Literature
3. Research Methods
4. Results or Findings
5. Discussion and Conclusion

Each of the different parts and sections will have further subsections based upon the requirement. We will now briefly discuss the content of each of these sections:

### Part I –Preliminary Pages

- Cover Page (optional)
- **Preface**

- **Abstractor Executive Summary**

**Part II – Main Body**Section 1:**Introduction**

- Introduction to the study
- Supportive statistical findings
- Statement of Purpose
- Significance of Research

**Research question(s) or hypotheses**

- Research questions (qualitative)
- A quantitative-based research hypothesis(s)

Section 2:**Review of Literature**

- It should include various published literature relevant to your research problem.
- The literature mentioned should adequately support your study with reliable evidences.
- The literature review should be in a form of a synthesis, not just summaries of individual publication.

Section 3:**Research Methods**

- Data Collection: Describe data collection method and procedures
- Data Sample: Describe the dataset, including their demographics
- Research Setting: Describe the research environmental setting, if applicable.
- Data Collection Instrument: Describe, in detail, how the researcher used the data collection instrument; Describe the advantages and limitations associated with the used instrument.
- Data Analysis: Describe type of procedure of analyses (statistical tests, qualitative analysis used) and the softwares (e.g. SPSS, E-Views for statistical tests).

Section 4**Findings and Conclusions**

- Mention Research Questions (Quantitative); Describe and compare with actual results
- Mention Research Questions (Qualitative); Describe and compare with actual results...

**Discussion**

- Discuss Research Questions once again and explain:
  - how the results answer the overall research question.
  - how the results confirm or contrast the literature the researcher has cited.

**Recommendations** (if any)

**Limitations**

- Discuss the limitations of the research.
- Discuss the limitations of Research Design, Sampling, Instrument

**Conclusion** (A brief closing summary)

**Part III – References**

**References** (Chicago or Harvard style can be used)

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## 21.5 SAMPLE STRUCTURE

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Outlined below is a sample format of a general research report, highlighting all the key sections and the subsections.

*Part I: Preliminary*

- Cover page
- Acknowledgement
- Preface
- Table of Content
- List of Tables
- List of figures
- List of Abbreviation

*Part II: Main Body*

### 1. Introduction

- Background
- Problem Statement
- Purpose and objectives
- Research Questions
- Definition of Terms
- Significance of the study

## 2. Literature Review

- Summary of literature
- Theoretical Framework
- Hypotheses

## 3. Research Methodology

- Research Design
- Variables and Measurements
- Questionnaire (if applicable)
- Population and selection of Sample
- Scope of the study
- Data analysis method

## 4. Data Collection and Analysis

- Goodness of Measure
  - Representativeness of data
  - Reliability test
  - Validity test
- Inferential analysis
  - Descriptive analysis
  - Test of relationship
    - Correlation analysis
    - Hypothesis testing
  - Test of difference

## 5. Discussion and conclusion

- Summary of major findings
- Discussion
- Implications of the study
  - Theoretical
  - Practical
- Limitation
- Recommendation for future research

### *Part III – References*

The reference material is generally divided as follows

- ⊙ Bibliography (Chicago or Harvard Style)
- ⊙ Appendices
- ⊙ Glossary of terms
- ⊙ Index

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## 21.6 LITERATURE REVIEW

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The purposes of a literature review are:

- to explain the limitations of a research problem
- to establish the relation between your current research and previous knowledge and also to suggest areas of future research
- to present a systematic summary of finding research gap to avoid duplication of earlier researches.
- to analyse previously adopted research methods for similar researches.

The literature review is not a glossary of past researches in which a researcher explains each article that he has looked into. Despite the fact that a synopsis of read articles and research papers is contained inside the literature review, however its scope goes up to outlining past researches. It is essentially centered around a particular research domain or subject of interest that a researcher examines fundamentally and sets up connections among various portions of works identified with his exploration efforts. Writing literature review additionally gives a theoretical structure and basis for the research.

The literature review may act as a barometer to assess your own contribution to the existing pool of knowledge. A research can be ascribed as being good if there is a significant contribution to the existing literature.

### **Guidelines for Writing a Literature Review**

The complete procedure of writing a literature review can be organized as a three-part approach as follows:

Steps 1: Exploring and listing the relevant literature

Steps 2: Analyzing and Organizing

Steps 3: Citing and Writing

*Examples:*

Although Trescothick (2001) argues that attack is the best form of defence, Boycott (1969) claims that ...

In a field study carried out amongst the homeless of Sydney, Warne (1999) found that ...

Please note that the literature review will be judged in the context of your completed research. The review needs to further the reader's understanding of the problem and whether it provides a rationale for your research.

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## 21.7 RESEARCH QUESTION

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A research question is an important part of a research report. It primarily aims at the core of research study, helps the researcher to choose appropriate research methodology, and helps at all stages of research, analysis, and presentation.

The research question should begin with a *research problem*, and should focus on the issues such as:

- Issues of concern
- Situations that need improvement
- Difficulties that need solutions
- Answers to the crucial issues

Research Questions should be:

- Should add value to investigator
- Should add to existing body of knowledge
- Should improve practice
- Should improve the human situations

Features of a good research question:

- Feasible.
- Clear.
- Significant.
- Ethical.

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## 21.8 REFERENCING

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References are not used basically to dodge plagiarism; they have other basic parts also. Referencing empowers you to perceive the opinion of various researchers in your work. Any school assignments that draw on the ideas, words or research of various researchers must contain references. Referencing is also a way to deal with offer credit to the researchers from whom you have acquired words and contemplations. By referring to the work by a particular specialist you perceive and respect the secured advancement benefits of that expert. As a student (or an academic) you can draw on any of the countless, bits of information and disputes disseminated by various researchers, countless have contributed years asking about and forming. You ought to just perceive their sense of duty in your research work.

Referencing is a way to deal with offer evidence to help the statements and claims in your own assignments. By referring specialists in your field, you are exhibiting your level that you think about the field in which you are working. Your references portray your work, and empower you to investigate your way through your picked field of study. References in a

manner make your composed work all the more capable. The best way to deal with references is to keep them exact. It is a record of the extensive number of sources you used while scrutinizing and investigating for an assignment.

Examples of Referenced Sources:

**One author**

Michael Pollan, *The Omnivore's Dilemma: A Natural History of Four Meals* (New York: Penguin, 2006), 99–100.

**Two or more authors**

Geoffrey C. Ward and Ken Burns, *The War: An Intimate History, 1941–1945* (New York: Knopf, 2007), 52.

**Four or more authors**

List all of the authors in the bibliography; in the note, list only the first author, followed by et al. (“and others”):

Dana Barnes et al., *Plastics: Essays on American Corporate Ascendance in the 1960s . . .*

**Editor**, translator, or compiler *instead* of author

Richmond Lattimore, trans., *The Iliad of Homer* (Chicago: University of Chicago Press, 1951), 91–92.

**Editor**, translator, or compiler *in addition* to author

Gabriel García Márquez, *Love in the Time of Cholera*, trans. Edith Grossman (London: Cape, 1988), 242–55.

**Chapter** or other part of a book

John D. Kelly, “Seeing Red: Mao Fetishism, Pax Americana, and the Moral Economy of War,” in *Anthropology and Global Counterinsurgency*, ed. John D. Kelly et al. (Chicago: University of Chicago Press, 2010), 77.

**Book published electronically**

If a book is available in more than one format, cite the version you consulted. For books consulted online, list a URL; also include an access date. If no fixed page numbers are available, you can include a section title or a chapter or other number.

1. Jane Austen, *Pride and Prejudice* (New York: Penguin Classics, 2007), Kindle edition.
2. Philip B. Kurland and Ralph Lerner, eds., *The Founders' Constitution* (Chicago: University of Chicago Press, 1987), accessed February 28, 2010, <http://press-pubs.uchicago.edu/founders/>.

**Journal article**

In a note, list the specific page numbers consulted, if any. In the bibliography, list the page range for the whole article.

Joshua I. Weinstein, “The Market in Plato’s Republic,” *Classical Philology* 104 (2009): 440.

### ***Article in a newspaper or popular magazine***

Newspaper and magazine articles may be cited in running text (“As Sheryl Stolberg and Robert Pear noted in a New York Times article on February 27, 2010, . . .”) instead of in a note, and they are commonly omitted from a bibliography. The following examples show the more formal versions of the citations. If you consulted the article online, include a URL; include an access date only if your publisher or discipline requires one. If no author is identified, begin the citation with the article title.

1. Daniel Mendelsohn, “But Enough about Me,” *New Yorker*, January 25, 2010, 68.
2. Sheryl Gay Stolberg and Robert Pear, “Wary Centrists Posing Challenge in Health Care Vote,” *New York Times*, February 27, 2010, accessed February 28, 2010, <http://www.nytimes.com/2010/02/28/us/politics/28health.html>.

### ***Website***

A citation to website content can often be limited to a mention in the text or in a note (“As of July 19, 2008, the McDonald’s Corporation listed on its website . . .”). If a more formal citation is desired, it may be styled as in the examples below. Because such content is subject to change, include an access date or, if available, a date that the site was last modified.

1. “Google Privacy Policy,” last modified March 11, 2009, <http://www.google.com/intl/en/privacypolicy.html>.
2. “McDonald’s Happy Meal Toy Safety Facts,” McDonald’s Corporation, accessed July 19, 2008, <http://www.mcdonalds.com/corp/about/factsheets.html>.

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## **21.9 PREPARATION OF REPORTS**

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For preparations or drafting of reports broadly three steps are involved:

### **I. First Draft:**

After a broad literature review, the researcher ought to continue with the principal draft. The researcher ought to guarantee that there is completeness or totality of actualities. These realities gathered will likewise should be tried for exactness or accuracy. A filtering should be done to hold the ones important for your exploration to guarantee that there is rationality of actualities and thoughts.

### **II. Second Draft:**

The researcher should give the primary draft, at this stage, a shape so it can be discernable, clear and clear. Extensive trimming or altering should be done to make the written work exact, concise and brief. At long last, at the second draft arrange, basic assessment should be made of the sum total of what that has been composed realities, discoveries, conclusions and proposals.

### III. Final Report:

The last stage in drafting is the arrangements of conclusive report. It focuses principally on the complete and last touches, i.e., on documentation and clean to make the report profound, legitimate, persuading and alluring. Documentation showed the references to the sources, different past and ebb and flow work and view, extra information and exchange and recommended additionally perusing on the particular issue as took care of by the researcher. As such, it demonstrated the careful quality of the examination and on the other a manual for additionally works.



#### *Check Your Progress- A*

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#### Q1. Multiple Choice Questions

- i. Which of the following generally comprise of the five major sections in a research report?**
  - a. Introduction
  - b. Literature Review
  - c. Methods
  - d. All of the above
  
- ii. The abstract of a report is a:**
  - a. detailed description of the results
  - b. basic summary of the report
  - c. survey of the existing literature
  - d. none of the above
  
- iii. Which of the following is not an objective of this unit?**
  - a. Develop new statistical tools for analyzing data.
  - b. Appreciate the significance of literature review and how to undertake it.
  - c. Prepare a well-structured report to present any research work.
  - d. Assess your own contribution to the existing literature.

**iv. Which of the following is not a referencing style?**

- a. Detroit
- b. Harvard
- c. APA
- d. Chicago

**v. Which of the following is an example of a correct referencing?**

- a. Hayashi, Fumio and Watanabi, Ken, *Treatise on the art of poetry* (Tokyo: Akira, 2012), 77
- b. Hayashi, Fumio and Watanabi, Ken, *Treatise on the art of poetry* (Tokyo: Akira, 2012),77
- c. Fumio Hayashi and Ken Watanabi, *Treatise on the art of poetry* (Tokyo: Akira, 2012), 77
- d. Fumio Hayashi and Ken Watanabi, *Treatise on the art of poetry* (Tokyo: Akira, 2012), 77

**Q2. Briefly discuss the importance of in-text referencing.**

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**Q3. Outline the three steps in preparing a research report.**

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**Q4. How might literature review help in building your own research report?**

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**Q5. Discuss the different methods of experimental design.**

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**21.10 FEATURES OF A GOOD REPORT**

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**1. Attractive:**

The research report should be chosen such that it is attractive not just to write, but to read as well. It is very important to finalise on a good topic to work on. The rest of the work depends on how attractive the topic selected is.

**2. Clear Topic:**

The topic selected has to be lucid. The objective of the research needs to be clearly stated and all the sections through to the conclusion, should be an extension to explain and address the objective. Clarity on the objective will translate into clarity in the rest of the research itself.

**3. Balanced Language:**

Language also plays a key role into adding the essence into research. The way the research is written will to a large extent affect the reception of work. The language should be tailored as per the intended audience. If the intended audience are the experts in the given field, on which the research is written, the language will have to be sophisticated enough, with all the subject specific jargons, to appeal to them. At the other extreme, if the intended audience are those who have little or no domain knowledge, the language has to be simple enough to convey all the pertinent details. The broad rule of thumb is to try and keep the language simple, but at the same time not too simplistic to deter the interest of the subject experts as well. A balance needs to be struck between these two extremes.

**4. No repetition of facts:**

Though it might seem like a good idea to repeat the facts to emphasise on specific points, this is not the sign of a good report. Repetition of facts can be interpreted as a feeble attempt to elongate the report. Repetition of facts can also be interpreted as the lack of concrete research work.

**5. Statement of scientific facts:**

A good research will contain citations to support the facts or ideas discussed in the research report. Statement of scientific facts attests a level of authenticity of the

research done, as well as the report written. However, one needs to provide citations wherever one is discussing these facts to avoid plagiarism.

6. Practicability:

Though in theory research can be on any theme imaginable, for practical purposes, the research needs to have an implementation or some practical use. Research on abstract concept which does not really have any practical applications cannot be deemed as good research. Also, the conclusions or recommendations provided will need to have some way of practically and viably implementing them.

7. Description of the difficulties and the shortcomings:

Research is continuous process to understand things and to subsequently increase and improve our understanding of them. Therefore, in the face of a continuously evolving system of research and our own understanding of it, it is important to list down the difficulties, limitations and shortcomings of the research. This will allow the subsequent research in the topic to identify and possible overcome the hurdles as the processes improve.

8. Review of literature:

At the core of all the research work is the contribution being made to the existing pool of knowledge. The hallmark of a good research is contribution to the existing literature. In order to identify how best one can add to the literature, a review of literature is of utmost importance. A good researcher would want to identify the gaps in the existing literature and work to fill those gaps rather than rework on something already existing in the literature.

9. Treatment of quotations:

In a research report it is very important to distinguish your ideas or conclusions from those of others. A way of doing this is by providing citations for facts or viewpoints of others. Providing citations will also help avoid plagiarism as in this case, someone else's idea is not passed off as one's own. Providing citations also lends some extent of authenticity to the research done. In-text citations and footnotes are good reporting practice.

10. Structure:

The research report is the presentation of the research work undertaken. It is therefore a challenge to the researcher to present the report in a systematic and comprehensive manner. Thus in order to best present the research work there is a need for it to have a proper structure to discuss all the elements and aspects of the research undertaken. The structure discussed in the earlier sections are the general formats that can be adopted for any field of study.

11. Use of Statistics, Charts and Graphs:

For most good research, there has to be some empirical evidence to support the theoretical discussion. These may just be as simple as just collating secondary data, or doing a primary research, or a detailed analysis using either. In any case, the data or the results will need to be presented in an easily comprehensible manner, in the form of tables or charts.

#### 12. Bibliography & Appendices:

As important as the main body of the report might be, the reference section is almost equally important. The bibliography contains a list of all references in the process of undertaking the research. The bibliography section acts as a pointer for further research on the theme. The appendices refer to the information alluded in the text. The tables, graphs and statistical output used in the main body of the report can be put in this section. This section provides a quick glance to the technical aspects of the report.

#### 13. Conclusions:

The conclusion section provides a closure to the research undertaken. The objective, which the research started with, is addressed in this section. The conclusion section will provide a summary of what was achieved through the research and also highlight the limitations or the gaps in the research. These might help in paving way for further future research.

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## 21.11 SUMMARY

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In this unit, you came to know about how to draft quality research reports to present and substantiate your findings. The various components of a report and the approach to writing them will be discussed in this unit. Research reports are usually a comprehensive and accurate draft of the conducted studies which have achieved its objective to identify or solve a research issue. Further, Research Report drafting is mostly a written work of the research evidences in a manner and structure which can be easily be understood by the reader and also confirms the legitimacy of the conclusions.



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## 21.12 GLOSSARY

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**Bibliography-** The bibliography contains a list of all references in the process of undertaking the research.

**Appendices-**The appendices refer to the information alluded in the text.

**Conclusions-** The conclusion section provides a closure to the research undertaken.



## 21.13 ANSWERS TO CHECK YOUR PROGRESS

### Check Your Progress-A

#### Q1. Multiple Choice Questions

- i. d All of the above
- ii. b basic summary of the report
- iii. a Develop new statistical tools for analyzing data.
- iv. a. Detroit
- v. c Fumio Hayashi and Ken Watanabi, *Treatise on the art of poetry* (Tokyo: Akira, 2012), 77



## 21.14 REFERENCES

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## 21.15 SUGGESTED READINGS

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1. Churchill, Marketing Research: Methodological Foundations, Cengage Learning, 2007
2. Zikmund, Essentials of Marketing Research, Cengage Learning, 2007
3. “Donald.R.Cooper and Pamila.S.Schindler”, Marketing Research Concept & Cases, TMH, 2006.
4. “Aaker , Kumar and Daj”, Marketing Research, 7th edition, Johnwiley, 2005.
5. “G.C.Beri”, Marketing Research, TMH, 2008.
6. “S.Shajahan”, Marketing Reasearch Concepts & Practices in India, Macmillan, 2004.
7. “David.J.Lick and Donald.S.Rubin”, Marketing Research, 7th edition, PHI, 2007.
8. ”Naresh.K.Machotra”, Marketing Research-An Applied Orientation, PHI, 2007.
9. “Parasuraman, Dhruv Grewal and R.Krishnan”, Marketing Research, Biztantra, 2007.



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## 21.16 TERMINAL QUESTIONS

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- Q1. Briefly outline the structure of research report.
- Q2. Discuss the purpose of literature review.
- Q3. Explain steps in writing a literature review.
- Q4. What is a research question?
- Q5. Explain the steps from Research Problem to Research Questions and Purpose.
- Q6. Discuss why referencing is important.
- Q7. Explain various styles of referencing with a common example across all styles.
- Q8. Discuss various characteristics of a good report.

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## **UNIT 22 INTERNATIONAL MARKETING RESEARCH**

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### **22.1 Introduction**

### **22.2 Objectives**

### **22.3 The EPRG Framework**

### **22.4 Scope of International Marketing Research**

### **22.5 Distinctions between Domestic and International Marketing Research**

### **22.6 Classification of International Marketing Research**

### **22.7 Information Requirement of International Marketing Research**

### **22.8 Organizing International Marketing Research**

### **22.9 Use of Secondary Data or Desk Research**

### **22.10 Collection of Primary Data**

### **22.11 Major Sources of Errors in International Surveys**

### **22.12 Problems in International Marketing Research**

### **22.13 Summary**

### **22.14 Glossary**

### **22.15 References**

### **22.16 Suggested Readings**

### **22.17 Terminal Questions**

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## **22.1 INTRODUCTION**

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Today companies are facing competition and challenges not only from the local competitors, but also from international players, and companies which were thought to be small and regional are giving tough competition to global players.

Companies expanding into unfamiliar and new markets needs in-depth and detail information about market demand, market conditions, social factors and other factors. Managers need information in order to develop strategies to expand in to unknown territories. Cultural diversities possessed by different markets make the task of managers more difficult and at the

same time signifies the need for updated information about changing lifestyle, different consumption patterns, fusion of cultural thoughts.

Advances in communication and information technology has further accelerating the pace of change, linking markets through flow of information, images and ideas across national boundaries, this makes it critical for management to keep abreast of changes and to collect timely and pertinent information to adapt strategy and market tactics in expanding markets.

As markets become more integrated worldwide, there is a growing need to conduct research spanning country boundaries, to identify regional or global segments, examine opportunities for integrating and better coordinating strategies in world markets, launching new global brands and developing effective global branding strategies.

All these factors highlight the importance of market research in international business or International Marketing Research (IMR).

International marketing research is the systematic design, collection, recording, analysis, interpretation, and reporting of information pertinent to a particular marketing decision facing a company operating internationally. IMR process calls for studying the various market characteristics for facilitating marketing decisions that can be taken across countries.

International marketing research can be defined in several ways. Kumar (2000) provided two useful definitions:

1. International marketing research = Market research conducted either simultaneously or sequentially to facilitate marketing decisions in more than one nation;
2. International marketing research = Comparative marketing research, with its principle focus being the systematic detection, identification, classification, measurement and interpretation of similarities and differences among entire national systems.

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## 22.2 OBJECTIVES

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After going through this unit you will be able to:

- Understand the significance of International Marketing Research.
- Identify the different types of International Marketing Research.
- Define scope and challenges in International Marketing Research.
- Understand different aspect of International Marketing Research.
- Differentiate between Domestic and International Marketing Research.
- Discuss problems faced in International Marketing Research.
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## 22.3 THE EPRG FRAMEWORK

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Companies in new century are focusing more on operating at global level rather than local level. The sophistication and complexity of the operations changes as the company steps into international markets.

The guidelines to manage international operations can be found in the EPRG framework. This framework identifies four types of orientations towards internationalization as the company expands into international markets. They are:

- a. Ethnocentrism – orientation towards home country
- b. Polycentrism – orientation towards host country
- c. Regiocentrism – regional orientation and,
- d. Geocentrism – world orientation

These attitudes reflect the goals and philosophies of the company and help in developing management strategies and planning procedures with regard to its international operations.

Companies begin by being Ethnocentric, i.e., they emphasize their domestic market in decision making. As experience and involvement in exporting is increasing, companies become Polycentric - they emphasize a host market in decision making. As the number of export markets increases, the company may become Regiocentric - emphasize a region (e.g. Asia, Middle East, Europe etc.) in decision making. Finally, Geocentric companies are worldwide oriented and emphasize both multiple markets and regions in decision making.

**In the ethnocentric stage**, the top management views domestic techniques and personnel as superior to foreign and as the most effective in overseas markets. The domestic company seeking sales extension of its domestic products into foreign markets illustrates this orientation. A company with this domestic market extension concept typically identifies markets where demand is similar to the home market and where its domestic product will be acceptable. Domestic business is its priority, even though foreign markets may be vigorously pursued, since company's orientation remains basically domestic. Marketing planning is conducted in the home country.

**A polycentric** attitude emerges once the company begins to recognize the importance of differences in overseas markets and the importance of its international sales to their organization, it becomes country-by-country oriented, i.e. it focuses on each export market separately. A company guided by this concept is of the view that country markets are vastly different and that, market requires an almost independent program for each country. The company also believes in using local personnel and techniques to suit the local market conditions. Affiliates operate independently of one another in establishing marketing objectives and plans, and domestic market and each of the host country markets have separate marketing mixes with little interaction among them. The company with such a multi-domestic market concept adapts its products without coordination with other country markets; its advertising campaigns, pricing and distribution decisions being localized.

**Regiocentrism** is a transitional phase between polycentric and geocentric orientation. The company views the similarities and differences between regions. The regiocentric orientation is a geocentric orientation that is limited to a region; that is, management will have a world view toward its region, but will regard the rest of the world with either an ethnocentric or a polycentric orientation, or a combination of the two.

In the regiocentric and geocentric stages, the company recognizes the regional commonalities and undertakes regional strategies by considering the region or the entire world as a potential market, ignoring national boundaries. The firm develops policies and organizes activities on a regional or worldwide basis. Firms using this global marketing concept design product lines, pricing decisions, promotions and the channels of distribution for regional or worldwide markets.

**Geocentrism** is based on the belief that it is possible to identify both similarities and differences and to formulate global marketing strategies fully responsive to local needs and wants. Geocentric company thinks globally and acts locally. It adopts a global strategy allowing it to minimize adaptation in countries to that which will actually add value to the country customer. This company does not adapt for the sake of adaptation. It only adapts to add value to the customer.

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## 22.4 SCOPE OF INTERNATIONAL MARKETING RESEARCH

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Effective and timely research is an essential tool for crafting strategy in a rapidly changing global marketplace. Research can aid in uncovering potential opportunities in international markets, in correctly positioning new products and formulating products for international markets, as well as in identifying appropriate advertising appeals and diagnosing potential issues in relation to other aspects of the marketing mix.

### 22.4.1 CORRECTLY POSITIONING NEW PRODUCTS

Research can help in correctly positioning new products. In China, PepsiCo was initially unsuccessful in introducing its Frito-Lay brand of potato chips into the market. Sales were particularly low in summer months. Research revealed that Chinese shoppers associated fried foods with *yang*, believed to generate body heat in summer months. As a result, Lay's introduced a 'cool lemon' variety in pastel-colored packaging to reflect *yin*, a cool feeling. The product subsequently became Lay's most successful in China.

### 22.4.2 AVOIDING PRODUCT FORMULATION ERRORS

Research can also help in uncovering how to reformulate products for local palates. HJ Heinz, for instance, wanted to market its oat-based baby food in China. Research showed that the Chinese were not familiar with oats and hence it was unlikely to be a popular food for babies. On the other hand, whitebait, a tiny fish, was discovered to be a staple food for infants in China. Heinz reformulated its baby food and produced a whitebait-oats combination. This proved to be an instant success among Chinese consumers.

### **22.4.3 SENSITIVITY TO GEOGRAPHICAL DIFFERENCES**

Costly mistakes can be avoided by consulting secondary data. Often it can be as simple as making sure that geography is politically correct. Microsoft launched Windows 95 in India with a color-coded map that did not show the disputed Jammu-Kashmir region as being part of India. As a result, Windows 95 was banned throughout India, leading to a substantial loss of sales, when Office 97 was launched, the color coding was eliminated and the company sold 100 000 copies.

### **22.4.4 UNDERSTANDING CULTURAL CHANGE**

Rapid changes around the world make it imperative that firms understand what consumers are thinking and how values are changing. To help its clients, McCann Erickson, the large global advertising agency, conducts marketing research in more than 40 countries simultaneously. The research allows it to understand each country's values from the consumers' perspective. The survey results help the agency determine the structure of consumption in each country, brand choice, lifestyles and media influence. Comparisons are made between sets of countries. This information helps spot trends and facilitates the creation of advertising.

### **22.4.5 IDENTIFYING APPROPRIATE ADVERTISING APPEALS**

The appropriateness of advertising appeals also needs to be assessed through research. An \$800 000 research project in 1997 in Brazil helped Coke identify a motherly female kangaroo as the advertising device mostly likely to appeal to women shopping for their families. The ads are themed 'Mom knows everything' and feature the kangaroo sporting sunglasses and toting Coke cans instead of a baby. Although there are no kangaroos in Brazil, the animal tested well among Brazilian women, who said they thought it represented freedom, but at the same time responsibility and care for children.

### **22.4.6 ASSESSING TRANSLATION ERRORS**

Research can also aid in assessing the need for translation. In entering Eastern Europe, Procter & Gamble (P&G) translated its detergent labels into Polish and Czech to adapt its products to the local market. However, consumers reacted negatively, perceiving this as an effort to dupe customers by passing the company off as a local Polish firm. Research revealed that labels should be written in imperfect Polish to show the company was trying to fit in, but was not quite adept enough to be fluent.

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## **22.5 DISTINCTIONS BETWEEN DOMESTIC AND INTERNATIONAL MARKETING RESEARCH**

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The process of international marketing research though involves the same disciplines as domestic research, has some differences compared to its domestic version.

The major differences are:

- The national differences between countries arising out of political, legal, economic, social and cultural differences and,
- The comparability of research results due to these differences.

### 22.5.1 NATIONAL DIFFERENCES

The main factors that affect the way in which people from different cultures behave are:

#### 22.5.1.1 Cultural differences:

Culture refers to widely shared norms or patterns of behavior of a large group of people. It is defined as the values, attitudes, beliefs, artifacts and other meaningful symbols represented in the pattern of life adopted by people that help them interpret, evaluate and communicate as members of society. The need for greater cross cultural awareness is heightened in our global economies. Cross cultural differences in matters such as language, etiquette, non-verbal communication, norms and values can lead to cross cultural blunders as illustrated by the following marketing mix:

**Product:** A soft drink was introduced into Arab countries with an attractive label that had six-pointed stars on it. The Arabs interpreted this as pro-Israeli and refused to buy it. Another label was printed in ten languages, one of which was in Hebrew again the Arabs did not buy it.

**Price:** An American firm was trying to get an acceptable price for their product from a Japanese buyer. The Americans presented a very detailed presentation and offered what they felt was a reasonable price. After a few moments of silence, the Americans thought the Japanese were going to reject the offer so they lowered the price. There was more silence by the Japanese. The Americans then said they would lower their price one last time and that this was the lowest they could go. The Japanese accepted this offer after a brief silence. The Japanese later said the first price was within an acceptable range, but it was their custom to consider the proposal silently before giving their decision. The Americans lost a lot of profit by jumping the gun and believing that Japanese respond just like the Americans do.

**Place:** A well-known drinks company tried to introduce a two litre drinks bottle into Spain, but found it hard to enter the market - they soon discovered this was because few Spaniards had fridge doors large enough to accommodate the large size bottle.

**Promotion:** When PepsiCo advertised Pepsi in Taiwan with the ad “Come Alive with Pepsi” they had no idea that it would be translated into Chinese as “Pepsi brings your ancestors back from the dead.”

#### 22.5.1.2 Racial Differences:

This would refer to the differences in physical features of people in different countries. For example, the types of hair care and cosmetic products needed in U.S would differ from those needed in South East Asia.

**22.5.1.3 Climatic Differences:**

This would include the meteorological conditions like degree of rain and temperature range in the targeted foreign market.

**22.5.1.4 Economic Differences:**

The level of economic development in a market can affect the desired properties of a product and in this way can inspire a company to adapt its products in order to meet the needs of the local market.

**22.5.1.5 Religious Differences:**

Religion has many impacts on products, more particularly on the ingredients, that constitute them. For example, in Islamic countries, companies, exporting grocery products based on beef have to furnish a certificate declaring that the animals have been slaughtered respecting “Halal” methods.

**22.5.1.6 Language Differences:**

Language is an important aspect of international marketing research. Inappropriate use of language could result in loss of market apart from turning out to be a cross cultural blunder, special precautions are required while designing and drafting questionnaire for international research.

**22.5.1.7 Differences in Actual and Potential Target Groups:**

In countries like England and Germany it is possible to do national samples. Small towns and villages can be included because distances are not great. In Spain, interviews can be conducted only in cities with populations of over 100,000 people, as the cost of interviewing people in small towns and villages is prohibitively high.

In addition, the international marketing researcher may also have to deal with other factors such as differences in the way that products or services are used, differences in the criteria for assessing products or services across various markets and differences in market research facilities and capabilities.

<b>DOMESTIC RESEARCH</b>	<b>INTERNATIONAL RESEARCH</b>
Likely to be conducted in one language, familiar to the research team	Possible language obstacles
Sampling made easier by a reasonable knowledge of geography	Possible sampling obstacles
Data collection may be feasible with a small team	Possible obstacles related to a larger team and subcontracting
Reasonable straightforward to communicate results	Many ways to communicate results

Research likely to be concentrated within one nation	Research conducted across the globe
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### **22.5.2 COMPARABILITY OF TASKS**

The concept of comparability refers to the problem faced by a researcher in comparing the results and interpreting the implications when dealing with two or more countries, is referred to as the comparability of tasks. This is absolutely essential to any research that has been set up to provide a basis for an international marketing decision.

As firms push the geographic frontiers of their operations to take advantage of growing opportunities, they need to collect information from a broader and more diverse range of markets. Increasingly, this entails conducting research in unfamiliar and distant markets in the Far East, the Middle East, Latin America and Africa. This in turn poses a number of challenges, not only in collecting accurate and reliable information on behavior patterns in an expeditious and cost-effective fashion, but also in predicting response to new and unfamiliar stimuli, and interpreting the implications thereof for marketing strategy.

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## **22.6 CLASSIFICATION OF INTERNATIONAL MARKETING RESEARCH**

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International Marketing Research includes a range from Single country research to the more elaborate Multi-country research. A brief description of each mode is discussed below.

### **22.6.1 SINGLE-COUNTRY RESEARCH**

This type of research is done when there arises a need for organizations to conduct research in a single foreign country market. Typically, this need arises when a researcher based in country A wants to know whether the marketing strategies that work well in its domestic environment can be translated to a country market B. The single country research is useful in bringing out the unique characteristics of the foreign market that would require adapting the product to serve the needs of the local consumers better.

### **22.6.2 MULTI-COUNTRY RESEARCH**

Multi-country research, as the name indicates, involves research conducted in more than one country market. Multi-country research can be further classified into three broad categories:

#### **22.6.2.1 Independent Multi-Country Research:**

This is perhaps, the most common form of international marketing research that can be seen in the industry today. Independent multi-country research studies occur when subsidiaries of the companies independently conduct research on the same products in a number of countries.

Examples of this type of research are brand awareness/perception of international products or test marketing of new products. The major disadvantages of this type of research are that it often leads to duplication of effort (such as questionnaires, etc.) and since such studies are conducted in isolation, comparisons of results across countries are made difficult.

#### **22.6.2.2 Sequential Multi-Country Research:**

Sequential Multi-Country Research is a way to research a range of geographical markets. It is attractive as the lessons can be learned in the first one or two markets to be researched and then can be applied to the other countries subsequently involved in the research program. The sequential approach is typically used when a product or service is the subject of rolling launch across countries.

#### **22.6.2.3 Simultaneous Multi-Country Research:**

This type of research involves conducting marketing research in multiple country markets simultaneously, and is, perhaps, the 'purest' form of international marketing research. It is a test for the researcher capabilities and also creates in its most acute form, the question of comparability.

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## **22.7 INFORMATION REQUIREMENT OF INTERNATIONAL MARKETING RESEARCH**

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The process of international marketing research though involves the same disciplines as domestic research, has some differences compared to its domestic version. A company intending to do business abroad may undertake studies in different spheres such as markets, promotion, distribution, price or products. Information requirement in each of these spheres will vary as will be evident from the discussion that follows:

### **22.7.1 MARKET INFORMATION**

When a company intends to test a market before entering, it needs information about market performance, market share, sales analysis and forecasting. This information can be obtained through market research.

### **22.7.2 PRODUCT INFORMATION**

A company operating in foreign countries has to decide which product line it should add, which it should discontinue, and which needs to be strengthened. In order to take a sound decision on these issues, the company requires a good deal of information. Apart from product line information, the company may need information on individual products. For example, it may like to know the behavior of product lifecycles in different countries in respect of one or more of its products.

### **22.7.3 PROMOTION INFORMATION**

Marketing research can provide information on promotional activities of the company, i.e. advertising and direct selling. The company may have to decide how much expenditure on

advertising is to be made, what media are to be used for advertising, which copy is to be used so that the best possible results can be obtained, etc. Likewise, marketing research can be helpful in taking decisions on personal selling such as number of salespersons to be appointed, their remuneration, formation of sales territories and the allocation of salespersons to these territories.

#### **22.7.4 DISTRIBUTION INFORMATION**

Marketing research can be helpful in providing information on the availability of channels and their relative desirability. Again, requisite information on warehousing, inventory, and transportation can be collected through proper marketing research studies.

#### **22.7.5 PRICE INFORMATION**

Pricing a product is a crucial problem before a company. It may like to know what price is to be fixed for its product so that it can maximize its profit. The effect of price on the demand for its product has to be ascertained. Here, too, marketing research can find out the consumers' perception in respect of a given product's quality and price.

#### **22.7.6 ENVIRONMENT INFORMATION**

Regardless of the nature of international marketing study, it is necessary that marketing researchers take into account different types of environment in a foreign country of interest. This means that they scan the economic, political, social, cultural and legal environments so that marketing strategies can be decided in the light of special features obtained in these environments.

#### **22.7.7 GENERAL RESEARCH INFORMATION**

The foregoing discussion briefly indicated the type of information needed in specific area. However, in any overseas marketing research study, some general information is needed. Community-type conditions such as elections, cultural events, religious celebrations, etc.

- Business conditions such as business ethics and traditional associations
- Lifestyles and living conditions, i.e. social and cultural customs and taboos and
- General economic conditions such as the standard of living of various groups of people and the economic infrastructure such as transportation, power supply, and communication.

##### **22.7.7.1 Industry Information**

Industry information: government policies affecting industry, availability of land and labor current or potential competitors, local companies as also third country companies etc.

##### **22.7.7.2 Study Related Information**

Study-related information: collateral data generated to complete a particular marketing research study. This information will vary on account of the nature of study. For example, if a study relates to the introduction of a new product in a foreign market, it may need

information on the existing products, technology available in the country, sources or raw materials, and possibilities of setting up joint ventures.



***Check Your Progress- A***

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**Q1. Discuss Scope of International Marketing Research**

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**Q2. Differentiate between Domestic and International Marketing Research.**

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**Q3. How one can Classify International Marketing Research?**

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**Q4. What is the Information Requirement of International Marketing Research?**

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## 22.8 ORGANIZING INTERNATIONAL MARKETING RESEARCH

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A Company intending to enter overseas markets for its products has to ensure that marketing research is organized on sound lines. There are several methods that may be used in organizing an export marketing research study. The company has to know their strengths and limitations so that it can make a judicious choice. In this context, the alternative methods for conducting research are, using

- Own staff;
- Importing agents;
- Research agencies in overseas markets;
- A domestic marketing research agency along with the services of a consultancy firm in the importing country; and
- The services of a consortium of research agencies.

Each of these methods has some advantages and limitations. As regards the use of own staff, it may be pointed out that it would be very expensive. As such, only large companies can afford to use this method. Most of the multinational companies use this method.

Using the services of importing agents may not give an objective assessment of the market as they may have other interests. This apart, as research is a highly specialized job, it is doubtful whether importing agents can give adequate information with absolute objectivity.

As regards the use of a research agency in overseas markets, its major advantage is that it will be very well informed of its home market. However, it may be difficult to select the right marketing research agency as complete information about different agencies may not be available to the exporting company. It is because of this reason; there is an element of risk in choosing an overseas marketing research agency.

Perhaps, the fourth method, viz. using a domestic marketing research agency along with the locally based consultancy firm offers some advantages over the preceding method. The method is, however, complicated on account of the difficulty in ensuring a meaningful link between the two organizations. Small and medium-sized companies which do not have their own trained research staff may find this method quite suitable.

In India, export marketing research is undertaken at different levels. First, there are several specialized corporations such as the State Trading Corporation, the MMTC, etc.

Second, we have industry-wise export promotion councils for major industries.

Third, there are specialized institutions such as the Indian Institute of Foreign Trade, the India Trade Promotion Organization that are engaged in export marketing research.

Fourth, there are consulting firms specializing in marketing research which may take up export marketing research on behalf of the sponsoring firm. Finally, large companies both in the public and the private sector too undertake such research on their own depending on their individual requirements.

As was mentioned earlier, it may perhaps be more appropriate for the above-mentioned agencies to seek the help of an overseas agency when research involves a field survey. Such collaboration will improve the quality and comparability of primary data, when two or more countries are involved in the survey.

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## **22.9 USE OF SECONDARY DATA OR DESK RESEARCH**

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IMR can be undertaken on the basis of either secondary data or primary data or a combination of both types of data. In the literature on international marketing research, the term 'desk research' is used to indicate the collection and analysis of secondary data.

Through proper desk research, it is possible to conduct a preliminary screening. This will enable the marketing researcher to identify those export markets which are potentially attractive. This preliminary screening should be reasonably comprehensive so that one may not overlook more prospective international markets. One should not only know the most promising overseas markets but should also know why certain markets do not need any further investigation.

Secondary data can be highly useful in international marketing research. Due to the high cost of gathering primary data and the large number of countries that may be involved, the value of secondary data is greater and its uses more extensive than in domestic marketing research.

Secondary data can be used to assess the extent of market interconnectedness. The extent to which two countries' economies are interrelated can be assessed using macroeconomic trade data and other data concerning flows between countries. Subject to the availability of industry and product market data, interconnectedness can be assessed at that level as well.

Secondary data perform an important function in international research. This is particularly significant in the initial evaluation of marketing opportunities and in identifying key countries or regions for in-depth examination. It provides a useful ongoing contribution in forecasting and identifying new opportunities for growth.

### **22.9.1 VALIDATING SECONDARY DATA IN IMR**

The shortcomings discussed here should be considered when using any source of information. Many countries have similarly high standards for the collection and preparation of data as those generally found in the United States and Europe, but secondary data from any source, including the United States and Europe, must be checked and interpreted carefully. As a practical matter, the following questions should be asked to effectively judge the reliability of secondary data sources:

1. Who collected the data? Would there be any reason for purposely misrepresenting the facts?
2. For what purposes were the data collected?
3. How (by what methodology) were the data collected?

4. Are the data internally consistent and logical in light of known data sources or market factors?

Checking the consistency of one set of secondary data with other data of known validity is an effective and often-used way of judging validity. Such correlations can also be useful in estimating demand and forecasting sales. As is the case with many data sets, Hofstede's well-worn data have proven valid vis-à-vis a variety of dependent variables, and it is still worthwhile to compare his measures of cultural values to other measures of the same variables.

In general, the availability and accuracy of recorded secondary data increase as the level of economic development increases. There are exceptions; India is at a lower level of economic development than many countries but has accurate and relatively complete government-collected data, whereas the source of secondary data from Chinese government are considered doubtful.

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## **22.10 COLLECTION OF PRIMARY DATA**

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Sometimes the information required by an exporting firm is just not available. In such a case, the marketing researcher has to be extremely vigilant in organizing it. In order to conduct a field survey in a foreign country, the marketing researcher has to follow the same steps that are involved in a domestic survey. However, some additional precautions are needed. For example, when marketing research is to be undertaken in a country where English language is not commonly used, it is necessary to get the questionnaire translated in that foreign language.

Proper translation of the questionnaire is very necessary. Again, for conducting the interviews, properly qualified interviewers have to be recruited on an ad-hoc basis for that survey only. It is advisable to hire the services of a professional marketing research agency in the country concerned.

This will be extremely helpful to the firm as it will have to face several difficulties in conducting the field survey in a foreign land. However, it will indeed be quite expensive to avail the services of a professional marketing research agency. Only large firms which are keen to export their products in overseas markets can afford to do so.

Collection of primary data is almost similar for domestic and international research, but some major concerns which a researcher should keep in mind while conducting IMR are discussed below:

### **22.10.1 DESIGNING SCALES IN IMR**

Designing scales for international marketing research calls for a great deal of adaptation on the researcher's part. It has to be decided whether a single scale can be used in all of the countries or whether it should be customized to suit each country. Americans use a five-point or seven-point scale; however, people in countries such as France, are familiar with a 20-point scale.

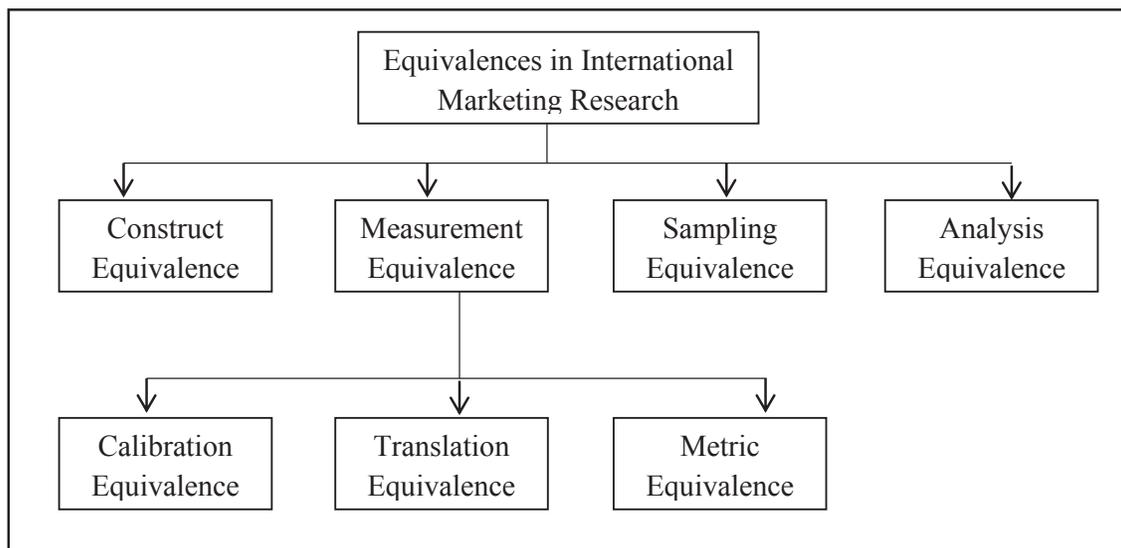
Semantics play an important role in the accuracy with which a scale measures any given attribute. Some cultures tend to overstate their feelings, while many others are modest. The word ‘excellent’ may connote different levels of perfection to Japanese and Italians. The scales used in domestic marketing will not be helpful to the researcher in analyzing the international market. This may be due to low educational or literacy levels and cultural biases that exist in various markets.

It has been observed that verbal rating scales work the best in international context. All respondents are accustomed to verbally express their feelings, irrespective of the country or the culture to which they belong. There could, however, be a problem with these scales. In some countries, “1” would be rated as the best while in other countries it would be the least preferred choice. The researcher should clarify this before asking respondents to rate attributes.

### 22.10.2 EQUIVALENCE ISSUES IN PRIMARY DATA COLLECTION

When crossing cultural borders, the very meaning of a scale may change and classical quality indicators such as reliability and validity may be strongly influenced by cultural factors. Consequently, international marketing research calls for appropriate equivalence and comparability checks.

It is important for the researcher to be able to compare data across countries and hence, it is essential to examine the various aspects of data collection process and establish their equivalence. The types of equivalence are briefly explained in the Figure.



**Fig 22.1** Equivalence Issues in Primary Data Collection

1. Construct equivalence deals with the function of the product or service that is being researched and not the method used in collecting the information. Different countries that are being must have the same perception or use for the product that is being researched. If this is not the case, comparison of data becomes meaningless. For example, if the bicycle market is being studied, it should be understood that it comes under the category of recreational sports in the United States and as a basic means of transportation in countries like India and China.

2. Measurement equivalence relates to establishing equivalence in terms of procedures used to measure concepts or attitudes. Three aspects will have to be considered to establish measurement equivalence

a. Calibration Equivalence – Equivalence has to be established with regard to the calibration system used in measurement (Kumar, 2000). This would include monetary units, measures of weight, distance and volume and perceptual cues like color, shape or form. Various countries around the world follow different units of weights and measures. Americans are used to weighing things by the pound or ton while the British and most of the commonwealth countries use the gram and kilogram. If the wrong terminology is used, responses will not be accurate. Colors also mean different things to different cultures. White, for example, is considered a symbol of purity and peace in the Western world but, a color of mourning for the Japanese.

b. Translation Equivalence – The research instrument has to be translated such that respondents in all countries involved in the study understand it. The instrument should also contain equivalent meaning in each research context. This becomes more complicated when the researcher has to interpret and translate nonverbal clues. It may not be possible to translate a questionnaire verbatim into another language because of lack of equivalent words in the foreign language. For instance, there is no equivalent term for “husband” in Japanese.

Marketers use three different techniques, back translation, parallel translation, and decentering, to help ferret out translation errors ahead of time.

- **Back Translation:** In back translation, the questionnaire is translated from one language to another, and then a second party translates it back into the original, and the two original language versions are compared. This process often pinpoints misinterpretations and misunderstandings before they reach the public.
- **Parallel Translation:** Back translations may not always ensure an accurate translation because of commonly used idioms in both languages. Parallel translation is used to overcome this problem. In this process, more than two translators are used for the back translation; the results are compared, differences discussed, and the most appropriate translation selected. Most recently, researchers have suggested augmenting this process by integrating pretesting steps and iteratively adapting the translations.
- **Decentering:** A third alternative known as decentering is a hybrid of back translation. It is a successive process of translation and retranslation of a questionnaire, each time by a different translator. In this process, the wording of the original instrument undergoes a

change, and the version that is finally used and its translation have equally comprehensive and equivalent terminologies in both languages.

c. Metric Equivalence – Metric equivalence is the scoring or scalar equivalence of the measure used. The researcher has to ensure equivalence of the scaling or scoring procedure used to establish the measure. Care should also be taken to establish equivalence in terms of the responses to a given measure in different countries. The scales used in different countries may vary depending on the culture and education level of the respondents. As mentioned earlier, in the United States researchers typically use a five or seven-point scale; however, there are countries where scales can have as many as 20 categories. When the sample consists predominantly of people incapable of reading, pictorial scales are used.

The specific country also determines whether the scale should be unipolar or bipolar and whether there should be a neutral point on the scale. For instance, researchers studying the Japanese market design scales with no neutral point, as the Japanese tend to remain neutral if given a choice. The researcher should also ensure equivalence of the response to a given measure in different countries.

3. Sampling equivalence is concerned with the decision making process. For instance, if the purchasing behavior regarding toys is being studied, researchers need to understand that while in the United States children get to select their toys in other countries parents may make the purchase decisions. Hence while collecting information, children in United States need to be interviewed and parents in other countries.

4. Analysis equivalence deals with addressing the various biases that might exist in different cultures. Different countries differ in their assessment of situations and problems. For instance, Japanese tend to take a neutral point, so it is wise to avoid a scale with a neutral point in order to obtain useful information. Likewise, Latin Americans and Italians tend to exaggerate their response and Americans do not typically go into details with open-ended questions. Factors such as this should be kept in mind while designing the scales for measurement.

Thus, establishing equivalence for an international marketing research study is an important task and requires judgmental decisions on the part of the researcher. The researcher will have to decide on the methodology that will work in the respective country.

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## **22.11 MAJOR SOURCES OF ERRORS IN INTERNATIONAL SURVEYS**

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Since surveys conducted in foreign countries to collect primary data are not so easy as the domestic surveys, certain errors crop up in such surveys. It may, therefore, be worthwhile here to know the major sources of error so that one may avoid them to the extent possible.

### **22.11.1 DEFINITIONAL ERROR**

Such an error arises on account of lack of conceptual, definitional, temporal and market structure equivalence. Conceptual differences may arise, for example, in respect of certain

food products which are either not known in some countries or are used differently. Definitional equivalence is an offshoot of the conceptual problem. Further, temporal equivalence may be affected if the surveys are not conducted simultaneously in the concerned countries. The comparability of data may be vitiated on account of seasonal factors in some countries while they are non-existent in others.

### **22.11.2 INSTRUMENTAL ERROR**

An instrument error may arise on account of problems of linguistic equivalence, contextual equivalence, instrument equivalence and response style equivalence. Linguistic equivalence may get distorted while translating a questionnaire in another language.

### **22.11.3 FRAME ERROR**

This type of error arises on account of the varying sampling frames used for different countries. Some sampling frames, on the basis of which a sample is drawn, may be defective in the sense that they account for a relatively small proportion of the population. Further, the definitions of dwelling units and households may be different in different sampling frames.

### **22.11.4 SELECTION ERROR**

This type of error arises in the process of selecting respondents in two or more countries. For example, if a study is undertaken to compare consumption behavior in respect of say, breakfast cereal, in two countries X and Y, it may happen that respondents in country X may be comparable with those in country Y, except their age. Country X may have proportionately more young respondents than in country Y. This may have an impact on the consumer behavior in the two countries. As a result, their consumer profiles are not strictly comparable.

### **22.11.5 NON-RESPONSE ERROR**

On account of the variation in response in two or more countries, the non-response error will arise. To a large extent, the magnitude of response will vary on account of educational and cultural differences in the countries covered in the survey.

### **22.11.6 SAMPLING ERROR**

This type of error is the only one which is free from cultural differences in different countries. On the basis of statistical principles, the sampling error can be computed.

Further, one should note it is extremely difficult that a survey will be completely free from any error. Even in a domestic survey, it is rare that all errors are completely eliminated. In a multinational survey, errors are bound to arise. All the same, the marketing researcher should try to minimize the varying types of errors so that the comparability of data can be maintained.

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## **22.12 PROBLEMS IN INTERNATIONAL MARKETING RESEARCH**

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The task facing the international manager is a complex and challenging one. Correspondingly, the challenges facing the international researcher are equally daunting. In particular, there are a number of conceptual and operational issues to consider that do not arise, or at least not in the same magnitude as in domestic marketing research.

### **22.12.1 COMPLEXITY OF RESEARCH DESIGN**

In the first place, designing research for international marketing decisions is more complex than where a single country is concerned. The conduct of research in different countries implies that much greater attention is required to defining the relevant unit and level of analysis; that is, countries versus groups of countries or regions, or national markets versus global market segments, as well as the scope of the research. This includes the need to examine issues at different levels – i.e. within versus across countries – as well as the extent to which the relevance of a given unit of analysis, for example the country, is changing.

### **22.12.2 DIFFICULTIES IN ESTABLISHING COMPARABILITY AND EQUIVALENCE**

Considerable difficulties are likely to be encountered in establishing equivalence and comparability of research in different countries, both with secondary and primary data and with methods of data collection. For example, secondary data on motor vehicle registrations may not provide equivalent data between countries. In many industrialized countries, a company car is provided to sales people and is counted as a commercial vehicle. It may, however, also be used extensively for personal transport. Thus, data on noncommercial registrations would understate the actual extent of personal cars.

Many of the concepts, measurement, instruments and procedures for primary data collection have been developed and tested in the US and Western Europe, their relevance and applicability in other countries are far from clear. Concern with equivalence and comparability as well as accuracy may be particularly critical where secondary data are collected from the Internet.

### **22.12.3 COORDINATION OF RESEARCH AND DATA COLLECTION ACROSS COUNTRIES**

The conduct of research in the international environment not only adds considerably to the complexity of research design and data collection, but also gives rise to a number of issues relating to the organization and administration of research in different countries. Concern with the coordination, design and execution of research across different countries implies that agreement has to be reached with regard to research design in every country where research is conducted. The research instruments and data collection procedures also have to be harmonized.

This can result in substantial difficulties and coordination problems, particularly where the research task is outsourced to a local research agency. These can add considerably to research costs and also lead to considerable time delays.

#### **22.12.4 INTRA FUNCTIONAL CHARACTER OF INTERNATIONAL MARKETING DECISIONS**

The intra-functional character of many international decisions – especially in selecting countries to enter, where to expand, or what methods of operation to use – suggests the need for intra-functional research. In selecting countries, for example, an important issue is not only the existence of market opportunities and market potential, but also possible sources of supply. This suggests that marketing research should be coordinated with research to identify and evaluate alternative suppliers or sources of supply. Similarly, decisions about the mode of operation also entail decisions about the degree of equity exposure and location of foreign production.

Some difficulties are likely to be encountered in coordinating intra-functional research. For example, the accounting or finance department might want to focus on measures of profitability such as cash flow or return on investment (ROI), while the marketing and sales departments are more concerned with market share and sales. An intra-functional orientation provides a stronger conceptual and methodological foundation for research. Greater precision is introduced in the conceptual and operational definition of the variables and constructs to be studied, and these are more closely linked and integrated with the specific decisions to be made. This should also lead to improved coordination of strategic decisions made by different departments and also of information collection relative to international markets.

#### **22.12.5 ECONOMICS OF INTERNATIONAL INVESTMENT AND MARKETING DECISIONS**

A final factor to be considered is the economics of international investment and marketing decisions.

The time horizon required for making such decisions is typically considerably greater than that required for comparable domestic decisions. This is due in part to the much more rapid rate of growth and change in many international markets, as for example Asia or Latin America. In particular, it is important to take a long-term view of market potential, and to consider entry at an early stage of market development, to avoid pre-emption of the market by competitors. The rapid pace of change in many industries, such as telecommunications, consumer and industrial electronics, means that market trends need to be monitored worldwide, as does the impact of different environmental scenarios on these trends.

Such considerations imply that the payout period for evaluating the costs associated with the conduct of international marketing research needs to be considerably longer than that in relation to comparable domestic research. While in the domestic market a payout period of one year might be appropriate, in international markets a period of five years might be more

relevant. Similarly, the lack of familiarity with foreign environments, and with operations within these environments, implies that much research, especially in the initial entry stages, should be viewed as an investment rather than a current expense. This can help to avoid costly entry mistakes and enables the development of more effective long-run international expansion strategies.

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## 22.13 SUMMARY

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International Marketing Research thus links the organization with its future markets. It includes activities such as specification, gathering, analysis, and interpretation of information to help the management understand a particular market, identify the market specific problems and opportunities, and develop courses of marketing action. The research activity must recognize the country specific diversity in terms of culture, demographics, economy, etc. to yield a marketing strategy that will be both applicable and successful. In this unit we discussed about International Marketing Research (IMR) in detail, its characteristics, difference with domestic research and important points to remember while conducting an IMR.




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## 22.14 GLOSSARY

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**Back translation:** Translation of a questionnaire from its original language to another language and then translation back to the original language by another person not familiar with the original version; used to ensure consistent content.

**Comparability:** Analogous results obtained across cultural contexts. Distinct from standardization, it implies comparability at the interpretation stage but not necessarily at the data-collection stage.

**Comparative research:** Comparing attitudes and behavior in two or more countries or cultural contexts to identify similarities and differences between them.

**Construct equivalence:** Accounting for the role of the product or service that is being researched (as opposed to the method used in collecting the information). Consists of functional, conceptual and category equivalence.

**Desk research:** The examination of information already exists in internal records, government publication, newspaper articles, published research reports, and so forth.

**EPRG framework:** Describe the orientation of a company's management towards globalization. Ethnocentric orientation is centralized, polycentric is decentralized, and regiocentric and geocentric are integrated.

**Equivalence:** Construct, measurement, and sampling equivalence are used to ensure comparability of primary data.




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## 22.17 TERMINAL QUESTIONS

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- Q1. Discuss the breadth and scope of international marketing research. Why is international marketing research generally broader in scope than domestic marketing research?
- Q2. How would you proceed to shortlist possible overseas markets for your product?
- Q3. Why is the formulation of the research problem difficult in international market research?
- Q4. Discuss the problems of gathering secondary data in foreign markets.
- Q5. "In many cultures, personal information is inviolably private and absolutely not to be discussed with strangers." Discuss.
- Q6. What are some problems created by language and the ability to comprehend the questions in collecting primary data? How can a foreign market researcher overcome these difficulties?
- Q7. Discuss how decentering is used to get an accurate translation of a questionnaire.
- Q8. Discuss various errors encountered while conducting International Market Research.

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## **UNIT 23 ETHICS IN MARKETING RESEARCH**

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- 23.1 Introduction**
- 23.2 Objectives**
- 23.3 Needs of Ethics in Marketing Research**
- 23.4 Marketing Research Ethical values**
- 23.5 Need of Ethics in Marketing Research**
- 23.6 Marketing Research: Ethical Dilemmas**
- 23.7 Ethical issues in Research at different levels**
- 23.8 Principles of Marketing research ethics**
- 23.9 Ethical Dilemma: Market researcher perspective**
- 23.10 Summary**
- 23.11 Glossary**
- 23.12 Answer to check your progress**
- 23.13 References/ Bibliography**
- 23.14 Suggested Readings**
- 23.15 Terminal Questions**

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### **23.1 INTRODUCTION**

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Ethical practices are the key to attain the goal in the market while appreciating the healthy practice among the competitive partners of the industry or of business world. Research is the key for advancement and evolution of innovative practices in marketing by the organization. Marketing research involving ethical practices enhances the chance of business world overall growth.

Predictive property of research results can be used by the firms for enhancing the opportunities lies in the future for any business firms. Unethical practices of marketing research can lead to the meaningless outcomes and can be unwanted expenses for the business too. Every organization has its major investment into R&D practices, thus ethical practices are the need of marketing research process.

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## **23.2 OBJECTIVES**

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After reading this unit you will be able to understand:

- The concept of the ethical values.
- The need and importance of ethics in marketing research.
- The ethical dilemmas involved in marketing research
- The principles of marketing research ethics.

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## **23.3 NEEDS OF ETHICS IN MARKETING RESEARCH**

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Marketing research is the key for attaining competitive edge over the firms in the market. It involves practice carried by the organization of their own or external party involvement to carry research on behalf of organization. The interaction with respondent, adoption of research tool, conceptual understanding between the organization and the third party (party conducting research on behalf of organization) raised the chances of unethical practices which need to be regulated by different means to carry ethics in research.

Research process beginning from problems understanding followed by the research design consisting selection of research method, data collection tool, data collection, analysis of data and concludes the findings. In each research steps researcher's responsibilities to use fair means of conducting research process. Understanding between organization and third party promotes the use of appropriate practices in research field at ground level. Respondents and researcher, research methods e.g. questionnaire, interviews, focus group discussions, schedule etc., analysing tools (methods and IT tools) each possess easy or appropriate methods.

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## **23.4 MARKETING RESEARCH ETHICAL VALUES**

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Values are basic beliefs that direct the action or motivates attitude. It determines that what is important to individual (person/organization). Ethical values in businesses guides decision making and generates acceptable, reliable and responsible behaviour. The guiding system of every organization must be followed to attain harmony and responsible behaviour in the business market. As vision and mission of every organization differs but when they run in the same competitive scenario there must have similarity in their ethical perspective to attain healthy competition in the market.

Some commonly used ethical values that are shared by every organization are as follows;

### **23.4.1 RIGHT AND JUSTIFIED**

All the values carried by organizations must be right in regards to the acceptance, reliable and responsible behaviour among the industry participants. Actions guided by the values must be right and could be justified by measurable tools. In case of marketing research ethics, values

must coincide with right practices under marketing and research process. Research ethical practices must be justified using appropriate methodology to solve the research quests.

### **23.4.2 TRUTH AND FAIR**

Ethical values must be based on truth and based on the commonly acceptable context of society and marketers (in case of marketing research). Decision making based on true values must be fair i.e., it must be unbiased. Marketing research ethics need to be based on marketing truths and fair researched must be produced as per market rules.

### **23.4.3 DISTINCTION FROM LEGALITY**

Ethical values are not similar to legality. Legality of any action or values depends on law. Legal norms create the dimensions for any act to be lawful or not. In case of ethics, being right in values is being ethical. Ethically right decision may not be covered under the legal dimensions. Thus action in business and marketing research are governed by ethical values which may be different from legal perspective.

### **23.4.4 DIMENSIONS OF ETHICAL VALUES**

Ethical values possess multi dimensions described as follows;

**23.4.4.1 Fabrication/Falsification/Plagiarism** Marketing research ethical values concerns includes fabrication of the information to look more acceptable and attractive along with falsification of the information to approve the interest of any unit of the work (research). Research work must possess work carried purely based on scientific method and must provide proper credit to the other contributor. Non citation/ referencing of other's work lead to the concern of plagiarism. Value in ethics must contain proper credit giving to the owner of the work taken from different sources.

**23.4.4.2 Questionable Policies/Honorary Authorship:** Apex body of the organization or any work creates policy restricting the credit allocation to the pre-defined authority in many policies. Honorary authorship of the work may be given to that identified body or authority defined in the policy. Proper policy need to be formulated to acknowledge the real hands behind the work carried to attain the results under any research.

**23.4.4.3 Common Knowledge/ Pre-Conceived Notions:** Research process gets from the common knowledge or pre-conceived notions of the researcher. To attain the results according to scientific system of search researcher must isolate them from any assumptions or previous experience or knowledge. The action carried in this way removes all the probability to get biasness in the research steps. Thus ethical values must possess objectivity of the researcher while carrying the work so as to get the right outcomes determined by the process of the research.

**23.4.4.4 Misconduct/ Violation of Privacy/Rules:** The researcher has chances of getting closer to the respondent and different sources of information necessary to conduct research. Their need to have identified and defined boundaries of the research work and researcher so that the privacy of sources cannot get violated. Rules for conduct of research practice need to be defined by the firm to avoid any kind of misconduct during the research work.

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## **23.5 NEED OF ETHICS IN MARKETING RESEARCH**

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Being unethical in action, administration and conduct of the marketing research may be smoother for the researcher. Ethical values lead to difficulty but contain steps leading appropriate results as per the scientific system of the research. Marketing research must possess ethics in practices. The reasons to carry ethics in marketing research can be listed as;

### **23.5.1 SOCIAL WELLNESS**

Ethical marketing research practices help in contributing towards welfare of the society. Value oriented actions in research leads to build step stone for future action among the industry players. Ethical research is ideal platform for social development and considers social wellness as key factor of research outcomes.

### **23.5.2 SOCIAL & ECONOMIC ENVIRONMENT**

The healthy competitive environment among the multiple marketing firms is an outcome of ethics consideration in practice. Ethically oriented researches contribute in the economic development of the firms. Right decision making, considering the society welfare build growing economy.

### **23.5.3 GOVERNMENT PLANS**

Ethical research considers the policy framework of the government and develops boundary.

The research actions under ethical frame provide respect to the government policies.

### **23.5.4 INVESTMENT INVOLVEMENT**

Each organization has heavy investment in marketing research practices. Results of research contribute to decision making and policy framing for the advancement by the organizations. Due to adequate amount investment in research work carrying ethics becomes necessary to attain correct results for further implementation.

The investment on marketing research practices can be understood with the help of investment scenario globally in R&D. By the year 2019 global investment on the R&D contributes to US \$ 1.7 trillion, in which around 10 nations have investment counting up to 80% of their total spending. The investment of top 10 leading nations in research is represented in the table. The sustainable development orientation of the nations have targeted for enhancement of research investment by 2030.

<b>Nation</b>	<b>Expenditure in Billions (US\$)</b>
United State	581.03
China	519.2
Japan	193.17
Germany	123.22

India	94.06
South Korea	93.46
France	66.22
Russia	61.94
United Kingdom	51.38
Brazil	39.15

**Table 23.1 GROSS R&D EXPENDITURE WORLD WIDE BY LEADING RESEARCH NATIONS (2019)**

*Source: <https://www.statista.com/statistics/732247/worldwide-research-and-development-gross-expenditure-top-countries/>*

### 23.5.5 KNOWLEDGE DEVELOPMENT

Research outcomes not only contribute in decision making but also an important inputs for the knowledge bank of the industry, organization as well as for academics. Ethical practice in research leads to develop right set of content for learners referring the results for learning purpose. Thus inculcation of ethical practice is necessary to build strong knowledge bank for future references. In current scenario contributing in knowledge management.

### 23.5.6 DEPENDENCY ON DATA ACCURACY

The data accuracy provides the condition under which decision to opt for specific strategy or policy can be decided. Manipulation of data carried in research leads to misleading results and not beneficial for meeting the objectives of the research. Ethical values lead to data accuracy and ultimately contribute to attain correct results of the research. Data manipulation or data fudging provide ease to research operation but creates manipulated outcomes.

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## 23.6 MARKETING RESEARCH: ETHICAL DILEMMAS

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Marketing research ethical practice provides many inside inputs about the participants involved in it. Keeping the research right and ethical practice even has some chances of information which is of private nature about the participants. Different dilemmas are available for research to carry ethically are mentioned below (Hague et al., 2013);

### 23.6.1 PERSONAL INFORMATION ABOUT THE RESPONDENTS

While collecting information regarding the research, respondents' personal information gets collected as a byproduct of the research. The contact information and other details are very crucial now a day (due to emergence of network marketing, telemarketing, internet marketing). Marketers some time asks for these details other than the required results (in case

of third party conduct the research). In organization driven research these information are handy for use by the organization. Marketing research ethical practices creates dilemma for sharing/ utilizing such personal information of the respondent.

### **23.6.2 MARKET TESTING RESULTS**

Marketing research concentrates on fulfilling the research objectives and one of organization objective is to collect the information for their new products feedback from the respondents. The trial of new product in the market sometime may have different impact on the users. Research consultants work on behalf of the organization and use their credentials. Getting result for trial of company creates ethical dilemma for researcher of following the research process scientifically.

### **23.6.3 INCENTIVES TO RESPONDENTS**

The research field work consist the data collection from the right set of respondents. The method of data collection and tools takes lots of time, energy of the respondents. Most of the time data collection has no benefit for the respondents and they feel like utilized in the process of data collection. Thus most of the respondents are reluctant to respond to research tool used for data collection. Researcher uses different incentives for respondent to collect the information. The use of incentives for collecting the information from the respondent is always becomes the source of dilemma among the researchers.

### **23.6.4 COMPETITOR'S CUSTOMER RESPONSES**

The respondent may lie in the category of loyal customers to the competitive firms. The responses of such customers are being manipulatively not considered for research. Such omission or manipulation leads to create wrong projection of the results and leads to unethical practice too. This creates dilemma for the researcher as loyalty of customer towards the competitive firm may not be useful for the firm which research work is carried out. Thus the dilemma regarding inclusion or exclusion of such responses is always available among the researchers.

### **23.6.5 SELECTIVE RESPONSE CONSIDERATION**

Many tools are used to collect information from the respondents in research process. Let's consider questionnaire being selected as medium to collect responses. Response sheet collected from the respondent may have semi filled responses, contradicting responses and highly biased response. Thus consideration or non-consideration of such responses lies with the researcher. Thus they feel sense of dilemma while rejecting or selecting such response sheet as part of their research data. Similarly, in other tools as well consideration of certain responses while rejecting others may lead to biased results thus is a matter of dilemma.



### Check Your Progress- A

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#### Fill in the blanks.

- i. Giving credit to the author of the work is termed as.....
- ii. Presenting information in a manner so as to attained the pre identified results is called.....
- iii. .... the process of capturing, distributing, and effectively using knowledge.
- iv. Manipulation of data is called.....
- v. Ethical.....are the confusions behind taking any action.

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## 23.7 ETHICAL ISSUES IN RESEARCH AT DIFFERENT LEVELS

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Ethics and ethical issues are involved in each step of the research. Thus first there is need to understand the types of issues available at different level of research. The issue at different level are as follows;

### 23.7.1 PROBLEM IDENTIFICATION STAGE

Most important aspect of any market research is identification of the problem. The problem identification must consider that the concern rose for research contains *relevance* as well as *utility* for the firm or the affecting parties. Due consideration of all parties of the research comes under the ethical consideration for marketing research. Identified problem area need *not to be based on convenience*. There must have opportunity for *addition to the current knowledge body*.

### 23.7.2 STAKEHOLDERS' CONSIDERATION

The scope of marketing research is not confined to organization only but also has impact on its surrounding. Thus indirectly other than the organizations there are many stakeholders are available to marketing research. The list of stakeholder contains *Researchers/Respondents/Academic community/ Govt./ sponsors/ clients/ public*. While operationalizing the marketing research perspective all the stakeholders must take into account. As per the list of stakeholders there exist contradictions in research to carry taking all stakeholders into account. Thus the ethical concerns get raised while acting on marketing research.

### 23.7.3 FOR-PROFIT COMMERCIAL RESEARCH

The pre identified outcomes which has probability of favor for organization and in rewards consultancy may be able to attain, can be projected to gain benefit. The research main objectives may get compromised for gaining more profit. For attaining profits research may contradict of bypass the code of ethics established for research.

### **23.7.4 RESEARCH NEED TO BE OBJECTIVE BASED**

The concentration of research activities must be restricted to objectives defined in the beginning of the research. Deviation of research due to *segmentation concerns, distribution channels* benefits raises ethical concerns. Along with this *budget* becomes constraint and restrict the objective attainment. Thus budget should not become criteria for research work to define its objectives. Appropriately defined terms (*operational definition*) also contribute to implement ethical marketing research practices.

In addition selection of measurement scale, identification of sample needs to be based on the demand of the marketing research. The selection of *research approach and methodology* must be based on the research objectives. In any of the above mentioned areas compromise over research scientific system generates ethical issues.

### **23.7.5 BIASNESS**

To be ethical in marketing research practice all the biasness tried to be taken out from the actions. Many a time biasness is inseparable from the process as it *is inherent in the nature of the research or the person executing it*. Thus objectivity in all the tools and technique need to be ensured so as to minimize the chances of any type of biasness in the process.

### **23.7.6 SECONDARY SOURCES APPROPRIATION**

For fast and easy procedure importance of the *previous information* is overlooked. The inputs from the previous actions research are the guiding lines under which current principles and objectives can be determined for the marketing research. The *gray areas* i.e. the area of future studies and the untouched dimensions of the study pave path for the future study. Thus due consideration of the secondary source with proper understanding needs to be included in the study so as to get ethical correct practice of research.

### **23.7.7 RIGHT REPRESENTATION OF THE RESPONDENTS**

In marketing research study it is very difficult most of the time to cover the *universe/ population* of the research area. Thus the *samples* are drawn representing the population. The determination of the sample size, segment, is based on the consideration of *secondary source information*, using *judgment of the experts*, and *selection procedure* of tool need to be scientifically proven. Correct representation can determine the right result needed to meet the objectives of the study.

### **23.7.8 DATA COLLECTION TOOLS**

Majorly Questionnaire or Schedule is used to collect the data from the respondents. Selection from these is possible when *knowledge about respondent* is clear with the researcher about their capacity to understand the tools themselves or with the help of the other is required. *Framing* of both must analyze that it contains the inputs relevant to the required information. Another consideration related to *maintain the interest* of the respondent through making the things less boring. The set of questions must be able to maintain reasonable size, *sensitivity of*

*the questions*(must be recognized by the respondents), *no ambiguous statement* to create confusion among the readers, *obligation free questions* and *proper use of words* to clear the concept to the respondent. Some scope for the respondent can be provided so as to receive their further inputs but need to be limited (*open ended questions*).

### **23.7.9 TOOLS & FIELD WORK**

In context to implement the tools on respondents, their need to have execution of pilot testing for checking the correctness of the tool. Proper administration of the tool needs to be carried for removal of any possibilities of ethical concern in the marketing research. The tool selected for the research should be evaluated on reliability and validity grounds. The result implementation on the basis of identified limitation should provide the scope for generalization of the research. Generalization only provides facility to the marketer to execute the results in general mass if results are used to create new plans/ product or policies.

*Pre-defined procedure* and *documentation of field work* helps the further action under the marketing research. For the marketing researcher their need to have *identity proof* to carry the research works under the identified group/institution.

### **23.7.10 DATA ANALYSIS**

The data analysis required expertise over the technicality of the questionnaire related editing, coding of responses, removal of no- required segment of the responses, understanding of the similarity in answers from different respondents along with IT enabled researchers. Ethical procedure may demand for the reduction of the sample size too. Extending the data to more sample size responses (Extrapolation), compromise over the research design based on the research design, exclusion of the data contradicting company's objectives or personal viewpoint of the researcher are some ethical concern raised in the data analysis.

### **23.7.11 MARKETING RESEARCH REPORT WRITING**

The art of reporting the work accomplish also possess ethical concerns. Use of language need to carry all the required set of knowledge which abides the all perspective without error. The clarity in research result is needed to remove confusion from the reader's mind. Due credit to the other's work using referencing and bibliography in the report removes the concern of plagiarism and authenticate the work too. Proper defined limitation of b the study defines the scope the results obtained. To be ethically on correct side marketing research must have some scope for the future as changing nature can be coordinated using the scope of future option provided in the research outcomes.

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## **23.8 PRINCIPLES OF MARKETING RESEARCH ETHICS**

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The guiding principle to carry the research being ethically correct, researcher can follow two basic principles of market research. These principles are as;

1. Respondent need to be safeguard from any adverse effect of the research process.
2. Transparency and honesty with the client and respondent must be maintained always.

**Respondents' safety:** The marketing research in one end collect the information regarding the objectives set for the research on the other hand it collects some input of the respondents which are required in the research responses along with these are beneficial for the company's MIS (marketing information system). The personal information of the respondents' (consumers) is available with the organization and can be misused for their benefit. The basic principle need to be followed by the researcher is to protect the confidential information of the respondent. Use of such information is possible only in case respondent provide permission to utilize such information for defined purpose.

**Transparency and honesty:** Researcher must carry all the process in transparent manner. The purpose of the research must be clear to the entire participant to the research work. Any misleading information need to be avoided strictly so as to keep ethics into practice. Attracting respondent with false information, incentive providing to respondent to respond for their response and many such practices must be avoided. Objectively followed procedure in scientific manner remove maximum chances for and unethical practice. So researcher must keep in mind that all his work should maintain transparency and honesty in practice.

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## 23.9 ETHICAL DILEMMAS: MARKETING RESEARCHER PERSPECTIVE

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Ethical Dilemma	Ethical Response
New product trail results identification is being requested by the company's.	Such set of information need to be considered under confidential matter it is not available in the market. The matter in any case should be prioritized under confidentiality of information.
The company insists to collect and provide the contact information of the respondent's (future customers).	With due permission from the respondent about the information sharing and purpose asked requirement of the company can be served. Other confidential information of customer without permission cannot be share by researcher.
Responses of some respondent are not considered in the data but being collected in the researcher.	Incomplete and non-sincere responses can be ignored while other responses need to be considered without failure.
Respondent being incentivized for providing the responses under the research process.	Incentivizing the respondent for motivating them to participate in research is legal and ethical too. But incentive cannot be used as a source of compulsion to be participant of the

	research work.
Researcher is asked to conduct ghost shopping for the competitive firm.	Ghost shopping falls under ethical category if the due reward against the services used of competitor is given. Willfully avoiding the reward and just to get the nerve of market conduct of ghost shopping is not ethical.



### *Check Your Progress- B*

#### **Write True or False.**

- i. Data fudging is an ethical practice.
- ii. Plagiarism can be removed through citation of other's work.
- iii. Research ethical practices contribute in knowledge development.
- iv. Data accuracy is necessary to attain objectives of the research.
- v. Research tool selection cannot contain unethical practices.

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## **23.10SUMMARY**

As marketing research is the need of time consideration of ethics is also a major concern. With the understanding about the ethics influence it can be concluded that the presence of ethics is pervasive in nature in each part of the marketing research. The importance of ethics identifies the necessity to implement the ethics in each part of the marketing research practice.

Inherent from the beginning of market research each step follows the presence of ethical issues. Concerns of researcher regarding decision under the periphery of ethics can be resolved only when researcher is known to pre-defined code of conduct derived with due consideration of the ethics. Principle of ethical marketing research and ethical responses to the dilemmas are the basis for designing the code of conduct to carry in research work.

Companies along with the researcher must draw their boundary under ethical practices. Scientifically conducted research backed by ethical consideration will be able to contribute to the development of nation as well as healthy work culture between the marketing firms.




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## 23.11 GLOSSARY

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**Ethical values:** The guiding principles for controlling the behavioural (practices in terms of research work) to follow the right path for attaining the objectives of the task taken.

**Knowledge Management:** “Knowledge Management is the process of capturing, distributing, and effectively using knowledge.” -Tom Davenport

**Plagiarism:** “The practice of taking someone else's work or ideas and passing them off as one's own”.

**Legality:** Any action taken by an individual or organization within the periphery of law is a legal action.

**Data fudging:** “In scientific inquiry and academic research, fabrication in the data, intentionally misrepresentation of research results is termed as data fudging.”

**Citation:** “A quotation from or reference to a book, paper, or author, especially in a scholarly work.”

**Extrapolation:** “Extrapolation is a type of estimation, beyond the original observation range, the value of a variable on the basis of its relationship with another variable.”

**Referencing:** Referring the person/group of people/institution wherever their work is being used.

**Bibliography:** Referring to person/group of people/institution even if their idea is a source of motivation/thought generation for any research work to begin.




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## 23.12 ANSWER TO CHECK YOUR PROGRESS

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### Check Your Progress –A

- i. Citation.
- ii. Manipulation/ Fabrication.
- iii. Knowledge Management.
- iv. Data Fudging.
- v. Dilemma.

**Check Your Progress –B**

- i. False.
- ii. True.
- iii. True.
- iv. True.
- v. False




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**23.13 REFERENCES/ BIBLIOGRAPHY**


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## 23.14 SUGGESTED READINGS

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## 23.15 TERMINAL QUESTIONS

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- Q1. What do you understand from marketing research ethics? Explain using example.
- Q2. Why ethics are necessary in marketing research?
- Q3. Explain the contribution of ethics in building knowledge bank of the organization.
- Q4. What are the dimensions of ethical values?
- Q5. Explain the concept of data fudging.