MANGALAYATAN
U N I V E R S I T Y

Learn Today to Lead Tomorrow

Business Research

MGO-2102

Edited By

Dr.Anurag Shakya

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1

INTRODUCTION TO RESEARCH

1.1 INTRODUCTION

The increasing complexity of business makes it very difficult for an entrepreneur to remain in business and prosper in the highly competitive environment of business demands, entrepreneurial flair and skills. It is necessary for a marketer to interpret market requirements, relate them to available resources and assume responsibilities of the enterprise. Above all, the customer holds the key position

in all circumstances and needs to be motivated to purchase the maximum of the firm's products and services.

A manufacturer, retailer or supplier of any goods and services needs access to certain information so as to meet customers' needs and wants and to design any effective marketing plan to meet those needs and wants. This information may concern the target market, products/services, price, distribution and promotion of the company as well as the competitors. Some of the basic questions that need to be answered in this context are:

- What are the constituents of the market?
- What does the market buy?
- Who are the participants in the business?
- How does the market buy?
- When does the market buy?
- Where does the market buy?
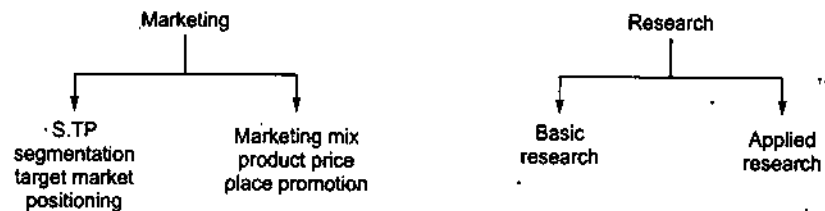
Fig. 1.1. Schematic representation of marketing research

These and any such questions can only be answered through regular contact and feedback from the consumer or the end users. However, majority of the companies lose their customer due to lack of the information needed. So, business and other organisations have no choice but to resort to marketing research to obtain the information they need for decision-making.

It is a hybrid of marketing and research. This has been depicted in the diagram.

Research can be classified in two categories:

- Basic research
- Applied research

Basic research addresses more the fundamental questions and not the problems with quick solutions. Applied research is, however, concerned more with the solutions of routine and immediate problems. Marketing research is not directly concerned with the fundamental problems in marketing but with those of immediate short-term concern. In practice, marketing research is concerned with applied research.

What is Marketing Research?

Marketing research is the study of problems, techniques and other aspects of marketing and related decision-making and their implementation. It studies an economic unit in respect of its various constituents such as consumers, buyers and sellers. It studies their response pattern towards price, promotion, purchasing power and loyalty towards specific brands and similar other marketing activities. It also tries to determine the contribution of other relevant factors such as habits, customs and preferences to decision-making.

It may be worthwhile here to look at other definitions:

"Marketing research may be defined as the systematic gathering, recording and analysing of data about problems relating to the marketing of goods and services under essentially non-recurring conditions."

—Hasty, Roland, W and Till R Ted

"Marketing research has to do with the gathering, processing, analysis, storage and dissemination of information to facilitate and improve decision-making."

—Seibert Joseph C

"Marketing research is the branch of marketing intelligence that conducts specific enquiries into problems in order to guide decisions."

—Luck, David, J Wales

"Marketing research is the systematic and continuing study and evaluation of all factors bearing on any business operation, which involves the transfer of goods from producer to consumer." **—A H Delens**

"The marketing research is the systematic and objective research for analysis of information relevant to the identification and solution of any problems in the field of marketing." **—Green Face and Thu**

The American Marketing Association (AMA) defined marketing research as the function which links the consumer, customer and public to the marketer through information — information used to identify and define marketing opportunities and problems, 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, design the method for collecting information, manages and implements the data collection process, analyses the results and communicates the findings and their implications.

. All the above definitions of marketing research emphasise the need for evaluating the problem and information in a more comprehensive and exhaustive manner. We can say that marketing research is a systematic and objective process of identifying and formulating the marketing problems, setting research objectives and methods for collecting, editing, coding, tabulating, evaluating, analysing, interpreting the data in order to find justified solutions for these problems.

Importance of Marketing Research

With the change from a seller's market to buyer's market, it was deemed necessary to acquire information on the needs, preferences and evaluation of the consumer.

The most relevant requirement was to ensure that the right product reaches the right person at the right place at the right price. Besides, it was also necessary to get feedback from the customers as to whether they are getting optimum satisfaction and thus continue to make changes in the marketing mix so that consumers remain loyal to the product. In turn, the whole task requires entrepreneurial flair and skill which ultimately calls for marketing research.

Thus, marketing research is a very useful tool in enhancing the decision-making ability of the marketer in the dynamic environment of today.

Marketing Research is the function that links the consumer with the organization through information. It involves systematic and objective search for and analysis of information that can be used for evolving some marketing decisions. Any research study must clearly state the issues being investigated. It must apply a systematic and formal procedure in collection and analysis of information. It must communicate the study findings in a manner which could help in arriving at some marketing decisions.

The following are the main objectives of Marketing Research:

- *Academic Objectives:* To gain awareness about a phenomenon or to achieve new insights into it. The academic object of marketing research is the acquisition of knowledge and it is the thirst for knowledge coupled with curiosity that has been the guiding force behind a rich variety of research work, independent of any material incentive.
- *Utilitarian Objectives:* The primary goal of marketing research is to understand the marketing culture, marketing environment and marketing decision process and thereby gain a greater measure of marketing control.
- *Marketing Research:* It may be used to determine the frequency with which a certain thing occurs or with which it is associated with something else.
- It helps in testing a hypothesis or a casual relationship between variables to determine the cause and effect impacts.
- It helps in providing information regarding manufacturers, retailers, suppliers of all kinds of services.
- It helps in providing solutions of marketing problems of Business and Industry.

Marketing research and motivational research are considered crucial and their results assist in more than one way, in taking business decisions.

1.2 ROLE AND SCOPE OF MARKETING RESEARCH

Marketing research provides the right information at the right time in the right place and to the right person which is important in decision-making. It helps the decision maker in various ways. There are two major reasons for this objective: (1) the increased complexity of business environment (2) the increased complexity of decision makers.

- *The Increased Complexity of Business Environment:* The study of complexity of business environment can be studied in four parts.
  - ❖ Technology changes
  - ❖ Research and development
  - ❖ Product changes
  - ❖ Information technology changes

The Technological Changes: The technological changes consist of factors related to knowledge applied and the materials and machined uses in the production of goods and services. These changes have an impact on the business of an organisation. In India, we know that the state of technological development varies among different sectors of the industry.

Research and Development: The breathtaking rate of technology change racing through all types of industry is due in large part to increasing expenditures for research and development. Despite the engagement of few firms in research and development and that too in a few areas, the impact of these expenditures are felt by all. Not only products and supporting operations are becoming more complex but the life cycles of products are also being shortened.

Product Changes: Technological advances resulting partly from research and development, partly from growing customer sophistication, have resulted in the third cause of complexity — product changes. While the marketing manager of yesteryear had greater chances of his or her product ideas becoming marketable, today's manager needs to deal with an enormously high product mortality rate.

The Information Technology Changes: The changes in Information Technology (I.T.) have profound impact upon the complexity of management and organizations. The marketing manager knows that the ability to obtain, store, process, retrieve, and display the right information for the right decision is vital.

• *Increased Complexity of Decision Maker:* What are the new techniques that make 1990s the era of a systems approach? In the past, marketing managers have tended to solve problems as isolated situations, independent of other operations of the company. For example, if a T.V. manufacturer noted a sales decline and traced it to lack of aggressive effort by sales officers, the problem was assumed to be a sales management problem. Solutions were sought through better training or replacement of their sales people.

Scope of the M.R. Function

Marketing research is the function that links the consumer with the organisation through information. It involves systematic and objective search and analysis of information that can be used for evolving some marketing decisions. The function of marketing research is to look at the particular decision area where research results are used.

SALES ANALYSIS
- Types of consumers that constitute the potential market.
- Size and location of the market.
- Growth and concentration of the market over a certain period of time.
- Purchase habits of key market segments.
- Do consumers prefer to buy some particular brands?

SALES METHODS AND POLICIES
Marketing research studies are also conducted with a view to evaluate the effectiveness of the present distribution system. Such studies are used in establishing or revising sales territory boundary. Compensation to sales force, physical distribution and distribution cost analysis, etc.

> **PRODUCT MANAGEMENT**
> Every marketer tries to formally or informally utilize information to manage the existing and new products. It examines market feedback about competitive offerings. Marketing research studies have been conducted to monitor the performance of the test brand launched in the selected market.

Advertising Research

Media Research

Three National Readership Surveys (NRS) have so far been conducted in India. These studies have basically estimated the readership of leading newspapers. Moreover, some marketing research has evaluated the relative effectiveness of different media in specific product fields, and in the context of achieving specific tasks such as creating brand awareness or a particular product benefit.

Copy Research

Advertising agencies have been regularly engaged in this activity where they test out alternative copy designs by obtaining the feedback from consumers. Advertising agencies regularly make use of marketing research studies to assess and monitor the effectiveness of different advertising campaigns.

Corporate Research

Large-scale corporate image studies among different target audiences. They involve in different target audience. They involve an assessment of knowledge about company activities, association of company with sponsored activities and company perceptions on specific dimensions. These types of corporate image studies are done periodically to monitor and change the image over time among different audiences.

Syndicated Research

Several research agencies collect and tabulate marketing information periodically. Reports are sent regularly to period subscribers. Such services are found specially useful in the sphere of movement of consumer goods through retail outlets.

1:3 TOOLS AVAILABLE TO A MARKETING RESEARCHER

Exhibit 1.1: Analytical marketing research system

	Statistical analysis	Model analysis	
Marketing problem ⇒	– Regression analysis – Correlation analysis – Cluster analysis – Factor analysis – Conjoint analysis	– Optional production model – Distribution model – Pricing model – Market selection model – Media mix model	– Alternatives ⇒ – Selections for decision making
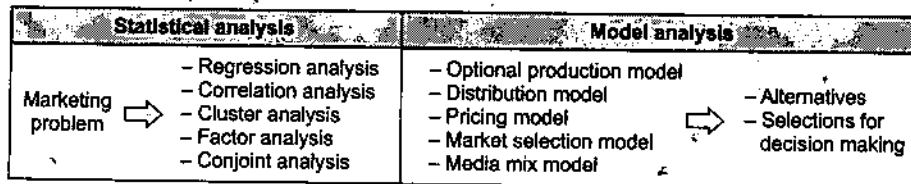
1.4 THE JOB OF A RESEARCH ANALYST

Marketing research organisations look for strong basic skills in analysis and communication, rather than expertise in a particular industry or methodology. Strong writing skills, strong analytical skills and other skills are the qualities that are mostly sought by research organisations. The following jobs are executed by a research analyst:

- Decision regarding information needed from time to time.
- Decision regarding methods to be used in research
- Decision regarding research design
- Analysis and interpretation of data
- Research report writing
- Presenting the findings with suggestions.

1.5 ADVANTAGE OF MARKETING RESEARCH

- Marketing research is used to measure market potential, characteristics and share of markets for a particular brand or company.
- It helps in obtaining information that could lead to the formulation of short and long-range forecasts.
- Companies can use marketing research to evaluate new product opportunities, its acceptance and to test existing products relative to competitors products.
- Marketing research helps to make better advertising decisions.
- It also helps to evaluate the effectiveness of marketing activities and draws attention to a potential problem.
- Marketing research is helpful in planning questionnaires to test comprehension, work norms, the memory factor, etc.

1.6 AIMS AND OBJECTIVES OF MARKETING RESEARCH

- To understand why customers buy a particular product
- To know the marketing opportunities
- To understand marketing problems
- To help in the selection of a right course of action
- To know about customer acceptance of the product
- To understand the distribution network of the product
- To forecast the probable volume of the future sales
- To analyse the expected market share
- To assess competitive strengths and policies.

1.7 LIMITATIONS OF MARKETING RESEARCH

- *Not similar to science*: Although marketing research uses the techniques of science, it is not an exact science itself. The results obtained are not accurate as compared to physical and chemical sciences.
- *Uncontrollable variables*: Political, legal, technological and social variables are uncontrollable from the standpoint of the individual marketing decision maker. The results are affected if these variables change.
- *Human tendencies*: Consumers, dealers, wholesalers, retailers, etc., are the basic constituents on which marketing research is carried out. Human beings act artificially when they are targeted for research work. Many aspects of human behaviour affect the results of marketing research.
- Marketing research is considered to be a wasteful activity in India. As a result, organisations do not allocate resources for research purposes. Time and money still remains the main limitation in all types of marketing research and discourages researchers to put in their best efforts.
- *Lack of computerisation*: Computers are usually not used in research work as it is costly and there is lack of proper training. If computers are used widely, they will reduce the time taken for analysis and research results can be produced much faster.

1.8 STEPS IN MARKETING RESEARCH

Exhibit 1.2: Research process


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                    Research process

Identifying the   Developing a    Designing    Collecting   Analysing   Preparing
marketing problem marketing plan or the marketing  data       the         the
or setting the    studying the old research                  collected   research
objectives of MR  research findings strategy               data        report
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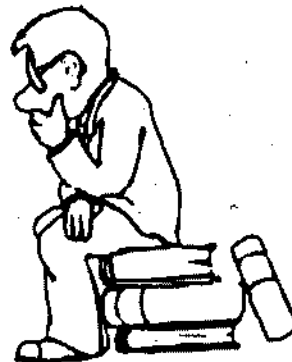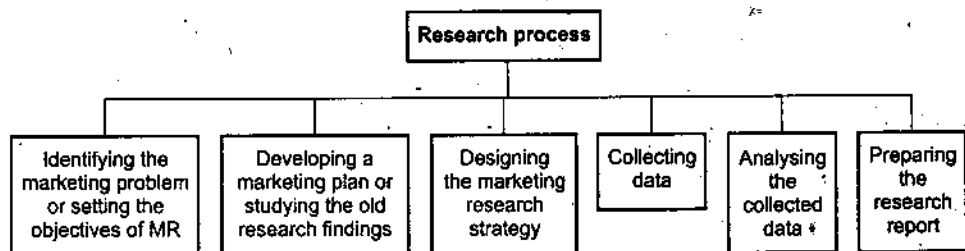
Identifying the Marketing Problem

The first step in marketing research is identifying and understanding the marketing problem. What is the problem? What type of information is required to solve it? What segments of the related information are already available? Marketing research also makes use of the available literature for an in-depth background study of the problem and a marketing researcher must define the research objectives clearly.

The marketing research problem undertaken for study must be carefully selected. The task is a difficult one, although it may not appear to be so.

Nevertheless, every researcher must find out his own salvation for research, as problems cannot be borrowed. How to define a marketing research problem? How to define a marketing research problem is undoubtedly a herculean task. However, it is a task that must be tackled intelligently to avoid the perplexity encountered in a research operation. The usual approach is that the researchers should themselves pose a question and set up techniques and procedures for throwing light on the question concerned. Formulating or defining the research problem properly and clearly is a crucial part of a research study and must in no case be accomplished hurriedly.

Developing Marketing Research Plan

When the marketing problem is clearly identified and formulated, a marketing researcher should develop a plan to collect the relevant information. While developing the research plan, he should also familiarise himself with the existing research findings. He can also take the help of library sources as well as experienced consultants, persons with practical knowledge, etc.

Designing Marketing Research Strategy

A marketing researcher should design the research strategy in accordance with the requirements of the problem. He should make certain hypotheses, the testing of which would be considered helpful in solving the problem.

Example

A toothpaste company may design its marketing research strategy in the following manner:

(a)	Research	:	Descriptive research
(b)	Data Sources	:	(i) Secondary data
		:	(ii) Primary data

(c) Research Approach   : Survey method
(d) Research Instrument   : Questionnaire
(e) Type of Questionnaire : Structured non-disguised
(f) Type of Questions   : Close-ended questions
(g) Sampling Plan
      (i) Sampling Unit   : Purchases toothpastes
     (ii) Sample Size   : 500 persons
    (iii) Sampling Procedure : Simple random sampling
(h) Contact Method   : Personal
(i) Mode of Collecting data : The respondents will be chosen randomly and requested to grant interviews. The questions will then be asked in a pre-determined sequence. The secondary data will be collected from various books, journals, reports (both published and unpublished), etc.
(j) Data Processing   : (i) A number of tables to be prepared to bring out the main characteristics of the collected data.
                           : (ii) Inferences to be drawn from the data collected.

Collection of Data

A marketing researcher has to make a plan for collecting secondary data, primary data or both, as the case may be. Primary data gives the original information for specific purposes whereas secondary data consists of information that already exists.

The marketing researcher would either select one of the above mentioned methods or both. His decision depends on the nature of the study, the objective of the study, financial resources available, availability of time and the desired degree of accuracy.

Primary data can be collected through experiment or through survey. If the researcher conducts an experiment, he requires some quantitative measurements, or the data, with the help of which he examines the truth contained in marketing research hypothesis. But in the case of a survey, data can be collected by any one or more followings ways:

• Questionnaire method
• Telephonic Interview method
• Personal Interview method
• Observation method

Analysis of Collected Data

The following steps are involved in analysing the collected data:

• Coding

- Editing
- Tabulation and analysis
- Interpretation
- Recommendations, if any.

Analysis work after tabulation is generally based on the computation of various percentages, coefficients and by applying various well-defined statistical formulae. In the process of analysis, relationships or differences, supporting or conflicting, original or new hypothesis is subjected to test to determine with what validity data can be said to indicate any conclusion.

Preparation of Research Report

Keeping the objectives of the study in mind, the researcher should prepare the study report. The findings should be written in a concise, simple and objective – oriented language. Graphs and examples in the main report should be limited to those needed to convey essential facts to support the research statement. Though there are no fixed contents in the research report, but generally, the organisation and physical presentation of the research report contain the following:

Organisation of the Research Report

The research business reports are normally arranged in different groups. These groups are known as:

- Prefatory Group
- Main Report Group
- Appended Part Group

The contents/parts of these groups will be decided by the marketing researcher in consultation with the management. However, the following details provide typical part details for each group of the report.

	Group	Parts of the Group
1.	Prefatory Group	Title Fly
		Title page
		Letter of Authorisation
		Letter of Transmittal
		Preface or Foreword
		Table of Contents
		Table of Illustrations
		Glossary of Terms/Abbreviations
		Executive Summary
2.	Main Report Group	Introduction
		Objectives
		Methodology
		Findings
3.	Appended Part Group	Recommendations
		Bibliography
		Appendices
		Index

The brief description of each part is given below:

Prefatory Group

Title Fly

The building of the title is a difficult task. Build it around five Ws: Who, What, Where, When and Why. Some researchers sometimes may also add another dimension to this, i.e., How. In case of some problems, it is not essential to use all the Ws. The following example given is a typical case of how to build a title:

WHO	:	XYZ Company
WHAT	:	Analysis of sales performance
WHERE	:	Central India
WHEN	:	1999
WHY	:	(Implied)

The title may read like:

Analysis of the XYZ Company's 2001 sales performance in Central India.

The title must be carefully worded. It should ensure completeness of the coverage.

Title Page

This is the front cover of the report. In order to give a business like appearance, the report should be bound. In doing so students use an illustrated cover to make it attractive. The title page should display following information:

- Report title
- Identification of researcher
- Identification of authorizer/recipient of report
- Date of writing the report

Letter of Authorisation

Institutes may authorise orally or in writing. Normally, the acceptance of synopsis is communicated orally or in writing and this authorises the researcher to proceed with the study. Many universities/academic institutes have made it mandatory to attach the authorisation with the final submission.

Letter of Transmittal

The letter of transmittal is a letter that transmits the report to the authorities. It helps in establishing the completion of task and token of submission to the concerned authorities. Generally, the letter should have a warm note of appreciation and use personal pronouns to create a friendly environment.

Foreword / Preface

Forewords and Prefaces also perform the function of transmittal. Forewords and prefaces are usually long and include helpful comments about the report. They also includes expressions of indebtedness to those who helped in the research work.

Table of Contents

The table of contents of a report is a guide map describing the structure of the report. This is a valuable document. It greatly assists the reader in finding a particular section. Make sure that contents are listed in the same order as they appear in the report and with the same wording.

List of Tables / Charts / Illustrations

If the report has a number of charts, illustrations and tables, the author may include the list of illustrations as part of the report.

Physical Presentation of the Research Report

Appearance of the report communicates how tidy or untidy the researcher is. Neat reports cause favourable impressions in the mind of the evaluators. A well arranged report gives the impression of:

- Completeness of the work
- Competency of the researcher
- Professionalism

The general guidelines for laying out different types of contents are discussed below:

Guidelines for Report Presentation

The inclusions in the physical representation of the report are as per the flow chart illustrated in exhibit 1.3. The following guidelines should be followed for the physical presentation of the report:

Exhibit 1.3: Physical presentation of report

Project brief → Chapter scheme → Title fly → Title page → Terms of reference →

Main report ← Glossary options ← Acknowledgement ← Executive summary ←

Conclusion → Recommendations → Appendices → Bibliography
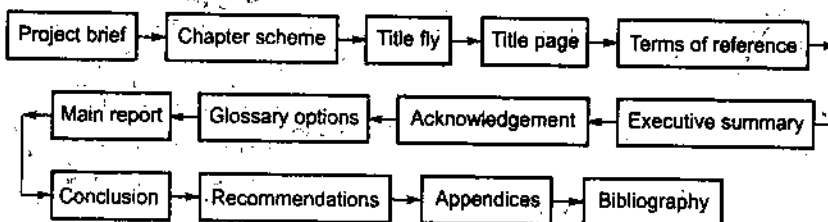
Page Layout

There are two types of page layout:

Special Page Layout

This is normally considered when laying out

- Synopsis or executive summary
- First page of the chapter
- Table of contents
- Preface

The special page layout may also be required for the letters being enclosed with the report, e.g.

- Letter of transmittal
- Letter of authorisation

The sample page layout for the above are illustrated in exhibit 1.2

Conventional Page Layout

The pages following the first page of the chapter should be laid-out in such a way that they look attractive. A proper binding margin should be provided and no letters should get covered by the binding. Normally the reports are leftbound, therefore, an extra margin in addition to suggested margins should be provided for binding.

Generally the margins provided are:

- Top, left and right margins are equal and uniform.
- For double spaced the margins are generally 25 mm.

1.9 HOW MARKETING DECISIONS ARE TAKEN?

Decision Relating to	Intuitive Approach	Research-oriented Approach
	The executive relies mainly on emotions, personal biases and previous experience regardless of its direct relevance. Decisions are made after careful analysis of the situation. Often, the most expedient system is used.	The executive relies on deliberate, scientific analysis to reach conclusions. These conclusions are based on studies, tests, controlled investigations and expert opinions.
Product Characteristics Design	"Make it conventional, why gamble?"	"Let's do some research to determine customer preference."
Colour	"Give them any colour they want so long as it is black."	"We can run tests on colour preferences and discuss this with our colour experts."
Quality	"Make it so that it will last three months or so."	"Let's find out what kind of product will satisfy most customers and yield the maximum profit."

Advertising Message Content	"It's obvious that we should direct our appeal to women. We can stress how the product will increase their sex appeal."	"Let's determine what the target market is. Then we can pretest several appeals to see which is the most effective."
Media	"Let 80 per cent go to TV and 20 per cent to magazines. I've never liked newspapers or radio for this type of product."	"We should conduct an investigation to determine which media have the greatest impact and reach the most customers per rupee."
Budget	"Spend the same amount per unit as we did last year."	"Let's analyse how much advertising is needed to get the market share we want."
Packaging Size	"Let the production department decide what sizes to produce. Their judgement is good enough for us."	"What packaging sizes do our competitors use? We ought to study the recent trends in package sizes and learn what the deal preferences are."
Design	"Have the Art Department make some sample designs. Then we can decide."	"We could consult a packaging firm to design several packages and then field test them to determine customer reactions."
Price Price level	"Price it competitively."	Let's find out, through testing, what price will yield the maximum profits."
Channels selection	"Use manufacturer's agents. It is the easiest way to get market penetration at all levels."	"Let's test two or three alternatives, such as using salaried salesmen and manufacturer's agents. We should also analyse each territory to determine which set-up works best in each area."
Retail outlets	"Sell the product to every retailer you can. We want volume."	"Let's do some research to determine the income and accessibility of different potential markets."
Target Markets Selection of market segments	"Let's go with the market. It has got the most potential."	"Let's do some research to determine the income and accessibility of different potential markets."
Appeal to target	"Our product is good, we can make identical appeals to all segments of the market."	"Maybe it would be better to develop separate campaigns to reach different market segments. How can we find their individual market requirements?"
	"Decisions may prove reasonably successful in a fairly routine situation. Overall, however, inadequate market intelligence used emotionally or intuitively, is likely to result in a poor marketing performance."	"Generally, decisions carefully taken will have the maximum impact. Complete up-to-date marketing intelligence used rationally, will improve the marketing performance."

1.10 USERS OF MARKETING RESEARCH

Marketing research highlights issues and problems relating to marketing and consequently helps to solve them. It is an effective aid in implementing marketing concepts by obtaining information that identifies the consumers' problems and needs. It also improves the efficacy of marketing decisions by evaluating the effectiveness of marketing strategies and tactics. Therefore, Marketing Research (MR) is rated as a highly useful tool that is used by companies in formulating rational responses to specific problems of marketing, identified scientifically. No wonder it is used widely, the major users being:

- Consumers
- Market intermediaries
- Business firms
- Marketing agencies (Rural and Commercial)
- Government
- Producers

Consumers

It goes without saying that, in any competitive environment, the consumer is the king. In the final analysis, all sales proceeds flow in favour of consumers. So, knowledge of consumer behaviour in a target market is a must for every business concern. MR locates the consumer requirements of goods and services and the factors on which these depend upon. For example, a typical consumer demand for a particular product depends upon the habits and mobility patterns of the consumers. Thus, what an organisation must understand is how most consumers will respond to different product features, prices and advertising appeals, etc. Take the example of TITAN, whose success can be attributed to its knowledge of market requirements and supplying the watches to fulfill those needs.

So the consumers' response to the market-controlled stimuli has to be understood. Consumer habits keep on changing as do, of course, their likes and dislikes. Therefore, even when a product is made in tune with the market trends, the need for being constantly in touch with the changing tastes of the consumer remains. This, in turn, underscores the need for marketing research almost as an ongoing project.

Market Intermediaries

Market intermediaries are an integral link between the producer and the final buyers. Selling a product requires a channel for bringing the product to the market and distributing it to the final buyers. A channel of distribution is the route taken by the goods as they move from the producers to the ultimate consumers and industrial users. Intermediaries are the business units or persons who specialise in performing operations or rendering services that are directly involved in the flow of goods from the producers to the buyers. A manufacturer might think of a large number of channels of distribution for bringing his product to the ultimate consumers. Marketing research helps him select the right kind of channels of distribution.

Business Firms

Every business concern is interested in improving its position in the market by (a) Increasing its sales share in the market and (b) Increasing its profitability. As a matter of detail, it is interested in minimising production costs, choosing the most marketable variety of products, using the most cost-effective techniques of sales promotion, adopting an optimum pricing policy and pursuing an optimum dealer policy. In all these areas, MR is essential for decision-making.

Marketing Research Agencies

There are numerous specialised agencies engaged in conducting marketing research covering different segments of markets, both actual and potential. They have experts for conducting specialised research. These research agencies can be assigned the projects by concerned parties such as government departments and corporate units. On the basis of their findings, they prepare research reports for their clients.

In India, some marketing research agencies are Lintas India Ltd. Indian Market Research Bureau, Hindustan Thompson Associates Ltd, MARG and ORG.

Government

Research in various areas is also done by government departments. Examples are price indices, per capita income, expenditure levels and patterns, agricultural pricing and economic policy of the government.

Producers

A competitive market is flooded with new products, brands and substitutes almost everyday. Like the Sword of Damocles, the threat of cut-throat competition is always there. So every producer has to think hard about what his end-product should be. He finds too many brands and too much marketing noise, which forces him to rework the strategies that worked in the past but are no longer valid. MR helps in the analysis of the market structures and selection of the product category which will sell in the teeth of stiff opposition.

1.11 TYPICAL APPLICATIONS OF MARKETING RESEARCH

Type of Research	Research Activities Covered
1. Research on market	(a) Analysing market potential for the existing products and estimating the demand for the new ones
	(b) Sales forecasting
	(c) the characteristics of product markets
	(d) Analysing sales potential
	(e) Studying the market trends
2. Research on product and services	(a) Customer acceptance of the proposed new products
	(b) Comparative study of competitive products
	(c) Determining new uses of the present products
	(d) Test-marketing the proposed products
	(e) Studying the extent of customer satisfaction/dissatisfaction with the company's products
	(f) Product line research
	(g) Packaging and design research
3. Research on promotion	(a) Evaluating advertising effectiveness
	(b) Analysing advertising and selling practices
	(c) Selecting advertising media
	(d) Motivational studies
	(e) Establishing sales territories
	(f) Evaluating the present and the proposed sales methods
	(g) Studying competitive pricing

	(h) Analysing the salesmen's effectiveness
4. Research on distribution	(a) Location and design of distribution centres
	(b) Handling and packaging of merchandise
	(c) Cost analysis of transportation methods
	(d) Dealer supply and storage requirements
5. Research on prices	(a) Demand elasticities
	(b) Perceived prices
	(c) Cost analysis
	(d) Margin analysis

(**Source**: Adapted from Crisp Richard D, *Marketing Research Organisation and Operations*, Research Study No. 35, American Marketing Association, New York, 1958, p. 394).

1.12 PROBLEMS IN CONDUCTING MARKETING RESEARCH IN INDIA

Due to vast size of the country, heterogeneous population and infrastructural and attitudinal problems, it is not easy to conduct marketing research in India. India's large and heterogeneous population comes in a big way in conducting marketing research. Being a big and diverse country, national surveys required India to be divided into several hundred districts and interviewing several thousands of people. Accessibility to people living in the country is another big problem. Only very few people own telephone, postal system is also not up to the mark. Because of low literacy level, mail interviews are of limited application. Personal interviews seem to be the only viable alternative but even these are beset with transport problems and lack of trained staff in the small towns and rural areas. Not only the business firms, but advertising agencies also do not hold favourable attitudes towards marketing research. Advertising executives view it as a hindrance to their creative work and hence do not like spending much money on it.

Issues and Trends in Research

Marketing Research is a field that is rapidly changing and growing in importance. Current issues and future trends in research include the following:

- **Intense Competition:** The intensity of worldwide competition in all the areas of operations will increase. The military warfare of the twentieth century will be replaced by economic warfare in the twenty-first century. Market research will play a very dominant role in product development, product design and product distribution strategies.

- **Importance of Marketing Strategy:** Companies will need long-term global business strategies to survive in the market place. Vertically integrated partnerships will be needed to strengthen competitive position. A new type of alliance based on cooperative specialisation within industries may become a necessity. The strategic alliance will require extensive background research.

- **Product Variety and Customisation:** An increased variety of products and services will be offered to the customer. In many cases, customisation for the individual will be possible. This means that expected life of products in the market will continue to decrease. Therefore, product and service innovation based on market research will hit the market at an increasing rate.

- **Emphasis on Quality:** The quality of products and services will continue to improve as customer expectations of quality grow. This will lead to more emphasis on product research, social research, packaging research, distribution research, etc.

- **Advance in Technology:** Technology will continue to advance at a rapid rate, particularly in the areas of advanced materials, advanced technology, super computing, etc. This has resulted in inter-disciplinary research and more importance to experimental designs.

- **Concern Regarding Business Environment:** The impetus for environment responsibility shifts from government regulations to customer response requirements leading to more concentration on marketing research.

1.13 RESEARCH DESIGN

The purpose of marketing research is to provide information which will aid in management decision-making. A marketing manager, for example, in a large consumer goods company may want to collect information to assess whether or not to launch a new product or to determine why the sales of a particular product are declining. In collecting this information, three major steps may be identified. First and the foremost is establishing of research objectives. Then a research plan needs to be formulated and implemented; and finally data analysed followed by a presentation of research findings. A clear and precise definition should be made by the management of the decision problem, this should be expressed not only in terms of problem symptoms such as a decline in market share but also with possible contributing factors such as changes in competitors' strategies or

in consumers' tastes, as well as the actions the management might take based on research findings. Otherwise, irrelevant information may be collected.

Development of a research plan requires what data are to be collected; what research techniques and instruments are to be used; how a sample is to be selected; and how information is to be collected from this sample. Sometimes the required information may already be available in secondary sources such as the government or trade reports, company records, or sales force reports. This will not, however, have been collected with the particular problem in mind. Consequently, primary data collection may be required, in other words, collect information specifically for the particular problem.

Where primary data are collected, observational or other qualitative techniques, experimentation or survey research may be conducted. Observations and other qualitative techniques, such as projective techniques (word association, sentence completion tasks and focus group interviewing) are most appropriate in the initial stages of research, when little is known about the problem. The onus of interpretation is, however, placed on the researcher and consequently, such techniques are open to criticisms of subjectivity.

Experimental techniques are also potentially applicable, but they are rarely used except in-store experiments study, for example, the impact of in-store promotions on sales. Test marketing can also be viewed as a field experiment. Survey research is the technique most commonly used in marketing research. A standard questionnaire can be administered to large samples and systematically analysed using computerised techniques.

In observational or qualitative research instruments such as coding scheme, recording sheets and other tests may need to be designed. The most common instrument used is a questionnaire. For unstructured interviews and focus groups, only an interview guide indicating the topics to be covered may be required. A crucial aspect of survey research is, however, the design of a carefully worded questionnaire to elicit desired information from respondents. Attention to question form and sequencing is also essential in order to avoid biased responses.

Three principle methods of data collection may be considered – telephone, mail or personal interviewing. Telephone interviewing is quick and can be conducted from a central location where interviewers are controlled by a supervisor. However, only with this method the persons having telephones can be interviewed and a limited number of questions can be asked. Mail questionnaires are the cheapest method of survey administration, but suffer from low response rates and also assumes that the respondent clearly understands and can respond to questions. Personal interviewing is the most flexible method since the interviewer can select the sample by judgement or convenience sampling and is able to explain questions to the respondent. It is, however, an expensive method of data collection and susceptible to interviewer bias. In implementation of the research plan, this is where major sources of data inaccuracy and unreliability often arise. In the case of surveys, for example, respondents may bias findings by refusing to cooperate, by providing inaccurate answers, for example on income or by giving socially undesirable responses. Interviewers may also bias results by encouraging a specific response, by inaccurate recording of responses or in extreme cases, by falsifying responses.

Current developments in telecommunications and computer technology are rapidly changing data collection procedures and improving their efficiency. The results can also be analysed and updated with each successive response, thus, considerably reducing research time and costs. Data analysis includes tabulating, classifying and interpreting the information collected. The complexity of the analysis depends to a large extent on management needs. In many cases tabulation or cross-tabulation of results with averages and other summary statistics may suffice. In other cases, more sophisticated multivariate techniques such as factor or cluster analysis or multidimensional scaling may be required, if more complex interactions in the data are to be examined. Finally the presentation of research findings may be verbal and/or written. In either case, the main focus should be on clear presentation of key research findings and their implications on the decisions to be made by the management. As it is obvious from the above exposition on the process of marketing research process, the most vital element in this process is research plan or the research framework/design. For the research to be valid and reliable it is imperative that proper thought should go into the design of research, otherwise it may lead to GIGO (Garbage in, Garbage out) or mere data collection exercise with no information to the management for its problem-solving exercise.

A marketing research design may be described as a series of advance decisions that, when taken together, comprises a master plan or model for the conduct of the investigations. It is the blueprint that is followed in completing a study. An appropriate design requires careful consideration of the problem and objectives to be met in relation to the time and resources available for the study. The design or plan of a research investigation is best put in writing and it ordinarily covers the following aspects:

- Objectives of the research including a statement of general objectives and other operational objectives in as specific form as possible.
- The relation of these objectives with the problem at hand.
- The form in which the results will be obtained and how they may be used.
- The methods to be used in attaining each of the objectives of the research.
- A time schedule for the entire research, including speculations, deadlines for specific phases of the research.
- Personnel and administrative set-up, with duties specified for each person working on the research project.

1.14 TYPES OF RESEARCH DESIGN

On the basis of objectives of the marketing research, the research can be classified into: (*i*) Exploratory research (*ii*) Conclusive research. On the basis of character of data MR is often classified into: (A) Quantitative research (B) Qualitative research. The research design for exploratory research is best characterised by its lack of structure and flexibility. It is generally used for the development of hypothesis regarding potential problems and opportunities. Exploratory research is further subdivided into (*a*) search of secondary data (*b*) case study (*c*) survey of experts. Conclusive research which is used to provide information for the evaluation of alternative courses of action can be sub-classified into (*a*) descriptive research (*b*) causal or experimental research.

Descriptive market research is used to describe marketing phenomena while trying to determine the association among variables. It also seeks to predict future marketing phenomena.

In cross-sectional design, which is typically used in descriptive research projects, a sample of population elements is taken at one point of time. In descriptive research, we can make use of both case study and statistical study. Causal or experimental research seeks to unearth cause and affect relationships. A good causal research design seeks to minimise the interference of external variables while studying the relationship between variables. There is, however, a third type of research, also termed as performance monitoring research, that is an important part of marketing research activity of a firm. It typically requires a longitudinal research design (panel design), in which a fixed sample of population elements is measured repeatedly. In the traditional panel, the same variables are measured every time, as opposed to an omnibus panel where different variables are measured each time. In both types of panels, the sample of respondents remains fixed.

Exhibit 1.4: Research design in marketing research
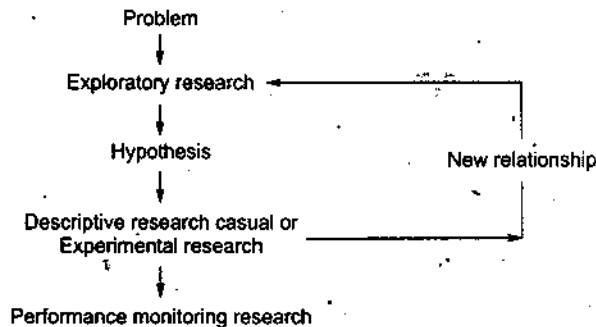
Exploratory Research Design

Flexibility and creativity characterise exploratory research study since the aim of its investigation is to find new hypotheses. Hence, formal design is rare in this type of research and much is left to the creative imagination of the market researcher. He could conduct a study of secondary sources of information or get views from the experts or resort to case study analysis. Market researchers exercise their individual initiative in spotting and following leads in an organised way.

Exploratory research using secondary sources of information

Many companies who regularly conduct market research studies have maintained a record of research findings over the years, the access to which is both quick and economical for a market researcher. Looking for hypotheses, a market researcher could consult basic research findings reported in professional journals. Other fruitful sources of secondary data are public libraries, newspapers, government reports, trade journals, general books, etc. Computerisation of database and quick search systems have made this type of research more organised, exhaustive and quick. At the same time there comes the problem of information overload and market research is the only way of shifting the relevant information by use of creative solutions to get insights on which management can act.

Exploratory research using expert opinions/individuals with ideas

Experts can give valuable insights into a marketing problem because of their experience with the problem at hand, ability to act as an observer and an ability to express ideas unlike any other individual. Despite the desire to find individuals with ideas, it is important not to concentrate the investigation only among the better educated or more articulate persons. A practical solution is to carry out exploratory research using a mix of cooperative, imaginative persons as well as randomly selected persons. Respondents should be given full freedom to respond to get new ideas. Various techniques called qualitative research techniques have been developed to unearth consumers' beliefs, values, attitudes, feelings that influence consumer behaviour. These qualitative techniques can be further divided into:

- *Depth Interviews:* These are one to one interviews because most people do not have clear ideas why they make particular purchase decisions. Individuals normally do not report decisions. They normally do not report socially unacceptable motives. So market researcher in-depth interviews attempt to influence respondents to talk freely about their subject of interest. Market researcher leads and probes the topic to get additional information. As such respondents are not approached with a fixed list of questions but the researcher has an outline in mind. No two interviews will proceed the same way as, for example, in a structured questionnaire interview. The market researcher has the flexibility to probe beyond superficial reasons, this is its strong as well as negative point in the sense that it makes it difficult to compare results. There is total reliance on the skill of the market researcher which makes it expensive to hire such knowledgeable persons. Depth interviews were discredited after being in limelight in Ditcher's time but have been lately beginning to make a comeback in understanding the consumer better for better consumer service.
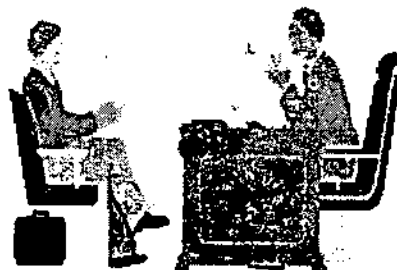
Direct questions to consumers about their attitudes or motives seldom elicit useful information. Direct questions do not measure the relative importance of the various types of reasons, and many individuals will not respond to what might be considered socially unacceptable.

Instead of approaching respondents with a fixed list of questions, the interviewer, in depth interviews, attempts to influence respondents to talk freely about the subject of interest. This is intended to put respondents at ease so they express any ideas they have on the subject. If some idea of interest is passed over too quickly, the interviewer may seek additional information by "probing".

The advantages of depth interviews:

❖ They bring out information that would not be obtained in a normal interview.

❖ The interviewer has a great deal of flexibility and can use his ingenuity to stimulate respondents to reveal more of their attitudes and motives.

The disadvantages of depth interviews:

❖ No two interviewers will proceed in exactly the same way, thus it is difficult to compare results.

❖ This creates difficulty in securing respondents cooperation and increases costs.

❖ The depth interview is the difficulty and cost of interpretation.

• *Focus Group Interviews:* When the management wants to get a first person feel of consumer reactions on its marketing mix variables, a market researcher can convert a focus group with him/her acting as a moderator. The discussion is guided from the generic product category to the product specific category to the specific brand under consideration. The interviews are usually recorded so that the market researcher may not lose information while keeping the discussion on the track. Reports based on focus groups typically may contain direct quotations from the interview session. These can be highly useful and stimulating to marketing people. The guiding concept in selecting samples for focus groups is never to use only one focus group but to keep running groups until the researcher is getting no more ideas. Individuals for a focus group are selected on quota basis. Again the disadvantage is that a skilled modulator is crucial to the success of focus groups. Also critics of focus groups argue that the results obtained are little more than creative ideas of the researcher.

Focus groups too, like in-depth interviews, have their advantages like:

❖ Bringing out the inner motivations of the consumers.

❖ Letting the researcher have a first hand experience of the consumer reactions.

❖ Generating new ideas.

Focus groups have their disadvantages too:

❖ Excessive reliance on the skills of the moderator.

❖ Wrong combination of consumers in focus groups, resulting in no tangible output.

❖ Using qualitative discussions quantitatively without checking them out.

Focus groups are, however, being used increasingly by researchers. Usually more than one focus group is used to get a clear and unbiased understanding of the target market behaviours and attitudes.

• *Projective Techniques:* In projective techniques interviewing, the respondents are asked to project themselves into a particular situation. The consumers then express different images they may have of competitive brands of a given product. A consumer may be asked to match a brand

and a person's image or asked for role reversal. It is another approach to getting respondents to reveal more than their surface feelings. For example, consumers might be asked such questions as:

- If brand A were a motorbike, what would it be?
- If brand B were a TV, which one might it be?
- The responses depend on the personality of a consumer. Every person has certain individual characteristics called basic personality. This basic personality is very stable and very difficult to change. These personality traits are present due to an individual's biological make-up. A marketer should remember that it is not possible to predict an individual's purchase behaviour based on his personality only. Nevertheless, by understanding the product or segment the market aims at the target group with certain major personality traits.

- *Exploratory Research using Case Analysis:* Although this method has long since attracted skepties ire because of its non-scientific nature, it is making a comeback. It involves the comprehensive study of one of a few specific situations and particularly the study of complex situations in which interrelations of several individuals are important. A situation is called a 'case'.

The design of a research project is the plan that ties the data to the conclusions that will be drawn. This method is based on finding the differences and the similarities so as to find the answers. Case research is not a quantitative exercise but is used to enhance understanding. It requires a rare combination of judgement to select cases and insight in interpreting them. Its strong points are holistic orientation, real life situation, i.e., in case study method inferences are made on the entire picture and not some of its parts; all the people actually concerned with the problem are contacted and data is obtained informally as well.

The disadvantages are mainly owing to its time consuming procedure; heavy reliance on investigators and the absence of formal information gathering techniques resulting in very generalised and random information which might not be useful at all.

Conclusive Research

When a marketing manager has to select one course of action among a number of alternatives, conclusive research provides him information that helps him to evaluate various alternatives and select among them a course of action. This type of research provides a rational basis for his decisions. The alternatives may be well or vaguely defined. Conclusive research design is characterised by formal research procedures. The research objectives are accurately defined and so are information needs. Conclusive research studies can be classified either as descriptive or experimental.

Descriptive Research

The research objectives in this type of research are generally describing the characteristics of consumer segment, viz., demographic, socio-economic,

geographic, psychographic and benefits sought. Descriptive studies can also portray buyer perceptions of brands; audience profiles for media types, viz., TV, radio, newspaper, journals and magazines, etc. They can also portray buying power of consumers, availability of distributors, product consumption patterns, price sensitivity of consumers, market share, etc. These are just a few representative studies out of numerous studies that come under descriptive research in marketing. Despite the emphasis on description, it should not be concluded that the studies should be simply fact-gathering expeditions. They can also be used to make predictions about the occurrence of a marketing phenomenon. The data regarding the presence of an association among variables can only be used for productive purposes but statements regarding cause and effect relationships are not possible with descriptive research (As may be possible in experimental or causal research).

The purpose and nature of descriptive research is quite different from that of exploratory research. Many descriptive studies are made with only hazy objectives and with inadequate planning. Much of the data collected in such studies turns out to be useless. Descriptive studies of this type are actually more of exploratory type. Effective descriptive research is marked by a clear statement of the decision problem, specific research objectives and detailed information needs. The research design should be fairly structured. Since the purpose is to provide information regarding specific questions or hypothesis, the research must be designed to ensure accuracy of the findings. Since descriptive studies may cost huge amount of money to carry out, there is then this necessity of its formal design. Descriptive research often makes use of survey research design which consists of a cross-sectional research design, that is, collecting data on few factors from a number of cases at one point of time. This is the most popular type of research design and is useful in describing the characteristics of consumers and determining the frequency of marketing phenomenon. As already mentioned it is often expensive and requires skillful and competent market researchers to conduct it effectively. It is also termed as statistical method in contrast to case method which focuses on many factors of few cases. This method ceases to focus on individual cases and focuses instead on classes, averages, percentages, measures of dispersion and more sophisticated statistical procedures. For example, cluster analysis can be used to group customers into different classes on the basis of few customer attributes or characteristics. Factor analysis can be used to group attributes into few factors which are important from consumers' point of view vis-à-vis a product, etc. In fact descriptive research presupposes that a sound causal model of marketing system exists in the mind of the decision-maker in contrast to exploratory research which seeks to generate hypotheses. A market researcher has to have a tentative hypothesis for carrying out descriptive research for the sole reason that he knows what data to collect from his respondents in the survey. Descriptive research designs can also use one or more of the following sources of data:

- Interrogation of respondents
- Secondary data
- Simulation

The analysis techniques used in descriptive research are those specifically for mass data. Each individual item tends to lose its identity. This is both an advantage and a disadvantage. The advantage lies in the objectivity with which

the analysis can be made. Averages or variance can be computed and compared; two independent researchers will arrive at similar results which is not the case with the case method. But the disadvantage lies in its mobility to prove cause and effect relationships which is the domain of experimental (causal) research. Even the direction of causal effect may not be visible through statistical study, e.g. when advertising and sales co-vary, it is often not clear whether advertising causes sales or sales cause the expenditure of more advertising effort because of greater apparent potential sales results. Simulation of marketing phenomenon consists in an incomplete representation of the marketing system or some aspect of this system. It is relatively a new source of data which is largely computer-oriented. Simulation can be used to gain insight into the dynamics of the marketing system by manipulating the independent variables (marketing mix and situational variables) and observing their influence on the dependent variables. A marketing simulation requires data inputs regarding the characteristics of the phenomenon to be represented and the relationships present. Simulations should neither over-simplify nor over-complicate. The limitations are its validity and time/cost of updating the model as conditions change. Simulation models can be classified on the basis of the purpose they serve, viz., predictive and descriptive.

Very often descriptive research may take the route of analysing already existing data on respondents, e.g., census data. Secondary source of data is much cheaper to access than carrying out a fullfledged survey and hence a great temptation for a market research. But the validity and appropriatness of such a secondary data descriptive research should always be borne in mind before embarking on one.

Example

The exploratory research on the drinking habit of milk yielded a set of three hypotheses to be tested. The information requirements were met by collecting data from over 100 respondents belonging to the upper-income group. A statistical frequency analysis and cross-classification analysis revealed the following:

- 64 per cent of the respondents preferred milk for themselves or their children as a breakfast drink. A mere 32 per cent respondents responded positively towards tea/coffee as breakfast drink. Rest of them opted for juice in the morning.
- 76 per cent of the respondents were positive about the taste of the flavoured milk with the teenagers liking it much more.
- 40 per cent elders preferred tea/coffee in the evening, whereas 35 per cent of the teenagers preferred milk as a breakfast drink.
- 80 per cent of the respondents wanted to give their children milk during the day when they return from school.
- 62 per cent of the respondents considered it a status symbol to offer tea/coffee to their guests or at social gatherings.

Experimental or Causal Research

Although, it is the nature of marketing decision-making that all the conditions allowing the most accurate causal statements are not usually present but in

these circumstances, causal inference will still be made by marketing managers. Because in doing so they would want to be able to make causal statements about the effects of their actions. "The new advertising campaign we developed has resulted in p% increase in sales" or the "sales discount strategy we followed has resulted in p% increase in sales", etc. In both of these examples, marketing managers are making a causal statement.

However, the scientific concept of causality is complex and differs substantially from the one held by the common person on the street. The common sense view holds that a single event (the 'cause') always results in another event (the 'effect') occurring. In science, we recognise that an event has a number of determining conditions or causes which act together to make the effect probable. Note that in the common sense notion of causality, the effect always follows the cause. This is deterministic causation in contrast to scientific notion which specifies the effect only as being probable. This is termed as probabilistic causation. The scientific notion holds that we can only infer causality and never really prove it. That is, the chance of an incorrect inference is always thought to exist. The world of marketing fits the scientific view of causality. Marketing effects are probabilistically caused by multiple factors and we can only infer a causal relationship. The conditions under which we can make causal inferences are:

- Time and order of occurrence of variables.
- Concomitant variation.
- Elimination of other possible causal factors.

The fundamental research tool used to identify causal relationships is the experiment. The objective of an experiment is to measure the effect of explanatory variables or independent variables on a dependent variable, while controlling for other variables that might confuse one's ability to make causal inferences. Such research leads to questions like:

"Is a given print advertisement more effective in colour than black and white?"

"Which of the several promotional techniques is most effective in selling a particular product?"

"Can we increase the sales of a product by obtaining additional shelf space?"

As Cox and Enis quote:

"The usefulness of experimental design in marketing extends across the functional areas of promotion, distribution, pricing and product policies. Whenever marketing management is interested in measuring the effects of alternative courses of action, experimentation may be a practical means of reducing the risk involved in deciding among the alternatives."

An experiment is executed when one or more independent variables are consciously manipulated or controlled by the person running the experiment and their effect on the dependent variable or variables is measured. In surveys there is no manipulation of independent variables by the researchers. This is a fundamental difference between the experimental and non-experimental research.

Treatments are independent variables that are manipulated or whose effects are measured. Dependent variables are the measures taken on test units. Test units are the entities to whom the treatments are presented and whose response to the treatments is measured. It is common in marketing for both people and physical entities, such as stores or geographic areas, to be used by as test units.

For example, people may be asked to try a product and then have their attitudes towards it measured. Here people are test units, product type is the independent variable and attitude is the dependent variable.

Two concepts of validity are important in experimentation, internal and external. Internal validity is concerned by with the question of whether the observed effects on the test units could have been caused variables other than the treatment. Without internal validity the experiment is confounded. External validity is concerned with the 'generalability' of experimental results. A researcher, obviously, would like an experimental design to be strong in both kinds of validity. Unfortunately, it is often necessary to trade off one type of validity for another. There are three true experimental designs in which a researcher is able to eliminate all extraneous variables as competitive hypotheses to the treatment:

- The Pre-test—Post-test Control Group Design:
Experimental Group	R	0_1	X_1	0_2
Control Group	R	0_3	0_3	

- The Solomon Four Group Design:
Experimental Group 1	R	0_1	X	0_2
Experimental Group 2	R	X	0_5	
Control Group 2	R		0_6	

- Post-test only Control Group Design:
Experimental Group	R	X	0_1
Control Group	R		0_2

Symbols used:

X Represents exposure of a test group to an experimental treatment, the effects of which are to be determined.

0 Refers to processes of observation or measurement of the dependent variables on the test units.

R Indicates that individuals have been assigned at random to separate treatment groups or that groups themselves have been allocated at random to separate treatments.

Movement from left to right indicates movement through time. All symbols in any one row refer to a specific treatment group. Symbols that are vertical to one another refer to activities or events that occur simultaneously.

e.g. $0_1 X_1 0_2$ indicates that one group received or measurement of the dependent variable both prior to (0_1) and after (0_2) the presentation of treatment (X_1). Further the symbols

$$R\ X_1\ 0_1$$
$$R\ X_2\ 0_1$$

indicate that two groups of subjects were randomly assigned to two different treatment groups at the same time. Further, the groups received different experimental treatments and the dependent variables were measured in the two groups at the same time. These purely experimental research designs control extraneous variables like history, maturation, interactive testing effect, instrumentation, statistical regression, selection bias and test unit mortality.

Type of experimental design	Description	Situation in which it is used
1. "After Only" Design	Difference between the experimental group's response before and after the experiment.	Measurement of advertising recall, day after recall, etc. or measurement of increase in sales after a sales promotion scheme.
2. "Before After" Design	The experimental group's reaction is first measured before and after the experimental variable is introduced to them to check out the difference in behaviour. The disadvantage is that some uncontrollable variable might be responsible for the change in opinion or behaviour.	A consumer entering a departmental store, having various brands of shirts, may be asked his brand preference. The salesman at the store would be instructed to influence the choice towards a particular brand. The brand purchased by the consumer finally would indicate whether the sales people have been successful in influencing the brand choices of the consumer. A consumer's intention to purchase earlier is compared with any changes at the time of final purchase on account of external stimuli like an advertisement or influence of the dealer, etc.
3. Before After with Control Group	The design consists of having a control group which is not subjected to the variable, versus the experimental group which is subjected to the variable. The difference of their differences would give an idea of the extent of uncontrollable variables present.	In the experiment described earlier, there could be consumers to whom the salesman does not deliberately push a particular brand. This would constitute the control group. The differences between the purchase behaviour of the control group and that of the experimental group would indicate whether uncontrollable variables had caused the change in behaviour.
4. Four Group Six Study Design	To remove the bias which exists on account of the 'before' measurement four groups are made, two as in the before after with control group when the before measurement is not made — one control group and the other experimental. Theoretically, it will be the solution of four unknown quantities to find their differences.	The experiments of four groups six study design are difficult to set up and difficult to interpret and have little practical application although they are ideal.

5. After only with Control Group	In this case, no 'before' measurement is made but only the after measurement is made on the experimental group. The difference between the two would indicate the effect of the experimental variable.	The experimental group may be sent certain privileged discount coupons for a sale, whereas the control group is not, the results of the sale would indicate whether the discount coupons are indeed useful in increasing the sales of the product.
6. The Latin Square Design	If the effect of a single variable is to be studied over different time periods and different geographic regions a design which takes into account possible combinations is made and the differences arising on account of either the geographic region or the time period are studied.	Suppose the owner of franchised outlets, say Bata, would like to know whether there is a difference in sales occurring on account of differences in three types of display used by three similar Bata stores, situated at different locations in Mumbai, for a period of three months. The design would be: Month → 1 2 3 Bata Store Location Crawford Market A C B Linking Road C B A Andheri B A C where A, B, C are different sales displays. Latin Square designs are extensively used to establish cause-effect relationships in marketing situations

Source: Roy G. Stost "Journal of Marketing" April, 1979, pp. 34-36.

Steps in planning an experimental design:

- *Selection of the Problem*: Every problem cannot be studied through experimental method. One example of major conditions being capacity to manipulate the independent variable the effect of which is decided to be studied.

- *Proper Description of the Selected Problem*: After selecting the problem, it must be put in proper language, i.e., the hypothesis must be stated in clear and conceptual terms. The variables that affect the phenomenon must be known and conceptualised.

- *Selecting the Setting*: The background in which the experiment relating to phenomenon is to be carried out is termed as setting. In case of laboratory experiment it is created artificially and the experimenter decides how it can be done. In case of a field experiment, natural setting has to be located where the experiment can be made.

- *Pilot Study*: In planning an experiment, a pilot study may be necessary so that the researcher is brought face to face with realities and many problems that he had not thought of. This also will enable him to know more precisely the various causative factors involved, the nature and working of

the institution, the extent of co-operation or resistance that he is expected to meet.

- *Research Design*: The most vital past of the research is research design as it lays down the manner in which the researcher will manipulate the situation in order to study the desired effect. This in itself leads to problem or control over the phenomenon.

1.15 EXTENSIONS OF TRUE EXPERIMENTAL DESIGNS

There are four designs that permit the researcher to study more than one level of an independent variable.

Completely Randomised Design

This is the simplest of the designs in which the treatments are applied to the experimental units by a chance process. The researcher is making an assumption that there are no differences in the test units and as a result, all the test units are treated alike and are randomly assigned to test groups.

For instance, to find out the most appropriate price for a new product, three different price levels – high, medium and low can be tested. The different price levels can be tested in three different stores. The analysis would reveal the average amount of the product sold at each price level and disclose whether there is any significant difference in sales between the three price levels.

The main disadvantage of this design is that it does not take into consideration the influence of possible extraneous factors. However, this design has the advantages of simplicity and inexpensiveness.

Randomised Block Design

This is an extension of the completely randomised design. In this design, a single extraneous factor is isolated by blocking out its effects. In the price illustration cited before, the type of store was not given consideration, but it could be an important influence on the sales of the product. Thus, the randomised block design enables the researcher to consider the effect of one extraneous factor and provides a clear idea of the treatment's effect on sales. In our illustration, we might take six stores of each type like department stores, speciality stores or grocery stores and assign them to three price levels. The results will be the same as that provided by the completely randomised design but it gives us the effect of one extraneous factor.

Latin Square Design

The Latin Square design considers the effect of two extraneous factors. As the name indicates, the layout of the design is a square. In this design, the treatments on each subject are tested one at a time in a sequence and the treatment is rotated so that one extraneous factor will offset the other. For instance, if a marketer wants to test the effect of four window displays in four stores, he may do so by rotating the displays between the stores for two weeks in each store with a week's gap between each test. As the test would form a square, there would

be as many tests as treatments. With four stores and four displays, we have a 4 × 4 design. This is a complex and expensive design, but it is more efficient than the previous designs.

Factorial Design

In the Latin Square design, only one variable is tested, whereas in the Factorial design two or more variables can be determined. For instance, a marketer wants to test the effect of TV advertising and price reduction on the sales of a product. Suppose, he considers three price reduction and four levels of TV advertising, then it would be 3 × 4 design. Hence, 12 markets have to be chosen to test the combinations keeping the time period of the test constant. Factorial designs can be constructed for more than two variables also.

1.16 SELECTING AN EXPERIMENTAL DESIGN

The researcher has to consider three important factors in the selection of an experimental design. They are:

- *Time*: The researcher may be required to provide results at a speed, as marketing decisions are required to be fast due to competitive conditions. Hence, the researchers have to plan for designs which take short periods to complete.
- *Cost*: The cost of executing the research has to be weighed against the possible outcome and its value.
- *Secrecy*: The major limitation of experimentation is that it might reveal things to the competitors. Hence, if secrecy is needed, simulated laboratory experiments are advisable.

1.17 LIMITATIONS OF EXPERIMENTATION

The manager should recognise the following limitations of experimentation:

- It is not always possible to control the effects of extraneous variables. Differential effects among treatment groups can easily occur in field experiments.
- In field experiments, lack of cooperation from the wholesalers and retailers can limit the experimental activity.
- Lack of knowledge about experimental procedures on the part of marketing personnel may limit the usage of experimentation and in addition, it may lead to experimental conclusions being discarded as not meaningful.
- Experiments can be costly and time consuming.
- In using people as test units, care must be taken that the experimentor does not say and do things that bias test unit responses.

Difficulties in Experimental Designs:

- *Problems in experimental setting*: Generally it is not easy to determine the conditions under which experiment should be setup. In case of scientific experiments laboratory conditions may be established but this may not be possible in case of sociological/psychological experiments. In case of conduct of experiment in a natural setting, problem arises in varying various treatments and other conditions.

- *Problems in getting cooperation*: In case of business and social research, to obtain cooperation from people who form the subject of experimentation is not easy. Human subjects at times work according to their free will.

- *Difficulties in establishing control*: Control at times in an experimental situation more so in case of complex business and socio-economic research is lost since it is very difficult to get complete knowledge of various factors influencing the experiments.

- *Problem of consciousness*: In case of business experimental design, experimental subject is rather fluid and possesses a consciousness which limits the degree of experimentation.

1.18 DESIGNING CONSUMER RESEARCH

The purpose of the consumer study is determined by research design. When descriptive information is required, a quantitative study is useful. If new ideas, e.g., positioning of a new brand is needed, a qualitative study is likely to be conducted. The consumer research design can be classified into two categories:

A – Qualitative research design

B – Quantitative research design

- *Qualitative research design*: The purpose of the study and the type of data needed are considered while selecting the appropriate research design for a qualitative study. The data collection techniques include:

  ❖ *Depth interviews*: Lengthy non-structured interview between a respondent and a highly experienced interviewer, who minimises his or her own participation in the interview.

  ❖ *Focus groups*: Which consist of six to eight respondents who meet with a moderator or analyst for a group discussion focussed on a particular product as product category.

  ❖ *Projective techniques*: Consisting of a variety of disguised tests that contain ambiguous stimuli, such as incomplete sentences, untitled pictures or cartoons, word association tests, etc., which are designed to tap the underlying motives of individuals despite their unconscious rationalisations or efforts at a conscious concealment.

- *Quantitative research design*: The design of a quantitative research study includes the method for collecting the data, the sample design and construction of the data collection instrument.

  ❖ *Data collection methods*: There are three basic ways to collect primary data in quantitative research.

    ♦ Observational research – by observing consumer behaviour.

♦ Experimentation – by designing experiments to identify cause and effect of the relative sales appeal of many types of variables.

❖ Surveys – by questioning people in person, by mail or by telephone about their purchase preferences and likings.

❖ *Data collection instruments*: The primary instrument is the questionnaire. Other types of instruments are inventories and attitude scales which include Likert scales, semantic differential scales and rank order scales.

❖ *Sampling – It involves*:

♦ The sampling unit – whom to survey:

♦ Sample size – how many to survey; and

♦ Sampling procedure – how to select them.

• *Data collection*: Highly trained social scientists are required to collect data in qualitative studies. But, in quantitative studies a field staff is generally used.

• *Analysis*: In qualitative researches, the moderator or test administrator usually analyses the responses received. In quantitative research, the analysis is supervised by the researcher.

• *Report preparation*: It includes a brief executive summary of the findings. Depending on the assignment, it may or may not include recommendation for actions. The report will contain a full description of the methodology used.

Error Reduction Through Design

The basic purpose of research design is to guide the researcher in answering the research problem. It is accomplished through the careful construction of the research design so that the results obtained are as error free as possible. These errors and the researcher strategies for dealing with them are discussed in the following section.

• *Planning Errors*: Planning errors are those which deal with the setup of the design to collect information. Researcher can think of planning errors as being all those sources of misinformation because of which the study is inappropriately structured when the research is undertaken.

• *Collection Errors*: They are associated with the collection of information to answer the research problem. These errors are sources of misinformation due to the actual collection of data, given the study is actually well structured.

• *Analytical Errors*: They are those which are due to the inappropriate analysis of the data collected. Researcher can think of them as the actual manipulation of the data. To reduce analytical errors, it requires a justification of the analytical procedures used in manipulating and summarising the data.

• *Reporting Errors*: They are those due to the incorrect interpretation of the results of the study. They put erroneous meaning into the relationship and numbers identified from data analyses.

SUMMARY

- Marketing Research is a growing and widely used business activity because a manufacturer needs to know more about his final consumers. The Marketing Manager, using a variety of sources, obtains many types of information on which to base his decisions. Certain data, such as daily sales figures and monthly or quarterly totals are continuously and regularly supplied. Other information such as consumer survey results is generated only upon special request. Still other information, perhaps informally gathered competitive information, comes to the manager on an unscheduled basis.

- Marketing research is also used throughout all four phases of the administrative process: Selecting strategies, developing marketing plans, putting the plans into action, and evaluating their effectiveness. Some companies are now beginning to co-ordinate and integrate their marketing research activities into marketing information systems designed to provide managers the information they need for recurring problems and decisions.

- Today's world is full of competitive players; it is knowledge which can help firms in winning the race. The days when superior salesmanship could be the key factor are gone. The information technology with Internet-based information has opened the door of knowledge for the marketers the world over. It also means that each of the competitive firms have the similar type of access to information. The firms with better information base are going to be the winners.

- The marketing job starts with knowing your customers, their needs, likes and dislikes, besides other factors including when they buy, where and how they buy the products you sell. And marketing research is here to answer all such questions.

- A research design serves as a bridge between what has been established (the research objective) and what is to be done, in the conduct of the study, to realise those objectives. It anticipates what the client will need in terms of results and the analytical work on the gathered data that will convert it to useful findings.

- A formal design's benefits are particularly appreciated when the researcher is deciding specifically what data are needed. If data are gathered that prove to be irrelevant, it is both inefficient and confusing. It is even more serious to have overlooked some data that are vitally needed, which may be discovered until too late, at the analytical stage. A design also is appreciated when analysing the data and interpreting and thinking on the path to solutions and recommendations.

- Although, research designs may be classified by many criteria, the most useful one concerns the major purpose of the investigation. On this basis, we may identify the broad classes of designs as exploratory, descriptive and causal.

NOTES

1. Define marketing research and explain the factors which limit the acceptance of marketing research.
2. Differentiate between market research and marketing research.
3. Discuss the importance of marketing research for the producer.
4. Explain the seven steps in marketing research process.
5. Briefly discuss the nature and scope of marketing research in the context of economic liberalisation in the country.
6. What are the limitations and weaknesses of marketing research?
7. What is marketing research? What are the possible areas of marketing research?
8. A sales manager in a firm with a large sales force recently said, "My sales people give me better information about the market then I could ever get from our market research department." Discuss.
9. Could the same type of marketing research be used to develop a marketing plan and to evaluate the effectiveness of the marketing plan? Explain.
10. How is marketing research directed towards setting goals and establishing strategies likely to be different from marketing research directed towards the development of a marketing plan? Explain.
11. One of the key marketing trends of the 1990s is that organisations are trying to become more market-driven. What role should marketing research play in the process? Discuss.
12. A famous five-star hotel is planning to start fast food restaurants in major cities of the country. What are the various parameters which the company should keep in mind while launching its restaurants?
13. What are the major reasons for growing importance of marketing research in India?
14. Indicate whether marketing research is relevant to each of the following organisations and if so, how each might benefit:
   ❖ Your Company
   ❖ Central ministry in the Government of India
   ❖ A retail shop
   ❖ A bank
   ❖ A service business
15. Briefly comment on the problems faced by researchers in conducting marketing research in India?
16. Suggest some of the precautions to be adopted in the problem definition stage.
17. Marketing research can be conducted on all of marketing mix factors. Discuss.
18. It is possible to get information about market need of FMCG products package size. Is the statement true? If yes, then what needs to be done to get the information?
19. Discuss the objectives of marketing research.

20. Suggest some possible areas where marketing research would find increasing application in India.

21. Discuss the application of exploratory research design in marketing.

22. Discuss the various types of experimental research designs.

23. What do you understand by the term research design? What is its importance? What are the different types of research design? What relationship exists between them?

24. What is (A) Exploratory (B) Descriptive (C) Causal research? Using examples show how they differ from each other.

25. "The problem definition phase may never come to an end with one exploratory research leading to another." Comment.

26. "In-depth interviews are similar to individual case studies." Comment.

27. A coffee marketer uses observational research to study consumer buying habits. The research design consists of observing shoppers in supermarkets and recording the sex and approximate age of consumers who buy coffee.

   ❖ Is observation the best research technique to study this type of consumer behaviour? If not which method(s) is more appropriate and why?

   ❖ In your view is the researcher using a sampling method? Is this technique appropriate in this situation? Given the choice, what method would you use and why?

28. You are the product manager for brand 'Youth' shaving cream, a nationally distributed brand. Brand 'Youth' has been declining in absolute level of sales for the last four consecutive months. You ask the marketing research department to do a study to determine why sales have declined.

   ❖ Indicate whether this is an exploratory, descriptive or causal study.

   ❖ What data would be useful for determining the reasons for decline in sales?

   ❖ How would you design the study to obtain these data?

   ❖ What external secondary data are, in fact, available that would be useful for this purpose? From what sources can they be obtained?

29. Describe the various methods for controlling sources of extraneous variation in experimental designs.

30. Briefly explain the nature and scope of exploratory research.

31. Describe the sampling design process.

32. A pro-life group wanted to test the effectiveness of an anti-abortion commercial. Two random samples, each of 250 respondents, were taken from the city of Chandigarh. One group was shown the anti-abortion commercial. Then, attitudes toward abortion were measured for respondents in both the groups.

   ❖ Identify the independent and dependent variables in this experiment.

   ❖ What type of design was used?

   ❖ What are the potential threats to internal and external validity in this experiment?

33. What is the relationship between exploratory, descriptive and causal research?

34. What are the requirements for inferring a causal relationship between two variables?

35. Differentiate between internal and external validity.

36. List any five extraneous variables and give an example to show how each can reduce internal validity.

37. State the type of experiment being conducted in the following situations. In each case, identify the potential threat to internal and external validity.

   ❖ A major distributor of office equipment is considering a new sales presentation programme for its salespersons. The largest sales territory is selected, the new programme is implemented and the effect on sales is measured.

   ❖ Procter & Gamble wants to determine if the new package design for "Aerial" is more effective than the current design. Twelve departmental stores are randomly selected in Delhi. Further, six outlets are randomly selected to sell Aerial in a new packaging. In the other six, the detergent is sold in the old package. Sales for both groups of departmental stores are monitored for three months.

38. You are the product manager for brand S margarine, a nationally distributed brand. Brand S has been declining in absolute level of sales for the past four consecutive months. You ask the marketing research department to do a study to determine why sales have declined.

   ❖ Is this an exploratory, descriptive or causal study?

   ❖ What data would be useful for determining why sales have declined?

   ❖ How would you design the study to obtain these data?

39. Explain what research design would you use if you want to conduct a study regarding the demographic profile of the users of a particular brand of a product.

40. List out the uses of consumer research in the field of:

   ❖ F.M.C.G.

   ❖ Durable goods

   ❖ Consumer services

41. Every consumer is unique and the study that concentrates on the 'average' consumer is meaningless. Comment.

42. Compare qualitative and quantitative research.

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CASE STUDY–1
MARKETING RESEARCH FOR LORINO

Soumitro Ghosh, MD, Tabeffer India, felt that his company had developed a product with the potential to be a winner: a tablet-based soft drink, branded Lorino. The results of the market research that he had commissioned indicated that consumers were not only interested in the concept, but also liked the flavours in which Lorino had been test-marketed. However, breaking into the soft drinks market would not be simple. While the concentrates segment was stagnant, the aerated drinks segment was dominated by global players with huge ad spends.

The product had two overriding advantages. It didn't have the inconvenience of mixing, sugaring and stirring and disposing of the package unlike tetrapack.

Company had worked out a third-party contract distribution arrangement with Gretas which was also distributing soaps, biscuits and hair creams.

Tabeffer India also hired the services of Product Profile, a leading market research firm. The initial research revealed the following facts:

- The consumption pattern in volumes was; filter coffee: 3.9%, malted drinks: 2.2%; instant coffee: 1.8%; and soft drinks: 1.1%. The soft-drinks market, though a low-volume in comparison; was far more impressive in terms of value – ₹ 1,300 crore per annum.
- Aerated Soft Drinks (or ASDs) accounted for ₹ 1,100 crore; tetrapacks, ₹ 150 crore; concentrates, ₹ 60 crore; branded squashes, ₹ 25 crore.
- ASDs consisted of Colas (70%), Lemon drink (20%), Orange (10%).
- There are three brands in the Cola segment of ASD: Life, Prime and Vic. Life is a 100-year-old global brand with a brand image built around fun, youth and socialising group. Prime is a close rival of Life in several markets around the world. Vic had a near-monopoly position, with a 60% share of Cola market. With its macho image it had tried to position directly against Prime.
- In the lemon segment Misty was the single largest selling brand in the 70s and 80s which initially used its hygienic and thirst quenching values.

Later it projected an any time drink image highlighting the occasion-brand association. Its cloudy appearance was well received. Thus, the six broad conclusions were analysed by the company:

- The brand image during the launch will be vital.
- ASD brands have enormous ad spends.
- Global brands have been successful only in the Cola segment.
- Tetrapacks have seen the largest number of failures, but also single largest success.
- Brands targeting several demographic and psychographic segments have not been successful.
- For five years, the concentrates market has defied all attempts at expansion.

Questions

- Develop an 'image-plan' for Lorino.
- How will you develop product concept for Lorino before launching?

CASE STUDY-2: SHRI RAM CONSULTANTS

Shri Ram Consultants have been appointed by a leading group in hotel industry to prepare a feasibility report for opening a five-star hotel in Pune. The group had been the most successful one in the hotel industry and had always kept its eyes open for new opportunities.

In view of the very fast industrial growth in the city of Pune, the city had attracted the attention of the group. Pune, apart from being a modern city, has the added advantage of pleasant weather and several places of tourist attraction in the neighbourhood. Moreover, the closeness to Mumbai, a city of international stature, made it very easily accessible to international tourists.

For Shri Ram Consultants this was the first time that an assignment concerning the hotel industry had been received. They, however, soon realised that the assignment was not as simple as it appeared to be in the first place. The feasibility of such a hotel would depend essentially on two factors. Businessmen visiting the city for work would constitute one segment of the market, while tourists would constitute the other. Further, the tourists could be Indians or foreigners. The success of such a hotel would also depend upon the relative attraction of other tourist centres in the vicinity.

Further, it was necessary to estimate fluctuations in demand for hotel accommodation so that attractive discounts could be offered during the off-season for business conferences, executive development programmes, etc.

The consultants realised that they would have to undertake a market research on a national scale to assess the tourist potential of the city. They would also have to survey the foreign tourists to estimate one of the most important segments of the market.

The consultants wondered whether such a survey will have to extend over a period of one full year to completely take into account the seasonal variations in tourists traffic. They were also undecided about the manner in which the survey should be conducted. The company also feared that in the absence of

an accurate definition of the problem, they may land up surveying the compete tourist market in India rather than studying the feasibility of a hotel in Pune. They had heard that ITBC had appointed lady interviewers at several major airports for conducting such surveys and wondered if such a methodology could be of use to them.

The problem appeared well defined and they were concerned as the preliminary report explaining methodology of the research and the questionnaires to be used had to be submitted to the client along with the estimate of expenses within one month.

Questions

- How would you define the problem of assessing the feasibility of the hotel so as to help design the survey?
- How would you plan a survey for actually collecting information on expected demand for hotel space? How would you estimate the cost of such a survey?

UNIT

2

METHODS OF DATA COLLECTION

2.1 DATA COLLECTION METHODS

Having identified and formulated a research problem and having determined the objectives of research, a researcher has to face the problem of data collection. The information collected should be both accurate and relevant, as per the requirements of the researcher, who has to work out a suitable data collection method. Data collection methods can be broadly classified into (I) primary methods and (II) secondary methods.

- *Primary Methods:* Data directly collected by a researcher is known as primary data. The methods used for collecting primary data may be: (A) Survey (B) Observation. Cox has distinguished between the two forms of collecting primary data with respect to five criteria which are the following:

Characteristics	Data Collection Method	
	Survey	Observation
1. Type of information sought	Awareness/Attitude	Current behaviour and results
2. Control over data gathering activities	Relatively high	Relatively low
3. Data accuracy	Relatively low	Relatively high
4. Time factor	Relatively high	Relatively low
5. Personnel skills required	Relatively high	Relatively low

Source: Cox. William E. Industrial Marketing Research, 1979, pp.83

- *Secondary Methods:* Data not originally collected for use in the research project under consideration, but rather for use by some other person or for some other project are termed secondary data.

  The following methods are used in collection of primary data for marketing research projects:

Types of Secondary Data

There are several ways by which secondary data can be classified, which immediately suggest the classification of internal and external source. The following chart provides an overview of these sources.

Sources of secondary data

Internal sources
- Sales records
- Credit records
- Internal reports

External sources

Published
- Directories
- Periodicals
- Financial records
- Statistical sources

Commercial
- Demographic data
- Store audit data
- Diary ponel data
- Advertising explosive data
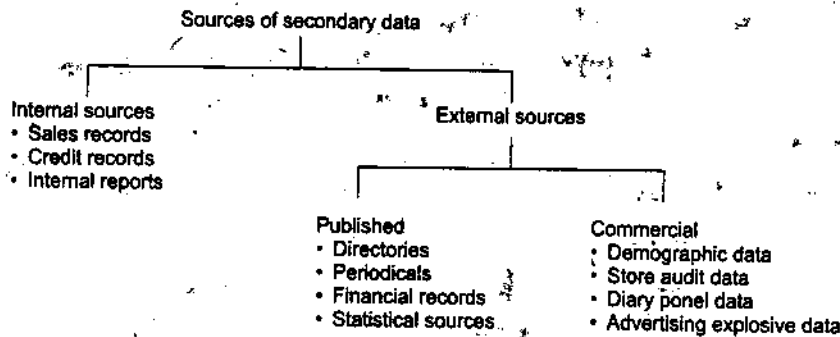
Advantages of Secondary Data

- It is more economical, as the cost of collecting data is saved.
- Secondary data provides valuable insights and contextual familiarity with the subject matter.
- Secondary data can be used as a basis for comparison with the primary data that the researcher has just collected.

Disadvantages of Secondary Data

- Locating appropriate source and finally getting access to the data would be a time consuming exercise.
- The data available might be too vast and a lot of time may be spent going through it.
- The accuracy of secondary data as well as its reliability would depend on its source.

- It might not be updated and not of much use in a dynamically changing environment.

Sources of Primary Data

- Interview Methods:
  - ❖ Depth Interviews
  - ❖ Mail Interviews
  - ❖ Telephone Interviews
- Delphi Technique
- Projective Techniques
- Focus Group Interviews
- Questionnaire Methods
  - ❖ Structured
  - ❖ Semi-structured
  - ❖ Unstructured
- *Interview Methods:* This is a method whereby a respondent and a researcher can come into direct contact with each other in some form or the other. The researcher may go from door-to-door for interviews or may contact the respondents at some central place. The technique of interviews provides the researcher with an opportunity to ask the respondents any additional relevant questions. Modern techniques of recording may also be used to ensure accuracy, verification, etc. Many marketing researchers use this technique because it is useful to have accurate information for a research project.

Advantages of Interview Methods

- Accurate information/data
- Additional information, if needed
- Flexibility in information collection
- Ease in communication
- Ease in obtaining personal information.

Disadvantages of Interview Methods

- *Cost:* Interviews are more expensive than the other techniques.
- *Difficulty in sampling control:* No respondent can be forced to give an interview. Non-response can vitiate the character of a sample.
- *Time-consuming:* The interview technique is highly time-consuming, forcing the researcher to limit the size of his sample.
- Possibility of getting fictitious information.
- *Depth interviews:* By this method, a researcher continues asking probing questions to secure as much information as possible. His probe, of course, is conditioned by the response of the respondent.

Example

- What make of scooter did you buy?
- Did you compare different scooters before buying a Bajaj?
- What has been your experience with it?
- Is it easy to maintain?
- Is it reliable on busy roads?
- Are you satisfied with its performance?
- Thus, the researcher will continue asking questions till he is satisfied.

Advantages of Depth Interviews

- ***Hidden information***: The main advantage of depth interview is that the researcher will, in all likelihood, access the information that he might not have otherwise got.
- ***Flexibility***: A depth interview offers flexibility to an interviewer because it is like an informal discussion between him and the interviewee on the latter's experiences.

Disadvantages

Lack of Proper Structure and System: Depth interviews lack a systematically defined way of analysing the information obtained. In the Indian marketing research context depth interviews lack popularity because of non-availability of professional personnel.

- ***Time-consuming***: This method requires considerable amount of time in interviewing which might not be available.
- ***Difficulty in tabulating and analysing the data***: Since this method lacks a proper structure and system the researcher faces a host of problems in tabulating and analysing the data.
- ***Mail Interviews***: This is a method whereby a researcher takes interviews by mailing the questionnaire to respondent.

Advantages of Mail Interviews	Disadvantages of Mail Interviews
1. May be only method able to reach the respondent.	1. Very little control in securing response from specific individual.
2. Sampling frame easily developed when mailing lists are available.	2. Cannot secure response from illiterates.
3. Not subject to interviewer bias.	3. Cannot control speed of response; long response time.
4. Respondent works at his own pace.	4. Researcher cannot explain ambiguous questions.
5. Assures anonymity of respondents.	5. Does not allow probing with open-ended question.
6. Wide distribution possible.	6. Difficult to change sequence of questions.

- ***Telephone interviews***: This is a method whereby a researcher questions the respondent on telephone.

Advantages of Telephone Interviews	Disadvantages of Telephone Interviews
1. Relatively low cost.	1. Difficult to establish representative sampling frame due to unlisted numbers.
2. Wide distribution possible.	2. Cannot use visual aids.
3. Interviewer supervision.	3. More difficult to establish rapport over the telephone.
4. Relatively strong response rate.	4. Does not handle long interviews well in most cases.
5. One of the quickest methods of data collection.	5. Subject to some degree of interviewer bias.

- ***Delphi technique***: It is a technique whereby a marketing researcher elicits information by means of discussions with various experts in the field. Each expert is asked to comment on the different aspects of a problem. Clearly, the success of this technique depends on a proper selection of experts.

- ***Projective techniques***: Projective techniques play an important role in marketing research. This group of techniques is based on indirect interviews in collecting data and is useful where data cannot be collected directly. These techniques are helpful in exploring the 'whys' of market and consumer behaviour. In projective techniques, respondents are requested to interpret the behaviour of 'others'.

  The following techniques are called Projective Techniques:

  ❖ Thematic Apperception Test (TAT)
  ❖ Role Playing
  ❖ Cartoon Completion
  ❖ Word Association
  ❖ Sentence Completion
  ❖ *TAT*: It is a popular technique in marketing research. The researcher shows a set of pictures to the respondents and then asks them to describe what they think the pictures represent.
  ❖ *Role Playing:* The respondents report their realistic behaviour in imaginary situations. They assume their roles in these situations as actors playing their parts on a stage or in a movie. Most role-playing situations involve interaction in a real business situation.
  ❖ *Cartoon Completion:* The respondents are shown a cartoon with one or more persons in a particular situation. They are then asked to come up with ideas about these characters.
  ❖ *Word Association:* It consists of presenting a series of words to respondents and recording their opinions for a detailed study.

- ***Focus group interviews***: It is the best known and most of the people jointly participate in an unstructured indirect interview conducted by a moderator. Here, attempts are made to focus the discussion on the problem areas in a relaxed, non-direct manner. Focus group interviews can be used for a number of different purposes.

Advantages

❖ It provides complex and varied data, because the discussion covers different group members.

❖ It saves time as well as cost.

Disadvantages

❖ Difficulty in sample selection.

❖ Samples are necessarily very small.

❖ Responses may be inferred by what others have to say.

❖ Difficulty in analysing the results.

2.2 SAMPLING

Marketing research is based on either population (universe) enquiry or sample enquiry. The researcher favouring one method over another depends on the size of the universe and the time given to the research agency.

Sampling may be defined as the selection of some part of an aggregate or totality on the basis of which a judgement or inference about the aggregate or totality is made. Sampling is simply the process of learning about the population on the basis of a sample drawn from it. Thus in the sampling technique instead of every unit of the universe only a part of the universe is studied and the conclusions are drawn on that basis for the entire universe.

2.3 FEATURES OF SAMPLING METHOD

The sampling technique has following good features and these highlight its value and significance.

- **Economy:** The sampling technique is less expensive, much less time-consuming than the census technique.

- **Reliability:** If the choice of sample units is made with due care and the matter under survey is not heterogeneous, the conclusion of the sample survey can have almost the same reliability as that of census survey.

- **Detailed Study:** Since the number of sample units is fairly small these can be studied intensively and elaborately and can be examined from multiple viewpoints.

- **Scientific Base:** This is a scientific technique because the conclusions derived from the study of certain units can be verified from other units. By taking random samples we can determine the amount of deviation from the norm.

- **Greater Suitability in most Situations:** Most of the surveys are made by the technique of sample survey, because when the matter is of a homogeneous nature, the examination of a few units suffices as is the case in the majority of situations.

2.4 LIMITATIONS OF SAMPLING

- *Less Accuracy*: In comparison to census technique the conclusions derived from sample are more liable to error. Therefore, sampling technique is less accurate than the census technique.
- *Changeability of Units*: If the units in the field of survey are liable to change or if these are not homogeneous the sampling technique will be very hazardous. It is not scientific to extend the conclusions derived from one set of sample to other sets which are dissimilar or are changeable.
- *Misleading Conclusions*: If due care is not taken in the selection of samples or if they are arbitrarily selected, the conclusions derived from them will become misleading if extended to all units. For example, in assessing the monthly expenditure of university students we select for sample study only rich students, our results will be highly erroneous if extended to all students.
- *Need for Specialised Knowledge*: The sample technique can be successful only if a competent and able scientist makes the selection. If this is done by an average scientist, the selection is liable to be wrong.
- *When Sampling is not Possible*: Under certain circumstances it is very difficult to use the sampling technique. If the time is very short and it is not possible to make selection of the sample, the technique cannot be used. Besides, if we need 100% accuracy the sampling technique cannot be used. It can also not be used if the material is of a heterogeneous nature.

2.5 CHARACTERISTICS OF IDEAL SAMPLE

A good sample has following qualities:

- *Representativeness*: An ideal sample must be such that it represents adequately the whole populations. We would select those units which have the same set of qualities and features as are found in the whole data. It should not lack in any characteristic of the population.
- *Independence*: The second feature of a sample is independence, that is interchangeability of units. Every unit should be available to be included in the sample.
- *Adequacy*: The number of units included in a sample should be sufficient to enable derivation of conclusions applicable to the whole population. A sample having 10% of the whole population is generally adequate.
- *Homogeneity*: The units included in the sample must bear likeness with order units, otherwise the sample will be unscientific.

2.6 SIZE OF SAMPLE

For proper study of the problem, it is necessary to have proper sampling. It means that the sample should be of proper size. If the sample is either too small or too big, it shall make the study difficult. What should be the size of the sample, is a question which should be answered only after taking into account

the various factors of the research problem at hand. In this context, Parten has laid down that:

"An optimum sample in survey is one, which fulfills the requirements of efficiency, representativeness, reliability and flexibility. The sample should be small enough to avoid unnecessary expenses and large enough to avoid intolerable sampling error".

2.7 FACTORS TO BE CONSIDERED IN SAMPLE SIZE

The following factors should be considered while deciding the sample size:

- *The Size of the Universe*: The large the size of the universe, the bigger should be the sample size.
- *The Resources Available*: If the resources available are vast, a large sample size could be taken. However, in most cases resources constitute a big constraint on sample size.
- *The Degree of Accuracy or Precision Desired*: The greater the degree of accuracy desired the larger should be the sample size. However, it does not necessarily mean that bigger samples always ensure greater accuracy.
- *Homogeneity or Heterogeneity of the Universe*: If the universe consists of homogeneous units, a small sample may serve the purpose but if the universe consists of heterogeneous units, a large sample may be required.
- *Nature of Study*: For an intensive and continuous study, a small sample may be suitable. But for studies which are not likely to be repeated and are quite extensive in nature, it may be necessary to take a large sample size.
- *Method of Sampling Adopted*: The size of samples is also influenced by the type of sampling plan adopted. For example, if the sample is a simple random sample it may necessitate a bigger sample size. However, in a properly drawn stratified sampling plan, even a small sample may give better results.

The above factors have to be properly weighted before arriving at the sample size. However, the selection of optimum sample size is not that simple as it might seem to be.

2.8 THERE ARE TWO METHODS OF COLLECTING DATA

- Complete enumeration
- Sample enumeration

But before discussing these two, we should be familiar with the following terms:

- *Population*: Population refers to the entire unit. *For example*, (a) The classification of 60 students is a population. (b) The unit of all presses of India, for the purpose of census is a population.
  - Remember a population is not significant to the size as in the above examples (a) and (b) population has sizes of 60 and 100 crore respectively. The only thing is that it should be the entire set but not a subset.

• **Sample:** A sample is a subset of population. As in the example (1), the class of 60 students is a population and any collection of 10 students taken from this population is a sample. There are many samples. There are many samples for population.
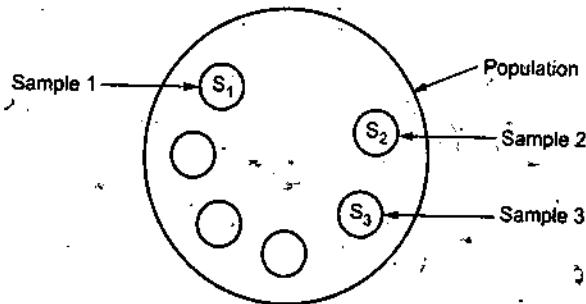
• **Parameter:** Any value such as mean standard deviation, etc., associated with the population is known as parameter, for example,

Consider the population of 20 students where marks are given below (out of 30)

25	27	29	30	30
10	15	25	27	28
22	23	21	29	27
18	17	29	30	22

Now the mean (avg.) of these marks is given by

$$\frac{25 + 27 + \ldots + 22}{20} = ?$$

This mean is known as parameter.

• **Statistic:** Any value such as mean, standard deviation, etc., associated with a sample is known as statistic. Continuing with the same example as above, if a sample of 10 students is taken, as follows:

10	30	29	27	25	28	23	21	22	17

Then mean $= \dfrac{10 + \ldots + 17}{10} = ?$

This mean is now known as statistic

• **Estimation:** The process of approximating the value of parameter from the known statistic is called estimation.
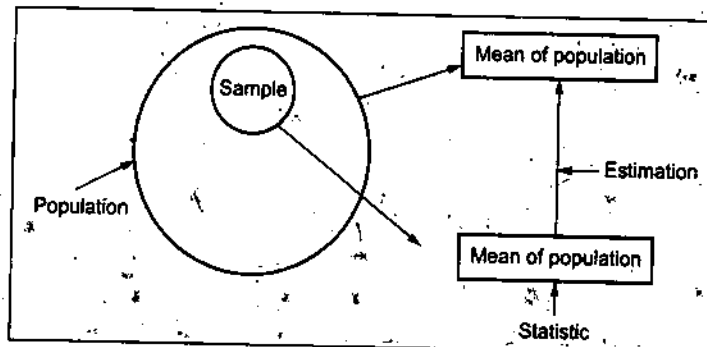
Now, we come to v type enumerations.

- **Complete Enumeration:** It deals with the investigation of the entire population.

  For example:

  ❖ For the census purpose, we will have to move each and every individual of our country. This cannot be done with the help of few individuals.

  ❖ Suppose a teacher wants to know the average marks obtained by the class of 50 students. Then he/she should know the marks of all the students (*i.e.*, whole universe) and then he/she can calculate the average marks as follows:

  $$\text{Average Marks} = \frac{\text{Total marks obtained by 50 students}}{50}$$

  Here each and every student's marks is studied, that is why it is a case of complete enumeration.

- **Sample Enumeration:** Under this method, part of the universe sample is considered for investigation.

  For example:

  ❖ Continuing with the same example as in the case of complete enumeration, if a teacher wants to know about the average marks of 60 students of a class then he/she may take a sample of 10 students and can calculate their average marks as

  $$\text{Average Marks} = \frac{\text{Total marks of 10 students}}{10}$$

  From this, he/she may guess about the average marks of the class. In fact, there are many cases where the sample is used to know about the population.

  Following examples illustrate how the samples can be used to drawn conclusions about the population.

  ❖ In a hotel, a cook tastes a small quantity of the dish to know about the acceptable quantity of the entire dish.

  ❖ A manufacturer of electric tubes is interested in knowing the average life of its product. Then it is desirable to take a sample of some tubes and perform experiments on tubes to know the average life of the tubes. It is not wise to display all the tube lights. In fact, this is an example where the sampling method is the only possible method.

Advantages of Sample Enumeration

- Saving in time.
- Reduced cost of survey.
- Sampling enumeration sometimes is the only possible method just as in cost of infinite universe, *e.g.*, tossing of a coin infinite times.

Disadvantages

- Choice of sample size
- Sample not representative
- Personal bias.

NOTE

According to A.C. Rosander, "The sample has many advantages over a census of complete enumeration...if carefully designed, the sample is not only considerably cheaper but may give results which are just accurate and sometimes more accurate than those of a census. Hence a carefully designed sample may actually be better than a poorly planned and executed census." The principal advantages of sampling as compared with complete enumeration are.

Sampling

A sample can be drawn from the population in a number of ways. The process of drawing the sample from the population is known as sampling. It may be defined as:

"The process of inferring something about a large group of elements by studying only a part of it is known as sampling".

- The sampling process has the following steps:
- Define the population
- Identify the sample frame
- Specify the sample unit
- Specify the sampling method
- Determine the sample size
- Specify the sampling plan
- Select the sample

Why Sampling is Needed?

- Sampling is needed due to the following advantages:
- Sampling is more economical
- It is less time consuming
- Destructive Sampling
- It is qualitative
- It gives enough reliability

2.9 TYPES OF SAMPLING

There are basically two types of sampling methods:

- Probability Sampling Method and
- Non-probability Sampling Methods.

In case of:

(a) Probability Sampling Method

- The probability or chance of every unit in the population being included in the sample is known.
- Selection of the specific units in the sample depends entirely on chance.
- No substitution of one unit for another is permissible and hence no human judgement or bias on account of this is possible.

- It is possible to measure the sampling error and hence we can know the degree of precision.
- The use of probability sampling also enables us to determine the sampling size for a given degree of precision and also enable us to choose a representative sample.
- As probability sampling helps in selection of a representative sample and gives the degree of precision, this helps in building up confidence in the inference.
- Various techniques of probability sampling are:
  ❖ Simple Random Sampling
  ❖ Systematic Sampling
  ❖ Cluster Sampling
  ❖ Multistage and Multiphase Sampling

(b) Non-Probability Sampling Method

- In a non-probability sample, the probability of indecision of any unit (of population) in a sample is not known.
- The selection of units within a sample involves human judgement rather than pure chance.
- The maximum information available "per rupee" which can be determined from a probability sample is not possible in this case and moreover, the degree of accuracy is not known.
- Although the probability sampling is scientific and gives the accuracy involved, however, because of convenience and economy, the non-probability samples are preferred as compared to probability samples.
- Many times, samples are selected by interviewers "at random" meaning that the actual sample selection is left to the choice of the researcher, such samples are non-probability samples and not probability samples.

Various techniques used in non-probability sampling methods:

- Judgement Sampling
- Quota Sampling
- Convenience Sampling

2.10 SOME OTHER TYPES OF SAMPLING

- Probability Random Sampling
  ❖ Simple Random Sampling
  ❖ Stratified Random Sampling
  ❖ Systematic Sampling
  ❖ Cluster Sampling
  ❖ Multistage Sampling
- Non-probability Sampling Techniques
  ❖ Deliberate Sampling
  ❖ Quota Sampling
  ❖ Convenience Sampling

Probability Sampling Techniques

(a) Simple Random Sampling

A random sample is known as a probability sample. Under this method the selection of items for a sample depends on chance. Each and every item of the population will have equal chance of being included in the sample. As a result, the element of personal bias is altogether avoided here. The researcher cannot exercise his discretion in the selection of sample items. It is expected that by allowing equal probability to all population units, the different characters that are present in the universe are given adequate representation to make it a probability sample. A deliberate effort is made by adopting scientific rules of sample selection. Therefore, the scope for bias is totally ruled out.

The method is formally defined as follows:

Suppose we take a sample of size n from a finite population of size N. Then there are ^NC_n samples has an equal chance of being selected is known as random sampling and the lot obtained by this technique is termed as a random sample. It is not easy in practice to ensure true randomness in the selection of items in a sample. However, to ensure randomness of selection one may adopt either the lottery method or consult the table of random numbers.

Method of Drawing Simple Random Sample

It has the advantage of ease of use because of the simple selection procedures and it requires only a listing of the entire population before the sample process can begin. The following methods are generally used in simple random sampling.

Lottery method: This is a common technique adopted for selecting random samples. All the items in the universe are numbered or named on separate slips of equal size. Such slips are then folded and mixed up in a box thoroughly and shaken so that it is difficult to identify the units of universe. Then, a selection is made blindly of the number of slips that are required for the sample. This is expected to ensure randomness or equal probability to all units of the universe.

For instance, one is asked to make a random selection of 50 out of 500 students of MBA, first year class. In order to ensure randomness in the selection, first the names of the students must be written on separate slips which are then uniformly folded. Put all the folded slips in a container and mix them thoroughly. Next, ask someone to pick 50 slips randomly one after another. Students thus selected constitute our random sample.

In the application of this method there exist two cases: (i) equal probability and (ii) varying probability. If one unit is selected out of 500 observations, there remain only 499 in the universe. When a second unit is selected out of 499 units of the universe, the chance of its selection is comparatively better than the earlier one. Therefore, to ensure equal chance to the entire population, a sample unit once selected is again replaced in the population. Thus, the total number of the population units remain unchanged giving equal opportunity to all units. In such cases, there is every possibility of repetition of units. This is called equal probability sampling technique or random sampling with replacement.

(b) Stratified Random Sampling

In this case, the population is divided into several groups known as strata. If a given population has distinct characters, it is represented as a heterogeneous

population. In such instances adequate care shall be taken to ensure proper representation to all the distinct characters of the universe. In order to ensure proportionate representation of all the characters, the technique of simple random sampling is not considered suitable. Therefore, an improved device is adopted in the name of stratified random sampling. In applying this technique, the population is divided into several groups called strata. Each group of the population is called a stratum. A group comprises units with a particular homogeneous character. All the units of the universe possess one chief homogeneous character but can be divided as separate parts, each of which again possesses one uniform character. For instance, a sample of 100 students has to be selected out of 1,000 students in a college. From among 1,000 students which constitute the universe, say we find 600 boys and 400 girls. Broadly, all are students and possess the homogeneous character. But this universe can be divided into two groups, viz; boys and girls, *i.e.*, strata. If proportionate representation has to be given to each group, the sample shall include 60 boys and 40 girls (on 10% basis). By making use of the proportionate stratified random sampling technique, the sample observations can be drawn on an equal proportion basis from each stratum with the help of simple random sampling technique. This proportionate stratified sampling procedure is expected to yield good results specially when there is no great difference in dispersion from one stratum to the other. However, in case of larger variations among different strata, this is certainly not the most efficient procedure. In such cases it is necessary to assign greater representation to a stratum with a larger dispersion and a smaller representation to one with small variation. Such sample selection is expected to lead to maximum efficiency.

In disproportionate stratified sampling, an equal number of cases will be taken from each stratum without any consideration for its percentage share in the universe. In the sense, smaller groups are giving relatively greater weightage when compared to the larger groups in the universe.

In either case, it is necessary that stratification shall be made with utmost care so that observations in each group comprise homogeneous elements. The application of simple random technique for selection of observations in each stratum will ensure equal chance to all the observations. The investigator is concerned more about adequate representation to all the characters of the universe and it is immaterial whichever unit is selected at random from each homogeneous group.

Example

Stratum	Number in Stratum	Number in Sample
1	N_1	n_1
2	N_2	n_2
3	N_3	n_3
...	...	...
...	...	...
...	...	...
K Total	N_n N	$\dfrac{n_n}{n}$

Here the population size is N and this population is divided into K parts N_1, N_2, ... N_k where the data within $N_1, N_2......N_k$ is homogenous and a sample of $n_1, n_2, ... n_k$ is taken from $N_1, N_2, ...N_k$.

If $\quad$ $\qquad$ $\dfrac{n_1}{N_1} = \dfrac{n_2}{N_2} = ... \dfrac{n_k}{N_k} \dfrac{n}{N}$

Then we have the case of proportional random sampling or proportional random sampling.

Example

Strata Income per month ₹	Population No. of Households	Sample *n* (Proportionate n)
0-500	5000	50
501-1000	4000	40
1001-2000	3000	30
2001-3000	2000	20
3001 and above	1000	10
	15000	150

Note that

$$\dfrac{n_1}{N_1} = \dfrac{n_2}{N_2} = ... = \dfrac{1}{100}$$

Here N = 15000

It is divided into 5 strata, for each strata select 1% sample

∴ Sample Size = n = 150 .

Merits

- *Administrative convenience*: As compared with simple random sample, the stratified samples would be more concentrated geographically. Accordingly, the time and money involved in collecting the data and interviewing the individuals may be considerably reduced and the supervision of the fieldwork could be allotted with greater ease and convenience.

- *More representative*: In an uncertified random sample some strata may be over-represented, others may be under-represented, while some may be excluded altogether. Stratified sampling ensures a desired representation of various strata in the population. It overrules the possibility of any essential group of the population being completely excluded in the sample. Stratified sampling thus provides a more representative cross-section of the population and is frequently regarded as the most efficient system of sampling.

- *Greater accuracy*: Stratified sampling provides estimates with increased precision. Moreover, stratified sampling enables us to obtain results of the known precision for each of the stratum.

- Sometimes the sampling problems may differ markedly in different part of the population, *e.g.*, a population under study consisting of (*i*) literates and illiterates or (*ii*) people living in institutions, hostels, hospitals, etc., and those living in ordinary homes. In such cases, we can deal with the problem through stratified sampling by regarding the different parts of the population as strata and tackle the problems of the survey within each stratum independently.

- Stratification is of great advantage when the distribution of the universe is skewed.

As W.M. Harper writes, "The reason why stratified sampling is an improvement over pure random sampling is that it lessens the possibility of one-sidedness."

Demerits

- It is a very difficult task to divide the populations into homogeneous strata. This may require considerable time, money and statistical expertise.
- If different strata of population overlap such a sampling would not be representative.
- The supplementary information to set up strata is not available sometimes.

(c) Systematic Sampling

Systematic Random Sampling

This method is popularly used in those cases where a complete list of the population from which the sample has to be drawn is available.

Under this method the kth item is picked up from the sample frame and k is the sampling interval defined as:

$$K = N/n$$

Where, N is the total size of the population and n is the proposed size of the sample.

Example

If 2000 items are to be selected from a universe of 2,000 items the k will be 10. Now if the starting number is say 6 then the kth numbers will be 16th, 26th, 36th, etc. It is therefore, necessary to select the starting point carefully either by drawing a card from a well shuffled pack of cards or by throwing a dice or by taking out a number chit from a lot of 10 numbers or so.

NOTE

This method although called a systematic random sampling is not necessarily a very scientific method. It is suitable when there is no unique variation in the universe. For example, if in a housing colony every 10th house (10th, 20th, 30th ......) is constructed on a corner plot which is larger than the rest taking every 10th house starting with 1 will give a biased selection in favour of the wealthier sections, who occupy these costly corner houses. Therefore, care should be taken to see that the systematic sampling does not introduce any bias for a given characteristic, keeping in view the purpose of the inquiry.

Example

Consider a population of size 500 and you have to select a sample of size 50.

Solution

Here

$$k = \frac{N}{n} = \frac{500}{50} = 10$$

Now select a no. from 1-10 by using random sampling (say No. 8) then the sample consists of 8, 8 + 10, 8 + 10 + 10, ...

i.e.,

8, 18, 28, 39, 48, ... 488, 498

(d) Cluster Sampling

Certain categories of units are concentrated in certain areas or geographically located in certain areas. The cluster sampling technique is a relatively easy device to select sample units on the premise that units belonging to one category exist at a specified geographical location. It is presumed that units available at a locality or area belong to one homogeneous group. Thus, by applying simple principles of random sampling the sample units can be selected easily so that they belong to the desired or specified category.

This technique can be applied in two stages for selection of a sample. In the first stage, various homogeneous groups are selected from the population depending on the nature of enquiry. These are termed as primary sampling units. In the second stage, elementary sampling units are selected from each of these clusters (groups). The technique of selecting sample observations from each cluster is known as sub-sampling. On geographical consideration, if specified groups exist at specified locations and random sampling technique is applied when selecting sample observations accordingly, it is then termed as area sampling.

(e) Multi-stage Sampling

As the name suggests, the sampling procedure is carried out in several stages. The population is first divided into large groups known as first stage units. Every first stage unit is divided into smaller groups, known as second stage units. These second stage units are further divided into third stage units and so on until the final stage units are reached. A sample from the first stage units will be selected by any suitable method such as random sampling. Then a second stage unit is selected from each of the first stage units again by applying a suitable technique (the technique applied may be the same as in the case of selecting first stage units or an altogether new technique can be employed). This process is repeated at every successive stage until the final sampling units are drawn.

This technique is considered highly scientific as selection procedures follow the scientific norms at every stage. Under this multistage sampling device there is little or no chance to ignore any character of the universe. Stratification of the universe at different stages will help identify all the significant homogeneous characters of the universe. This is the most accepted procedure, especially when enquiry is to be made, based on a sample drawn from a comparatively large universe.

For example, to introduce a new agricultural scheme in 1000 villages in a state with 30,000 villages. In order to identify sample villages, we may apply three-stage sampling.

In the first stage, the state is divided into a number of districts and first stage selection of districts will be made on a random basis applying some acceptable probability sampling techniques. As a result, a few sample districts can be drawn.

In the second stage, these districts are divided into mandals so as to make second stage selection of Mandals. A few mandals are selected following the scientific statistical sampling techniques.

In the third stage, these selected mandals will be subdivided again into villages so as to make finally the third or the final stage sampling units, *viz.*, villages.

At every stage, sampling procedures are clearly followed to ensure that there is no element of bias in selection. Further, this sort of sampling introduces flexibility in sampling method. This will help cover a large area of the universe, stratification at each stage will lead to accurate sub-division and creation of reasonably small sampling units.
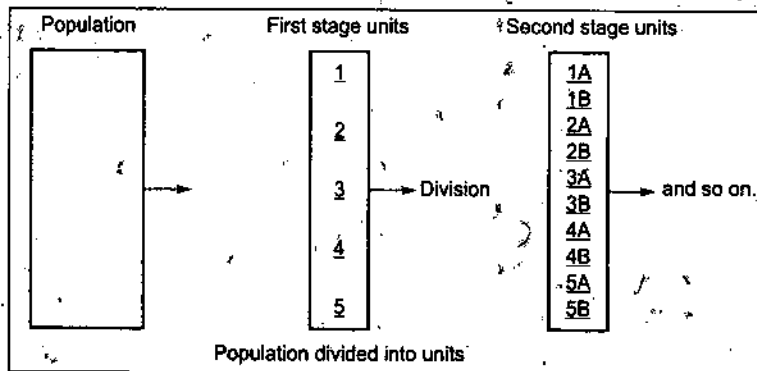
Fig. 5.1

Non-probability Sampling Techniques

(a) Deliberate or Purposive Sampling

This is also called judgement sampling. The investigator exercises his discretion in selecting sample observations from the universe. As a result, there is an element of bias in the selection. From the standpoint of the investigator, the sample thus chosen may be a true representative of the universe. However, the units in the universe do not enjoy equal chance of getting included in the sample. Therefore, it cannot be considered as a probability sampling technique. We come across this type of sampling mostly in social science research. The results drawn on the basis of such a sample cannot be applied to the universe as it violates the principle of the law of statistical regularity. This sampling technique only helps in making case studies without any consideration for generalised application. Even though the results of such samples are close to the population results on statistical grounds, the possibility of applying such a technique is ruled out. In general, the sample estimates differ widely from population parameters leaving room for large sampling errors. Further, the sample estimates also vary from one purposive sample to the other, thus, making it difficult to draw useful inferences.

Merits

Although, the principles of statistical theory are not followed, this technique is liberally applied in solving many economic and business problems. The justification for its application is provided on several grounds.

- In a relatively small universe, if sampling techniques of this type are used, it is possible to give adequate representation to all the characters of the universe by careful examination. Application of scientific techniques in such cases would result in omitting of essential characters of the universe.

- In most cases, statistical studies are expected to give quick results for policy formulation. The purpose of deliberate sampling has become a practical method in dealing with economic or practical problems.
- In studies where the level of accuracy can marginally vary from the prescribed norms, rigid application of statistical techniques becomes unnecessary.
- In social science research, one is concerned more about the probable results and at different stages the researcher has to resort to approximation. As a result, there is bound to be an error on account of approximations. Therefore, the application of deliberate sampling technique may not significantly disturb the results.

Demerits

- Fundamentally, this is not considered a scientific approach as it allows for bias or personal prejudice.
- The investigator may start with a preconceived idea and draw samples such that the units selected will be subject to specific judgement of the enumerator.
- The results of the sample cannot be extended to that of the population. Various samples drawn from a single universe give diverse results and in the absence of scientific application of statistical tools, it becomes difficult to establish the significance of statistical error.

(b) Quota Sampling

This is one kind of purposive or judgement sampling. A quota sample is one in which the investigator is directed to collect information from an assigned number, or quota of individuals, in each of the several groups characterised in the universe. The investigators select respondents within the quota according to their judgement. Different criteria may be adopted in selection of sample observations. However, the units selected in each group are based on the interviewer's choice rather than being decided on the basis of probability methods.

The quota sampling technique is very popular in opinion surveys and market studies. In the light of greater flexibility in selection of sample units, the investigator is free to draw units of his choice without adopting the rules of random sampling. This technique involves the risk of personal prejudice and presence of bias. Hence, quota sampling is not widely suggested in practical work. This technique has two important sources of error: (*i*) the quotas prescribed for the interviewer represent a crude stratification of the universe (*ii*) the principle of convenience is adopted by the investigator in selecting sampling observations.

Example

We have a population of three categories, *i.e.*, Rich, Medium, Poor. These are given in the ratio 20%, 30%, 50% respectively. Using quota sampling determine the number of representatives for each category of a sample size of 200.

Solution

Category 1. (Rich)   = 20% of 200 = 40
         2. (Medium) = 30% of 200 = 60
         3. (Poor)   = 50% of 200 = 100
                                    ─────
                                    200

(c) Convenience Sampling

A sample obtained from readily available lists such as telephone directories or other prepared population statements is called convenience sample. Even if the random sampling procedures are adopted, this technique cannot be considered as a random sample, the simple reason being that these basic lists are not prepared keeping in view the object of the study. The population data considered for the study shall depend on the specific object proposed and readily available information sources may not suit the purpose of the study.

Example 1

A ball pen manufacturing company needs to know the opinion about its products (ball pens). A marketing researcher of the company may visit the nearest village from his residence to know about the opinion.

Example 2

Suppose a marketing research study aims at estimating the proportion of shops which store a particular drink say Limca. Suppose a sample of 100 is needed. Then the researcher may go to the shops according to his convenience.

NOTE

This definitely is not a representative sample.

Law of Statistical Regularity

This principle signifies the representative character of the sample. The law of statistical regularity indicates that a moderately large number of items chosen at random from a large group are almost sure to possess, on an average, the characteristics of the large group. A sample 'properly' drawn from a population within certain variable limits reveals the characteristics of that population, even though the number of items in this sample is small as compared with the number of items in the population.

There are two qualifying conditions for application of this law: (*i*) The selection of the sample is purely on a random basis; in the sense that the sample shall not be drawn with the help of non-probability sampling techniques. When we say that the sample shall be drawn 'properly' this implies systematic application of probability criteria. (*ii*) The results of the sample reveal, on an average, the behaviour of the population. This signifies the fact that the sample estimates are within the prescribed limits to establish the fact that these estimates are equal to the population parameters. If these conditions are satisfied, it is possible for one to depict fairly accurately the characteristics of the population by studying only part of it. The theory of probability tells us of the mathematical expectation of happening or the failure of event and on this basis the law of statistical regularity tells us that random selection from the universe is likely to give a representative character.

It may be noted that different samples drawn from the universe would not yield the same results. However, the probable error diminishes with an increase in the number of items taken in the sample. That is, the larger the sample, the more reliable are the results.

Example 1

A random sample of 15 villages is to be selected (without replacements) from 470 villages. At first the 470 villages are to be numbered serially from 1, 2...470. Starting from anywhere in the page of random sampling numbers the digits occurring in succession in rows (or columns) are to be written down in blocks of three to give 3-digit numbers. Now the number 001 corresponds to village no. 1, 002 to village no. 2, and so on. Lastly, 470 will correspond to village no. 470. Numbers greater than 470 and also 000 will be rejected. Since sampling is without replacement we are to reject the repeated number (keeping the previous number intact) and new 3-digit number is to be taken until 15 different 3-digit numbers are obtained. In the 4-digit random number given above we start from 2nd row and 2nd column. We take down random numbers in groups of three and move horizontally. The numbers obtained are as follows:

208	977	290	945	390	144	457	117	818
620	643	760	093	973	195	939	343	220
304	752	931	581	857	805	629	470	726
491	401	210	166					

Now the numbers greater than 470 are rejected and, finally, we get the selected 15 villages having the following numbers:

| 208 | 290 | 390 | 144 | 457 | 117 | 093 | 195 | 343 |
| 220 | 304 | 470 | 401 | 210 | 166 | | | |

In this case (without replacement) if any number would occur twice, then the second number is to be rejected. But here there is no such case.

In the above method there is a large number of rejections, which can be avoided to a large extent by assigning two 3-digit numbers (instead of one) to each village. Thus, 001 and 471 would correspond to village no. 1; 002 and 472 would correspond to village no. 2 and so on. Thus, we find that the number of villages can be easily identified by the remainder obtained by dividing any random number between 001 and 940 ($= 2 \times 470$) by 470. The remainder 000 will be taken to represent village no. 470.

For example, for the random number 500, the remainder is 30 when divided by 470. Now 500 will correspond to village no. 30.

It may be noted that the random number 000 and any number greater than 940 are to be rejected.

NOTE

In case of sampling with replacements, any repeated numbers representing a village need not be rejected as the same village may occur more than once.

Example 2

Draw a random sample of size 10 (without replacement) from the following data, stating clearly the procedure followed by you.

45	24	43	17	5	28	27	21	11	46
33	26	24	14	34	21	25	48	35	38
26	27	35	8	30	26	30	28	21	27
20	13	23	36	38	20	25	31	24	18
12									

You may use the random sampling numbers given below:

5967	8941	7989	3335	7577	9735	3042	8409
7053	5364	5872	1143				

The above 41 numbers are numbered (horizontally) from 1 to 41. Since the given numbers are two-digited, the random numbers must also be two-digited. There are 100 two-digit numbers, *i.e.*, 00, 01, 02 .....99. Out of these numbers, many numbers will be rejected if only one two-digit numbers are allotted to the above 41 numbers. Let us allot two 2-digit numbers (instead of one 0) to each of the above 41 numbers, such that we may get the following table after allotment:

Serial no.	1	2	3	.....	40	41
Allotment	01	02	03	.....	40	41
Numbers	42	43	44	.....	81	82

Serial numbers can be easily identified by the remainder obtained by dividing any number between 01 and 82 by 41. The remainder 00 would correspond to serial no. 41.

Now, starting with the first digit of the given random sampling numbers and proceeding row-wise, we take groups of 2 consecutive digits: 59, 67, 89 (rejected), 41, 79, 89 (rejected), 33, 35, 75, 77, 97 (rejected), 35, 30, 42, 84 (rejected), 09, 70, 53, etc.

Here the numbers greater than 82 are rejected, as the allotment numbers are from 00 to 82.

For the numbers greater than 41, only the remainders obtained dividing by 41 are taken (remainder 00 corresponds to serial no. 41). Thus, we have 18, 26, 41, 38, 33, 35, 34, 36, (rejected), 30, 1. In the number series 35 is rejected as the sampling is without replacement. The remaining numbers finally, are 18, 26, 41, 38, 33, 34, 36, 30 and 1. (note that all these numbers lie between 1 and 41 and none is repeated.)

From the data given in question starting from the first number and moving row-wise, we find that above serial numbers correspond to 48, 26, 12, 31, 38, 36, 20, 27 and 45, which comprise the required sample of size 10.

2.11 ERRORS IN SAMPLING

Errors in statistics are classified in two categories:

- Sampling Errors
- Non-Sampling Errors

Sampling Errors

Sample always gives approximation to the parameter of universe. So, the differences between the actual figure and the estimated figure is always there. These differences are sampling errors. So, the sampling errors always have their origin in sampling. Such errors are not found in census or complete enumeration.

Generally sampling errors are due to the following reasons:

- Improper selection of the sample leads to sampling error. This improper selection may be due to the personal judgement, etc. *i.e.*, non-probability sampling techniques.
- These errors may be there due to the variability of population and wrong method of estimation. Usually this is in the case of hetrogeneous population.
- Faculty demarcation of statistical units.

Non-Sampling Errors

These kind of errors are present in both complete and sample enumeration. These errors generally arise when data are not properly observed, approximated and processed. The following factors give rise to the non-sampling errors:

- Incomplete questionnaire and defective method of interviewing.
- Errors in compilation and tabulation gives rise to non-sampling errors. Compilation errors include calculation mistakes.
- Personal bias of the investigator.
- If the various terms used are not properly defined then it also leads to non-sampling errors.

2.12 MEASUREMENT OF ERRORS

Statistical errors can be measured

- Absolutely or
- Relatively

Absolute Errors

Absolute error is the difference between true value and the estimated value.

Example

Suppose that the actual figure of sales of a concern is 8,800 and the approximated figure is 8,900. Then

Absolute Error = 8900 – 8800 = 100

Relative Errors

Relative error is the ratio of absolute error to the estimated figure. Let

$U' \rightarrow$ actual value

$U \rightarrow$ estimated value

$U' \rightarrow$ Relative error

Then
$$U_e = \frac{U' - U}{U}$$

Let actual value $= U' = 10,100$

Estimated value $= U = 10,000$

Then

Relative errors $= \dfrac{U' - U}{U} = \dfrac{10,100 - 10000}{10000} = 0.01 = 1\%$

NOTE

Relative errors are more valuable than absolute errors as absolute errors do not give the true picture. For example, let

True value	$= 99$
Estimated value	$= 100$
Then absolute error	$= 100 - 99$
	$= 1$

And relative error $= \dfrac{100 - 99}{100} = \dfrac{1}{100} = 0.01 = 1\%$

Again consider

True value	$= 99,999$
Estimated value	$= 1,00,000$
Then absolute error	$= 1,00,000 - 99,999$
	$= 1$

and relative error $= \dfrac{1,00,000 - 99,999}{1,00,000} = 0.001\%$

Clearly, relative error is giving better results.

NOTE

If true value is greater than estimated value then the error is known as positive error otherwise negative error. For example, if

True value	$= 900$, estimated $= 1000$
Error	$= 1000 - 900 = 100$ (positive error)
If, true value	$= 1000$, estimated value $= 900$
Error	$= 900 - 1000 - 100$ (negative error)

2.13 BIASED AND UNBIASED ERRORS

Statistical error can also be divided into the following categories:

- Biased Errors
- Unbiased Errors

Biased Errors

When the errors are introduced due to the personal bias, these are known as biased errors. These errors have a tendency to grow in magnitude with the increase in number of observations.

Unbiased Errors

These are the errors which do not accumulate with the increase in the size of observations but rather have a tendency to get neutralised. The main purpose of the statistical method is to avoid the biased errors and devise methods in such a way that the errors, if any, are only biased ones. One such devise is random selection over the bias selection.

SUMMARY

- This unit has focused on primary data. There are various types of questionnaires, which are used for marketing research purpose. The methods used for collecting primary data may be: (A) Survey Method (B) Observation.

- It is difficult for researchers to collect information about each of the population unit as is done under complete census method. Due to this difficulty associated with the census method or complete enumeration survey, we have to use the sampling method. Sampling is a common activity in our day-to-day work. There are two main categories under which various sampling methods can be put. These two categories are: (i) Probability sampling; and (ii) Non-probability sampling.

- In practice, many forms of non-probability sampling are in use, ranging in complexity from simple convenience sampling to elaborate variations of quota sampling. Some special forms enjoying wide application are: Group interview samples, shopping small intercept samples and controlled panel samples.

REVIEW QUESTIONS

1. Write a short note on sources of error in primary data collection.
2. Briefly explain the mail method of data collection.
3. Briefly describe the observational methods of data collection. What are their advantages and disadvantages? Illustrate with examples.
4. What are the differences between primary and secondary data?
5. Differentiate between internal and external secondary data.
6. What are the relative advantages and disadvantages of observations?
7. Describe a marketing research study in which both survey and observation methods could be used for obtaining the information needed.
8. Bring out the difference between stratified sampling and cluster sampling.
9. Discuss the advantages and limitations of sampling.
10. Compare and contrast quota sampling with stratified sampling.
11. Explain in detail various sampling designs under non-probability sampling method. Also bring out their relevance in marketing research studies.
12. What steps are essential in determining the sample size in a research project?
13. What is a sample size? How can it be determined?

14. When a non-probability sample is involved, how would you defend the sample size?

15. How will you implement a systematic sampling procedure?

16. Define the following terms: population, sampling unit, sampling procedure in a particular marketing research study.

17. What sort of sampling scheme will you select in each of the following situations? Explain why:

 ❖ A study to find out the smoking habit in north India.
 ❖ An all-India survey to assess the profile of colour-TV buyers.
 ❖ An all-India study to examine buying habit of a selected toiletry soap.
 ❖ A survey of households in a city to examine acceptance of various audio systems.
 ❖ A study to assess consumer reactions to a new brand of packaged food; saving scheme; storage device.

18. What is stratified sampling? When would you use a disproportionate stratified sample? How does it differ from proportionate sampling?

19. What is the sampling design that you would suggest for the following and why?

 ❖ A survey to estimate the potential users of microwave oven in Mumbai.
 ❖ A survey to estimate the potential users of mobile phone in Delhi.

20. What is the sampling design that you would propose for the following and why?

 ❖ A survey to estimate the usage of laptops in the small office segment— All India Level.
 ❖ A survey by a private courier company to estimate the satisfaction levels of its corporate clients.

21. Distinguish between probability and non-probability sampling methods.

22. A fertilizer company wants to test the effectiveness of its own fertilizer A against that of its major competitor's fertilizer B. A study was carried out where both the fertilizers were applied to two sets of fields and yields were compared. The set of fields to which fertilizer A was applied contained 5 fields and set of fields to which fertilizer B was applied contained 9 fields. The mean yield for the 2 sets of fields was 100 kg and 125 kg respectively. The combined standard deviation is 5.7 kgs. Is the difference between the two brands of fertilizers significant at 0.05 level of significance.

23. What common types of errors usually occur when information from respondents is collected? How could these errors be minimised?

24. Briefly explain the steps involved in the designing of a sample for marketing research studies.

25. What is the relationship between analysis of variance and the t-test?

26. A marketing researcher wants to test the hypothesis that there is no difference as regards the importance attached to the brand image by consumers living in the northern, southern, eastern and western India. A study is conducted and analysis of variance is used to analyse the data. The results obtained are presented in the following table:

Source	df	Sum of Sq.	Mean Sq.	F. Ratio	Prob.
Between Groups	3	70.212	23.404	1.12	0.3
Among Groups	996	20812.416	20.896		

❖ Is there sufficient evidence to reject the null hypothesis?
❖ What conclusions can be drawn from the table?
❖ If the average importance was computed for each group, would you expect the sample means to be similar or different?
❖ What was the total sample in this study?

27. Discuss the various types of respondent errors. How can they be minimised?

28. The management of a local restaurant wants to determine the average monthly amount spent by households in fast food restaurants. Some households do not spend anything at all, whereas other households spend as much as ₹ 300 per month. Management wants to be 95% confident of the findings and does not want the error to exceed plus or minus ₹ 5. What sample size should be used to determine the average monthly household expenditure?

29. Design a sample for each of the following marketing research projects:
❖ A study of brand loyalty in the soft drink market.
❖ A study of purchasing habits of colour TV buyers.
❖ An estimate of the distribution by income, class of household expenditure for recreational goods and services.

30. Briefly explain the respondent errors.

31. A manufacturer would like to survey users to determine the demand potential for a new power press. The new press has a capacity of 500 tonnes and costs ₹ 15.25 lakh. It is used for forming products from lightweight and heavyweight steel and can be used by automobile, construction equipment and major appliance manufacturers.
❖ Identify the population and sampling frame that could be used.
❖ Describe how a simple random sample can be drawn using the identified sampling frame.
❖ Could a stratified sample be used? If so, how?
❖ Could a cluster sample be used? If so, how?
❖ Which sampling technique could you recommend. Why?

32. South Retreat is a chain of fast food restaurants located in major metropolitan areas in the South and West of India. Sales have been growing very slowly for the last two years. Management has decided to add some new items to the menu, but first they want to know more about their customers and their preferences.
❖ List three hypotheses.
❖ What kind of research design would be appropriate? Why?
❖ List the information needs for the study.

33. Comment on the following sample designs and suggest improvements if necessary:
❖ A department store that wishes to examine whether or not the store is

losing or gaining customers draws a sample from its list of credit card holders by selecting every 10th name.

❖ A motorcycle manufacturer conducts research to study the consumer characteristics by sending 100 questionnaires to each of its dealers. The dealers would then use their sales records to trace down buyers and distribute the questionnaire.

❖ To test the ad-effectiveness, a full page ad is given in one of the magazines. One half of the page is used for the ad and on the other half of the page a short questionnaire solicits the comments of readers on the ad. An incentive is given for the first 1,000 responses.

34. What is the appropriate test of difference in the following situations?

❖ Average campaign contributions of Congress, BJP and JD are to be compared.

❖ Advertising managers and brand managers respond 'yes', 'no' or 'not sure' to an attitude question. Their answers are to be compared.

❖ One-half of sample received an incentive in mail survey. The other one-half did not. A comparison of response rate is desired.

35. What are the permissible descriptive statistics allowable with nominal, ordinal and interval scale?

PRACTICAL PROBLEMS

From the following data obtained from a sample of 1000 persons calculate the standard error of mean.

If the population mean were ₹ 84, what conclusion can you arrive at about the reliability of the sample?

Daily earnings (₹)	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
No. of Persons	100	200	350	400	400	200	200	200

• ABC Ltd. is considering the different television advertisements for promotion of new products. The management believes that advertisement A is more effective than advertisement B. Two test market areas with virtually identical consumer characteristics are selected. Advertisement A is used in one area and Advertisement B is used in another area. In a random sample of 12 customers who saw advertisement A tried the product. In a random sample of 200 customers who saw advertisement B, 44 tried the product. Does this indicate that advertisement A is more effective than advertisement B, if 5% level of significance is used.

• 1000 units from a factory are inspected and 24 are found to be defective, 1600 units from another factory are inspected and 24 are found to be defective. Can it be concluded at 5% level of significance that production at the second factory is better than that at the first factory?

• A soap manufacturer wanted to know what percentage of the citizens of Delhi use his soap. He conducted a survey and found that out of 1000 persons selected at random for the purpose, only 20% use his soap. He spent ₹ 10 lakh on an advertisement campaign to attract more customers.

In order to know the result of his campaign he conducted another survey and found that out of 1200 persons 15% are using his soap. Do you think that the expenditure has really increased the percentage of Delhi citizens using his soap.

- XYZ Ltd, a manufacturer of steel rods, considers that the manufacturing division is working properly if the mean length of rods is 8.6 inches. The standard deviation of these rods always runs about 0.3 inches. The manufacturer would like to see if the process is working correctly by taking a random sample of size n=40. There is no indication whether or not the rods may be too short or too long.
  - ❖ Establish null and alternative hypothesis.
  - ❖ Would you use a one-tailed test or two-tailed test?
  - ❖ If the random sample yields an average length of 9.7 inches, would you accept null hypothesis or alternative hypothesis?

- Out of 10000 customers ledger accounts, a sample of 350 accounts was taken to test the accuracy of posting and balancing wherein 40 mistakes were found. Assign the limits within which the number of defective cases can be expected at 5% level of significance.

- The quality department of a wire manufacturing company periodically selects a sample of wire specimens in order to test for breaking strength. Past experience has shown that the breaking strength of a certain type of wire is normally distributed with standard deviation of 100 kg. A random sample of 50 specimens gave a mean 5000 kg. The quality control supervisor wants a 95% confidence interval for the mean breaking strength of the population.

- A manager wants an estimate of average sales of salesmen in his company. A random sample of 50 out of 300 salesmen is selected and average sales is found to be ₹ 1,750. If the population standard deviation is ₹ 200, the manager specifies a 98% level of confidence. What is the interval estimate for population mean?

- A cigarette manufacturer wishes to use a random sample to estimate the average nicotine content. The sampling error should not be more than 2 mg. What sample size should the company use in order to satisfy these requirements?

- A firm wishes to estimate with the maximum allowable error of 0.05 and a 95% level of confidence the population of consumers who prefer its products. How large a sample will be required in order to make such an estimate if the preliminary sales reports indicate that 25% of all consumers prefer the firm's product?

- Intelligence test given to two groups of boys and girls gave the following information.

	Mean Score	S.D.	Number
Girls	150	20	100
Boys	140	24	200

Is the difference in mean scores of boys and girls statistically significant? Significance level is 1%.

- The mean lifetime of 200 light tubes produced by a company is found to be 1750 hrs with standard deviation of 80 hrs. Test the hypothesis that mean lifetime of the tubes produced by the company is 1650 hrs at 5% level of significance.

- A sales clerk in the departmental store claims that 60% of the shoppers entering the store leave without making a purchase. A random sample of 100 shoppers showed that 35 of them left without buying anything. Are these sample results consistent with the claim of the sales clerk? Use the level of significance of 5%.

- In a random sample of 50 persons taken from a village A, 30 are found to be consuming tea. In another sample of 100 persons taken from village B, 50 persons are found to be consuming tea. Do the data reveal significant difference between the two villages so far as the habit of taking tea is concerned? Level of significance is 5%.

- From the following data obtained from a sample of 500 persons, calculate the standard error of mean. If the population mean were ₹ 40, what conclusion can you arrive at about the reliability of the sample.

Daily Earnings	x	f	Daily Earnings	x	f
0 – 10	5	25	40 – 50	45	250
10 – 20	15	150	50 – 60	50	50
20 – 30	25	100	60 – 70	65	75
30 – 40	35	150	70 – 80	75	75

- 300 units from a factory are inspected and 6 are found to be defective, 400 units from another factory are inspected and 7 are found to be defective. Can it be concluded at 5% level of significance that production at the second factory is better than in the first factory?

- Ten oil tins are taken at random from an automatic filling machine. The mean weight of the tins is 20 kg and standard deviation is 0.5 kg. Does the sample mean differ significantly from the intended weight of 18 kg?

- Prices of shares of a company on the different days in a month were found to be 60, 65, 60, 70, 69, 72, 74, 64, 65 and 65. Discuss whether the mean price of the share in the month is 68.

- Set up an analysis of variance table for the following two-way design results.

Per Acre Production Data of Wheat Variety of Seeds

Variety of Fertilizer	A	B	C
W	6	5	5
X	7	5	4
Y	3	3	3
Z	8	7	4

- In order to determine whether there are significant differences in the durability of three makes of computers, samples of size n = 5 are selected

from each make and the frequency of repair during the first year of purchase. The results are as follow:

Make

x	y	z
5	8	7
6	10	3
8	11	5
9	12	4
7	4	1

In view of the above data, what conclusion can you draw?

- A random sample is selected from each of three makes of ropes and their breaking strengths (in kg) are measured with the following results.

A	B	C
70	100	60
72	110	65
75	108	57
80	112	84
83	113	87
120	73	107

Test whether the breaking strength of the ropes differ significantly?

- A company appoints four salesmen x, y, z, and q and observes their sales in three seasons – summer, winter and monsoon, the figures (in lacs) are given in the following table:

Salesmen

Seasons	x	y	z	q
Summer	36	36	21	35
Winter	28	29	31	32
Monsoon	26	28	29	29

Carry out the analysis of variance.

- The following table gives the number of refrigerators sold by 4 salesmen in three months.

Salesmen

Month	A	B	C	D
January	50	40	48	39
February	46	48	50	45
March	39	544	40	39

❖ Determine whether there is any difference in average sales made by the four salesmen.

❖ Determine whether the sales differ with respect to different months.

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UNIT

3

TOOLS FOR COLLECTION OF DATA

3.1 QUESTIONNAIRE DESIGN

One of the basic tools of marketing research is a questionnaire. When visualising a marketing researcher, we think of someone armed with a set of questions, asking them and writing the answers down. We can therefore, say that, The questionnaire serves as a useful guide for the communication process and may be used with survey research in any form – whether the questions are in written or verbal form. Without a questionnaire the interview has no structure. Questionnaires help to recognise the tastes, preferences and perceptions of various people so that the marketer may be able to formulate his future people, his future strategies regarding new product launch, sales promotions, etc.

To ensure a sincere response it is necessary to adhere to three basic conditions:

❖ Respondents must be able to understand the questions,

❖ They must be able to provide the information, and

❖ They must be willing to provide the information.

So, the researcher should keep in mind his requirements, on which the questionnaire should be based, these may be:

❖ How many interviews will there be?

❖ Who will be interviewed?

❖ How will the interview be carried out?

❖ Who will be administering the interview?

Recognition of these broader issues will help in designing questionnaires for researchers.

Steps Involved in Questionnaire Construction

The analysis of the content of each question results in construction of a questionnaire: why is it being included, types of questions, their sequence and wording, the final layout of questions and the final output in the form of a questionnaire. The following diagram may help in understanding the complicated form of a questionnaire:

Contents of Individual Questions

Only those questions seeking the required information should be used. So, if we require specific information regarding a profession, or, if we are targeting children/adults we should ask relevant questions pertaining to adults or children, as the case may be. Questions may be used keeping in mind the targeted respondents. The respondents should at least know the type and level of questions expected. Questions seeking specific details about data and time of events should be avoided. Care must be taken in designing the questions seeking information on personal facts such as, sex life, bad habits or status symbol. A single question may also be split into multiple questions for better response from the respondents.

```
┌──────────────┐   ┌──────────────┐   ┌──────────────────┐
│ Information   │   │  Method of   │   │ Sampling method  │
│   needed      │   │data collection│   │and sample size  │
└──────┬───────┘   └──────┬───────┘   └────────┬─────────┘
       │                  │                    │
       └──────────┌───────────────────────────────┐───────┘
                  │ Construction of questionnaire   │
                  │         and its design          │
                  └───────────────┬─────────────────┘
                  ┌───────────────────────────────────┐
                  │ Decide on the content of personal  │
                  │            questions               │
                  └───────────────┬────────────────────┘
                          ┌──────────────────┐
                          │ Types of questions│
                          └────────┬─────────┘
                          ┌──────────────────┐
                          │Wording of the questions│
                          └────────┬─────────┘
                          ┌──────────────────┐
                          │Sequence of the questions│
                          └────────┬─────────┘
                          ┌──────────────────┐
                          │Layout of the questionnaire│
                          └────────┬─────────┘
                          ┌──────────────────────┐
                          │Pretest of the questionnaire│
                          │Final revised questionnaire │
                          └────────┬─────────┘
                          ┌──────────────────────┐
                          │Final revised questionnaire│
                          └──────────────────────┘
```
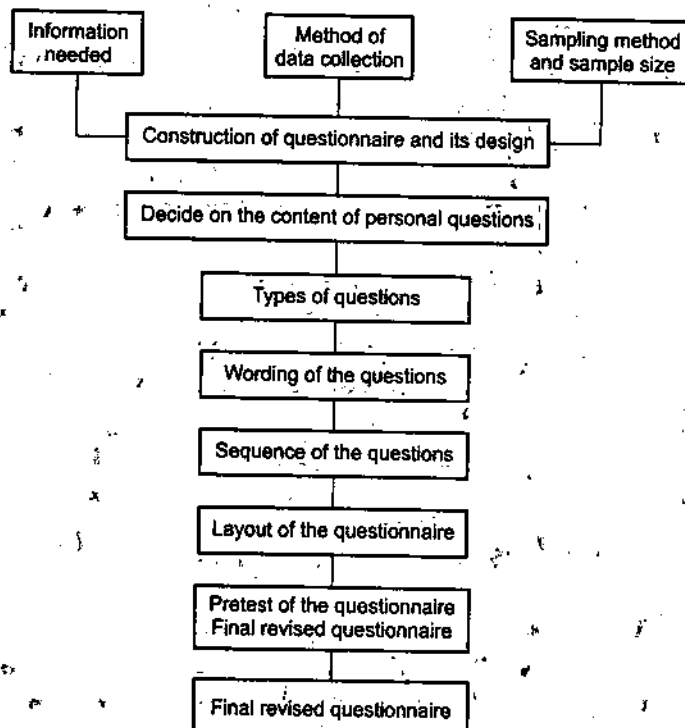
Fig. 3.1

3.2 TYPES OF QUESTIONS

The decision on which form of questions to use must be based on the objective set for the particular question. There are three main types of questions which are commonly used in market surveys:

- Open-Ended Questions
- Multiple Choice Questions
- Dichotomous Questions

Open-Ended Questions

An open-ended question calls for a response of more than a few words. In open-ended questions, respondents are free to express their views/ideas in their own words. The degree of openness varies from question to question. For example, the question, "What do you think about washing machines?" allows respondents almost total freedom to express their views on particular brands, advertising slogans, convenience and other issues.

Advantages

- It avoids persuading the respondent with a prestated set of response categories.
- It is helpful for exploratory and problem-identification research.
- Open-ended questions provide the basis for the researcher to judge the actual values and views of the respondents.

Disadvantages

- It is more time-consuming.
- Interviewers will vary in their ability to record the respondents' answers, in terms of probing and objectivity.
- The responses obtained may be so varied that it may be impossible to arrive at any conclusion.
- Coding or categorising the respondents' answers in open-ended questions is a very costly and laborious act.

Other disadvantages include the implicit extra weight given to respondents who are more articulate and tend to raise more points in their answers. Also, open-ended questions are less suited for self-administered questionnaires. The reason is that respondents tend to write more briefly than they speak, and there is also the problem of illegible handwriting.

In general, open-ended questions are most appropriate for exploratory research purposes and for research designed to develop more structured questions. While the cost of developing effective structured questions can be high, it must be weighted against the disadvantages of open-ended questions.

Multiple Choice Questions

Questions for which we have a number of choices as answers are termed multiple choice questions. There may be a fixed number of choices or in case the number of alternatives or choices is more, the respondents have to rank the alternatives according to their choices.

Advantages

- It is easier for both the interviewer and respondents.
- Multiple choice questions tend to reduce interviewer bias and bias caused by varying levels of respondents articulation.
- The tabulation and analysis in multiple-choice questions is much simpler.

Disadvantages

- To develop a sound set of multiple choice questions, considerable effort is required.
- The list of potential answers can cause several types of distortions in the resulting data.
- Too many questions and choices make the questionnaire monotonous.

Dichotomous Questions

This is an extreme form of the multiple choice questions, which allows only two responses such as – 'Yes-No', 'Agree-Disagree', 'Male-Female' and 'Did-Did not'. Often these two categories are supplemented by a neutral category such as 'Don't know', 'No opinion', 'Both' or 'Neither'.

Advantages

The advantages of dichotomous questions are similar to those of the multiple choice questions. These questions are well suited to clean-cut issues on which respondents are likely to hold very clear and concise views.

Disadvantages

The choice between just two alternatives might be too restricting for respondents. For example, the question "Do you plan to purchase a new car within the next three months?" may result in "Yes" from one individual and "No" from another. If both the individuals have the purchasing capacity then appropriate alternatives would be (a) May be (b) Probably (c) Yes (d) No.

Wording of the Questions

Questions for which the answer is very obvious or which indicate the researcher's own point of view should be avoided. The questions should be either subjective or objective on the type of information required. Questions stating or focusing directly on personal information such as income, expenditure level and bad habits, are usually not asked outright. Instead, a series of questions leading up to the relevant issue should be asked. A combination of negative and positive statements should be used to avoid any bias towards certain attitudes. For example:

- Do you think the quality of the cheaper washing-machine is not as good as that of the more expensive one—negative attitude?
- Frequently advertised brands of washing machines are of a higher quality – positive attitude.

The data collection procedure
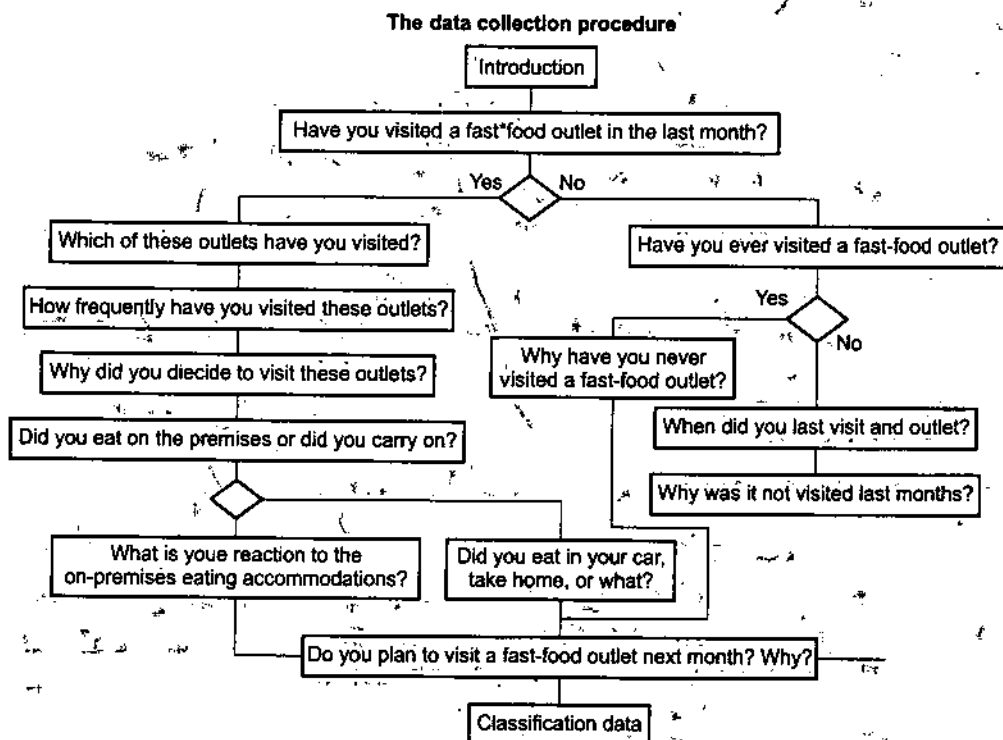
Fig. 3.2. Example of a flow chart plan for a draft questionnaire.

Following are eight general guidelines that you should consider in designing the wording of a question:

- Use simple words
- Use clear words
- Avoid leading questions
- Avoid biased questions
- Avoid implicit alternatives
- Avoid implicit assumptions
- Avoid estimates
- Consider the frame of reference

Sequence of Questions

The specific order in which the respondents receive the questions, is a potential source of error. However, a number of general guidelines may be helpful in avoiding errors:

- The opening question should be simple, objective and interesting, thus, arousing the curiosity of the respondent towards the subject matter of the questionnaire.
- The overall pattern of the questionnaire should be in a logical manner moving from one topic to another. Difficult questions should be placed towards the end of the questionnaire.
- Initial questions should avoid providing a biased frame of reference or suggesting answers to following questions.

Layout of Questionnaire

In mail surveys, the physical appearance of the questionnaire is very important as the data collection instrument is self-administered. So, the questionnaire should encourage the respondents' co-operation. It should not appear to be a long one and especially, questions should be short and simple.

Reproduction of the questionnaire should be done neatly on quality grade of paper. In general, a self-administered questionnaire should be printed on quality paper using an open format and type that is easy to read. The questions should be in sequence so that there is an ease of administration.

Finally, the response should be tabulated and subjected to computer analysis. Every response must be coded so that it facilitates in the final tabulation and analysis.

Pre-test

On a small selected sub-sample of the population, which the researcher is interested in, it is very useful to administer the questionnaire. This can result in valuable insight that might otherwise be expensive and difficult to obtain. A number of factors may be apparent at this stage, such as;

- Whether the subject needs additional information regarding a question;
- The time consumed during the entire questionnaire;
- Whether the initial question has generated interest;
- Whether the questions are interpreted correctly;
- To reduce the alternatives, some options might have to be dropped.
- Do the answers require a pre-meditated thought;
- Are there any unnecessary questions.

Pre-testing a questionnaire has many benefits, including the opportunity to experiment with various approaches to a given question or topic, examination of the effect of different question sequences and potential insight into the existence of position bias in the location of either the questions or their possible answers. Such experimentation may be carried out by using alternative forms of the questionnaire and then comparing the responses obtained through each approach.

Final Draft of the Questionnaire

After the pretesting process, some questions may be eliminated from the questionnaire, some close-ended questions may be changed to multiple choice questions or the sequence may be changed. Wording may also be changed and extra questions may be added to ensure a good questionnaire.

Thus, the final structure given to the questionnaire may serve the researcher's purpose.

3.3 TYPES OF QUESTIONNAIRES

Primary sources usually provide more detailed information than the secondary sources. This is partly because methods of data collection and the tools can be tailored more precisely to the informational needs of the researcher. A

questionnaire can take any form, but they are generally categorised according to the structure and directness. Structure refers to the degree to which the questions and possible responses are formed and standardised. There are four category of questionnaires.

Electronic Mail (E-Mail) Surveys

This is a new method by which researchers collect data, with the arrival of fibre-optics technology and interactive multimedia computing, paper-and-pencil method of data collection may well become obsolete in the near future. Researchers will be able to e-mail the questionnaires into the respondents' computers and get their responses back into their own computers without any human interference at all. With the use of the internet becoming more prevalent globally, e-mail surveys can be used for international surveys. Fax and e-mail surveys will increase as other countries become more industrialised. They are bound to become important data collection methods in the future. The following table explains the importance of E-mail surveys:

3.4 SOURCES OF ERROR IN PRIMARY DATA COLLECTION

The primary data collection methods are also subject to three important types of errors. These are sampling error, non-response error and response error.

Sampling Error: Sampling error as the name implies is inherent in the procedures of sample chosen and results in the sample becoming non-representative of the population. For example, in order to study the patterns of cold drink consumption among Indian population if you chose a sample of college students in a metropolitan city, this sample would not be representative of the population of the country.

Non-Response Error: A non-response error occurs when a unit included in the sample, cannot or has not been reached. For example, in a sample of housewives from a particular city area, if a number of them happens to be away every time the interviewer chooses to come, non-response is likely to occur. Incidence of non-response as already noted is very high in mail interviews as respondents simply ignore the questionnaire received by them.

Response Error: Response error occurs when the value of the reported variable differs from the actual value of that variable. We would here include errors of both communication and observation. There are two reasons for response error, i.e. inability of the respondent to give accurate information or their unwillingness to give accurate information because of time factor, prestige factor and invasion of primary factor, there are a number of ways in which interviewers deliberately obtain inaccurate information and supply it. If the questionnaire happens to contain a question that the investigator find embarrassing to ask respondents.

Coverage Error: This type of error occurs if we exclude certain groups of subjects from this population listing so that they have no chance of being selected in the sample. Coverage error results in a selection bias. If the listing is inadequate because certain groups of subjects in the population were not properly included, any random probability sample selected will provide an estimate of the characteristics of the frame, not the actual population.

Benefits	Personal	On-Site		Telephone		Mail	E-mail	Fax
	Computer Assisted Personal Interviewing	Computer Assisted Self Interviewing	Fully Automated Self-Interviewing	Computer Assisted Telephone Interviewing	Fully Automated Telephone Interviewing	Computer Disks by Mail	Electronic Mail Survey	Computer Generated Fax Survey
Respondents need not have any computer related skills	☑			☑	☑			☑
Allows respondents to choose own schedule for completing survey		☑	☑			☑	☑	☑
Can easily incorporate complex branching questions into survey	☑	☑	☑	☑	☑	☑	☑ ☑	
Can easily use respondent-generated words in questions throughout the survey	☑	☑	☑	☑		☑	☑ ☑	
Can accurately measure response writes of respondents to key questions	☑	☑	☑	☑	☑	☑	☑	☑ ☑
Can easily display a variety of graphics and directly relate them to questions	☑	☑	☑			☑	☑ ☑	
Eliminates need to encode data from paper surveys	☑	☑	☑	☑	☑	☑	☑	☑
Errors in data less likely compared in equivalent manual method	☑	☑	☑	☑	☑	☑	☑	
Speed or data collection and encoding compared to equivalent manual method	☑	☑	☑	☑	☑	☑	☑	☑

Source: Scott G. Dacko, "Data collection should not be manual labor," *Marketing News*, August 28, 1995, p. 31.

Fig. 3.3. Computer-assisted data collection methods.

Measurement Error: This type of error comes to the picture on account of inaccuracies in the recorded responses because of a weakness in question wording, an interviewer's effect on the respondent, or the effort made by the respondent.

Due attention is given to measurement error that happens because of weakness in question wording. Questions should be clear, not ambiguous.

A question should be objectively presented in a neutral manner; "Leading questions" must be avoided.

There are three sources of measurement error:

* Ambiguous wording of questions
* The halo effect
* Respondent error

As an example of ambiguous wording, in November, 1993 the Labour Department reported that the unemployment rate in the United States had been underestimated for more than a decade because of poor questionnaire wording in the current population survey. In particular, the wording led to a significant undercount of women in the Labour Force. Because unemployment rates are tied to benefit programmes such as state unemployment compensation system, it was imperative that government survey researchers rectify the situation by adjusting the questionnaire wording.

The "halo effect" happens when the respondent feels obligated to please the interviewer. This type of error can be minimised by proper interviewer training.

Respondent error occurs as a result of overzealous or underzealous effort by the respondent. We can minimise this type of error in two ways:

* By carefully scrutinising the data and calling back those individuals whose responses seem unusual.
* By establishing a programme of random callbacks in order to ascertain the reliability of the responses.
* An interviewer through mannerisms and tone, may purposely create a halo effect or otherwise guide the response in a particular direction.
* A respondent having a disdain for the survey process may willfully provide false information.

Ethical Issues

Ethical considerations arise with respect to the four types of potential errors that may occur when designing surveys that use random probability samples. We have already discussed the four types of errors.

Coverage error becomes an ethical issue only if particular groups or individuals are deliberately excluded from the population frame so that the survey results are skewed, indicating a position more favourable to that of the survey's sponsor.

Similarly non-response error becomes an ethical issue only if a particular group or individuals are less likely to respond to a particular survey format and the sponsor knowingly designs the survey in a manner aimed at excluding such groups or individuals.

Sampling error becomes an ethical issue only if the findings are purposely presented without reference to sample size and margin of error so that the sponsor can promote a viewpoint which might otherwise be truly insignificant.

Measurement error becomes an ethical issue in one of the three ways:

A survey sponsor may purposely choose loaded, leading questions that would guide the responses in a particular direction.

- **Structured and Direct (Surveys Using Questionnaires)**

   Among the communication methods in use today, surveys involving structured questionnaires are the most extensively used. If you want to know the consumption patterns of a particular product category, reasons for brand choice, the relative influence of different media on a person's decisions, the natural course would be to ask the people themselves. In order to get comparable information from respondents, formal non-disguised questions are pre-designed in the form of a questionnaire. Administrating the questionnaire may involve participation of an interviewer, who is instructed to ask the questions in the order given on the form and to ask only those questions. The questionnaire method, with or without the participation of an interviewer is such a prevalent and versatile method of data collection that it was felt that various stages of questionnaire planning and execution warranted a detailed explanation.

The basic advantages of using questionnaires are versatility and economy. The questionnaire method is versatile enough to be tailored to the needs of most marketing research situations. In addition variables like knowledge, opinions, intentions, motivations and personal habits, which do not lend themselves to observation, can only be elicited through questioning. It is also the only method to get information on past events for which records have not been maintained.

Relatively speaking, questioning turns out to be speedier and less costly than observation. Interviewers using questionnaires have a higher degree of control over information gathering activities than do observers, who have to wait for the respondent to perform the action under study. Moreover the lag time between one interview and another is controllable by the interviewer while the waiting time between two successive observations cannot be controlled by the observer.

The questionnaire method is, however, subject to certain limitations also. Important among them are inability of the respondent to furnish information. Even though they may be willing to share information about themselves, many respondents are actually unable to give accurate information to the questions asked. For example, it might be difficult for you at a point of time to give the exact reason for choosing a brand of soap over another unless you have carefully analysed these reasons beforehand. Therefore, on questions of buyer motivations quite often inaccurate information is given which interferes with the reliability of data collected.

Unwillingness of Respondent to Provide Information

The questionnaire aided interviewer is usually an imposition on the time of the respondent, who is required to answer questions on his personal habits, values, socio-economic characteristics and so on to an unknown interviewer. In some cases, respondents refuse to spend the time needed to answer the questions and in quite a few cases, refuse to answer questions in relation to their income or on very personal subjects. These 'gaps' in the information collection may affect the overall research process.

Influence of the Questionning Process

As the situation in which the questionnaire asks respondents' to relate routine actions is an artificial one, they may furnish information which is at variance with the truth.

Quite often, respondents to give answers that they think will please the interviewer. At times, if the true answer to a question shows them in a bad light or is damaging to the ego, respondents tend to give 'doctored' or manufactured responses. Also some respondents take at the whole process very lightly and try to amuse, shock or astonish the interviewer/reader through their responses.

- **Unstructured Direct Interviews**

  This method does not involve the use of a formally structured questionnaire. The interviewer is only given general instructions on the type of information sought. He has therefore, a considerable degree of freedom in choosing the questions, as well as the wording and the order which may seem most appropriate for a given interview. Generally used in exploratory research studies these interviews are useful in obtaining a clearer understanding of the problem and determining the areas to be investigated.

This technique is also applied for obtaining information on motives for respondents action. When so used, it usually takes the form of a depth interview. Exploring the motive behind a particular purchase the interviewer may continue asking probing questions like "could you explain what you meant by this statement? Why do you feel like that? Do you have any other reason"? Until he has obtained all the information he needs. The constraints in this case are requirements of the problem, time limitations and the willingness as well as ability of respondents to put their motives into words.

The advantage of unstructured direct interview is that since it is free of the restrictions imposed by formal questions, the interview may be conducted in a conversational causal mode, which is more conducive to information gathering. Moreover the vocabulary can be adjusted to ensure rapport and understanding. The flexibility and informality of the direct unstructured interview often provides access to information not usually obtained in structured questionnaire. The possibility that respondents will knowingly or unknowingly furnish wrong responses is, however, still there.

The success of the unstructured interview depends upon the skill of the interviewer in formulating and asking questions. The use of highly skilled and competent interviewers adds to the cost per interview. Another factor contributing to costs is that unstructured interviews are much longer than structured ones, and the varied order and form of questions makes editing and tabulating much more complicated.

- **Structured and Unstructured Indirect Interviews**

  In order to overcome the non-response or inaccurate response problem associated with direct questionnaires and unstructured interviews, some techniques have been developed to elicit information in an indirect fashion. Applying the projective techniques developed in the field of psychology, the respondents are asked to describe a non-personal ambiguous situation. The premise is that the description by the respondents would involve a projection of their own personalities, values, motives, needs and desires. The most common among these techniques are

word association tests, sentence completion tests and thematic apperception (interpretation of pictorial representation). These techniques have been mostly used in the study of buying motivations and consumption patterns of consumer products, which are similar in performance, price and quality, so that the consumer has little basis of differentiating them except brand and company image. Examples are soaps and detergents, food products, cigarettes, etc.

Since predesigned sets of words, statements or pictorial representations are used to elicit respondents descriptions, all indirect interviews involve some structuring. The degree however, varies from highly structured ones to relatively unstructured interviews where the interviewer has a high degree of latitude in questioning the respondent to get responses. Some of the commonly used indirect interview techniques are described below to help you to understand these tools of data collection.

Word Association Tests

The word association tests involve the presentation of a series of stimulus words to a respondent who is asked to quickly supply the word that first comes to his mind after hearing the stimulus word. Presumably the respondent would give the word that he most closely associates with the stimulus used. For example, given the name of a particular brand of instant coffee you may respond in terms of your feelings regarding its flavor, its evaluation vis-à-vis ground coffee, its costliness, its convenience depending upon the dominant association that you have for this product. It helps in identifying respondent perceptions about products and services, new packaging designs, advertising campaigns and so on.

Sentence Completion Tests

Developed as an extension of the word association test the sentence completion test involves providing an opening phrase of the sentences to the respondent who is then asked to complete it quickly. Trying to identify the motivation of car buyers a marketing research study used the sentence completion test. The phrases provided were:

People who drive a Maruti ....

Professionals usually drive ....

Most of the new cars ....

When I drive fast ....

Family men prefer ....

The responses given by men and women were found to differ. Fuel economy, maneuverability and stylish looks were interpreted to be the more important motives for men 'while safety was important to women'.

Thematic Apperception Test (Picture Interpretation Tests)

The test involves showing one or more pictures/cartoons to the respondent and asking them to describe the situation or to assume the role of one of the people shown in the picture/cartoon. Usually the picture shows one or more persons in an ambiguous situation and it is expected that the respondent will decipher the situation in accordance with his own personality.

In marketing research situations, use of cartoon involving people and the product under study is frequently made. The descriptions provided by the respondents are then interpreted by skilled interpreters to understand their price and quality association with the product, its valuation in the mind vis-à-vis competing products and so on.

Another variation of this projective technique is the story completion test when the respondents are given the beginning of a situational narrative and are asked to complete it.

Focus Groups

Focus groups are the most widely used type of indirect interviews. Here a group of people jointly participate in an unstructured indirect interview. A selected group of 8-12 people who have a common background on similar user experience relating to the problem under study is brought together in a group discussion exercise. The interviewer, who plays the role of a moderator attempts to focus the discussion on the problem areas in a non-direct, relaxed way. The purpose of this exercise is to provide interaction and involvement among the group members doing the interview, so that a spontaneous discussion with expressions of attitudes, opinions, values, user experience and intention of further product use takes place.

Focus groups characterise preliminary and exploratory studies rather than casual research and are used to generate information to facilitate the formulation of hypothesis or setting of premises for further research, it finds application in studies involving examination of new product concept, finalising creative concepts for advertising generation of information for modification of existing products as well as determining improved ways of distributing products.

Media used in Direct and Indirect Interviews

The interviews may use the personal medium, involving the use of an interviewer or use mail as a medium. Mail surveys are very common and offer the advantage of lower cost. However, the incidence of non-response in our country is so high that it has severely limited the use of this economical medium.

Another medium though not used frequently in India, is the telephone which lends itself to both structured and unstructured interviews. In countries where telephone interviews are exclusively used they are found to be a speedy and inexpensive medium for conducting interviews.

Let us now look at the other category of data collection methods.

Observation Method

Observation methods represent another class of data collection methods where without interacting with the respondents or the subjects under study, observations are made and recorded. Sometimes it is less costly and more accurate, if instead of asking the respondents their behaviour is carefully observed. Though past behaviour cannot be observed, the result of such behaviour can be. For example, instead of asking what brand of television do you own? Is it black or white? It is remote operated? It would be simpler to look at the set and observe its usage.

Observation may be used as the only means of data collection or in combination with other means. It is quite commonly used in exploratory and monitoring

researcher designs. For example, if the newly opened Green Supermarket in Delhi wanted to know if its price of commodities were competitive, the only way to get the information is to regularly monitor through observation, the prices of these commodities in other supermarkets and comparable stores.

In certain circumstances, though alternative modes of data collection are available, observation may actually be the preferable method of information collection, because of cost or accuracy consideration. In the section dealing with limitation of survey we have discussed inability or unwillingness of respondents to give information accurately. Observation may become the more suitable mode of data collection in such a situation. Studies on brand buying behaviour have shown that purchase/possession of the reputed or prestige brand is overstated while availing of discounts is understated by the respondents. In such case observations of buying patterns may give better results.

Observation may be carried out manually or mechanically. In countries like UK, USA and Canada devices like the hidden motion picture cameras are used to observe consumer behaviour in natural settings. The audiometer is another gadget, (described as the electromechanical equivalent of the respondent diary) used for recording day-to-day behaviour. It is installed in the televisions of a selected panel of people and automatically records the times the set is tunned on as well as the stations tuned in. The recording collected are used to get total average and share of audience for the different channels and commercials. These devices permit a complete and accurate recording. In India, some jewellery stores make use of short circuit cameras.

Manually, the observation method involves the use of trained observers who make and record direct observations of respondents' behaviour. Information pertaining to the following questions may be collected by direct observations:

- Who actually is the buyer for the product in question?
- To what extent do they seem to have predetermined idea of buying this product?
- Did they appear to be influenced by the person accompanying them?
- How many of them checked the price and/or compared it with that of competitors?
- How many of them studied the package before buying?

Direct observation discloses what was purchased rather than why it was purchased. As motives cannot be observed they must be inferred and these inferences can seldom be substantiated. Another limitation of manual observation is the observer's bias — observers may selectively record actions that seem meaningful to them and ignore others. This has implications for the objectivity of the research.

3.5 DATA AND THE RESEARCH PROCESS

Once the objective of research has been defined the first step is to trace out the nature and type of information needed in order to achieve the objectives. The first step in research process emphasises upon the types of data sources and options available to the researcher.

All data sources available to the researcher can be classified under two categories, i.e., secondary data and primary data. Secondary data are already published data collected for purposes other than the research problem while primary data are generated specifically for research purpose.

Define research objectives
|
Identify information needs
|
Formulate research design
|
Identify

Secondary data needs and data sources

Primary data needs and data sources

Search and analyse internal data

Identify extent and type of external secondary data

Respondenis

Experiments

Case studies

Government statistical publication syndicated source

Marketing research and other

Library sources

Fig. 3.4. Data and research process.

Basically there are 7 steps which are to be taken care of while designing a research project. The steps are:

- Specifying research objectives.
- Preparing a list of the needed information.
- Designing the data collection project.
- Selecting a sample type.
- Determining sample size.
- Organising and carrying out the fieldwork.
- Analysing the collected data and reporting the findings.

The aforesaid steps are not independent, rather every step depends to some extent on each of the others, and the first step must be planned with the second, third and remaining steps in mind. For example, one must have a clear picture about the research objective and the form and content of the "needed information" strongly affects the questionnaire, which in turn affects how the collected data will be analysed.

Research process steps and potential source of error that can cause problems in achieving the objectives.

S. No.	Step	Source of error	Problems in achieving the objective
1.	Specifying research objectives	Management does not define the problem properly	Imprecise measurement

2.	Listing needed information	Management does not identify precisely the specific information needed for the research objectives	Imprecise measurement
3.	Designing the data collection project	Ambiguous questions lead towards invalid responses	Imprecise measuring devices, measurement process influences results, difficulty in using experiment, great complexity of subject.
4.	Selecting a sample type	Sample procedure results in the selection of a biased sample	Imprecise measurement of universe, time pressure for results
5.	Determining sample size	Some errors arise from the random fluctuations normally associated with sampling	—do—
6.	Organizing fieldwork activities	Errors are caused by the improper selection of response; and by interviewers not following instructions	Measurement process influences results, time, pressure for results, great complexity of subject.
7.	Analyzing and reporting findings	Errors occur during the process of transforming raw data from questionnaires into "research findings"	Investigator involved in use of results, imprecise measuring devices, great complexities of subject

3.6. ATTITUDE MEASUREMENT

The measurement of attitudes is central to many marketing situations. Marketing programmes are based on marketing executives' perceptions of consumer attitudes towards their products, what attitudes they would like consumers to have and how they can change existing consumers' attitudes to the latter.

The strategy of marketing segmentation is often based on attitudinal data. Determining the attitudes of different marketing segments towards a product can be essential to developing a 'positioning' strategy. Attitude measurement is often the basis for evaluating the effectiveness of advertising campaigns. In addition the assured relationship between attitudes and behaviour helps in prediction of product acceptance and in the development of marketing programmes.

Nature of Attitudes

An attitude is an individual's enduring perceptual knowledge based evaluative and action-oriented process with respect to an object or phenomenon.

Components of Attitudes

Attitudes are generally considered to have three main components (*i*) a cognitive component of a person's beliefs about the object of concern, such as its speed or durability, strength or economy, etc. (*ii*) an affective component (*iii*) behavioural component—a person's readiness to respond behaviourally to the object. A person's emotional feelings about the object such as like and dislike, good or bad. The tendency to bring these three components together into something is called image.

Link between Attitudes and Behaviour

Attitudes are important in marketing decision-making because of the assumed relationship between attitudes and behaviour. Models which conceptualise construct of an attitude typically represent an attitude as a series of sequential components which leads to behaviour. The connection between attitudes and behaviour is not a simple one. The decision-maker and the researcher should be cautious in assuming such a relationship in a decision situation. The prediction of future behaviour for an aggregate of buyers does appear to be higher than the most decision situations are concerned with aggregate behaviour rather than individual behaviour, the attitude behaviour link does have some empirical support for any marketing decision situations. However, attitudes have only one influence on behaviour and in a particular decision situation other factors could be more influential than attitude.

An example would be an individual who has a highly favourable attitude towards purchasing a new luxury car like Mercedes Benz but because of economic constraints has to purchase a less desirable Tata Siera.

The marketing implications of this attitudes behaviour link relate to measuring the cognitive and affective components of a buyer's attitudes and being able to predict future purchase behaviour, could be influenced.

Attitude Measurement Process

In the attitude measurement process numbers are used to represent the marketing phenomena under investigation. The empirical system includes marketing phenomena, such as buyer reactions to products or advertisements. Therefore, measurement may be defined as the assignment of numbers to characteristics of objects or events according to rules. In effective attitude measurement, there is a requirement of relationships existing among the objects or events, the empirical system directly corresponds to the rules of the number system. Numbers are being used as symbols to model the characteristics of interest in the empirical system. The nature of the relationships existing in the empirical system determines the type of numerical manipulations that are valid in the abstract system.

Measurement may be defined as the assignment of numbers to characteristics of objects, persons, state or the event itself but some characteristic of it. When objectives are counted, for example, we do not measure the object itself but only its characteristic of being present. We never measure people; only their age, height, weight, or some other characteristic. A study to determine whether a higher percentage of males or females purchases a given product measures the male-female and purchase-nonpurchaser attribute of the persons sampled.

The most critical aspect of measurement is the creation of the rules that specify how the numbers are to be assigned to the characteristics to be measured. Once a measurement rule has been created and agreed on, the characteristics of events, persons, states or objects are described in terms of it.

3.7 DIFFICULTY OF ATTITUDE MEASUREMENT

As we know the measurement of weight, length and height is an easy task involving the use of a ratio scale. The natural zero point and equality of differences are obvious. This type of measurement situation is more characteristic of the physical sciences than the social sciences, marketing being one of them. Consequently, the task of measurement in marketing is typically more difficult and involves lower scales of measurement than those found in the physical sciences. The following exhibit shows the comparison:

Exhibit 3.1: Difficulty of the measurement process

Length	Preference	Happens
Weight	Attitudes	Creativity
Easy	Difficult	Very difficult
Ratio	Internal	Non-attendance
Scale	Scale	Scale

Source: Marketing Research, Thomas C Kinnear and James R Taylor, P. -229.

Measurement Accuracy

A measurement is a number designed to reflect a characteristic of an individual, object, or event. However, it is just an observation or picture of the characteristics of interest.

The terms validity, reliability, and measurement accuracy are often used interchangeably. The term reliability is used to refer to the degree of variable error in a measurement. We define reliability as the extent to which a measurement is free of variable errors.

Approaches to assessing reliability:

- **Test-retest reliability:** Applying the same measure to the same objects a second time.

- **Alternative-forms reliability:** Measuring the same objects by two instruments that are designed to be as nearly alike as possible.

- **Internal-comparison reliability:** Comparing the responses among the various items on a multiple-item item designed to measure a homogenous concept.

- **Scorer Reliability:** Comparing the scores assigned to the same qualitative material by two or more judges.

Measurement Development

Suppose you need to develop a measurement for a particular concept such as brand image. customer satisfaction or opinion leadership. The following steps are considered.

Exhibit 3.2: Methodology for Developing Sound Marketing Measures
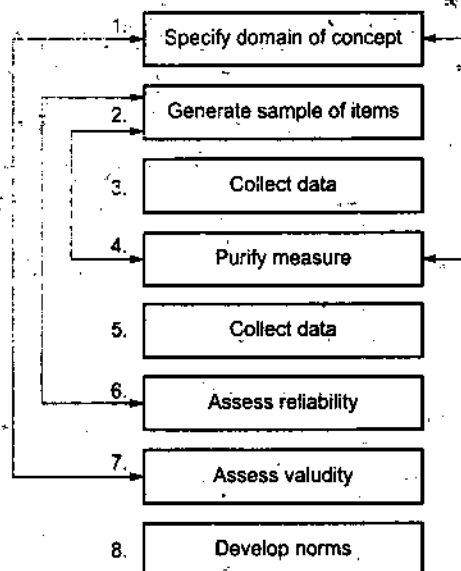
Source: Adapted from G. A. Churchill, Jr., "A Paradigm for Developing Better Measures of Marketing Constructs," Journal of Marketing Research (February 1979), 66. Used with permission from the American Marketing Association.

3.8 USE OF SCALING IN MARKETING RESEARCH

Attitude can be defined as the mental state of a consumer which predisposes him/her to respond in a certain way to a given stimulus. In marketing this can be perceived as a consumer's predisposition to respond to a product or service.

Marketing segmentation strategy is based on attitudinal segmentation. In measuring the effectiveness of advertising, attitude measurement plays a important role.

Scaling refers to the process of measuring of attitudes. Depending upon the types of attitude, the following appropriate scales are designed:

Exhibit 3.3
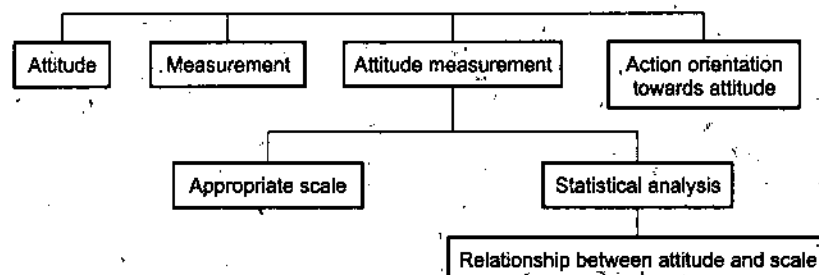
3.9 TYPES OF SCALES

Types of Attitude Rating Scales

There are many ways to present a respondent with a continuum of numbered categories that represent the range of possible attitude judgments. The following diagram shows various types of scales which are used in research.

Exhibit 3.4: Types of Scale
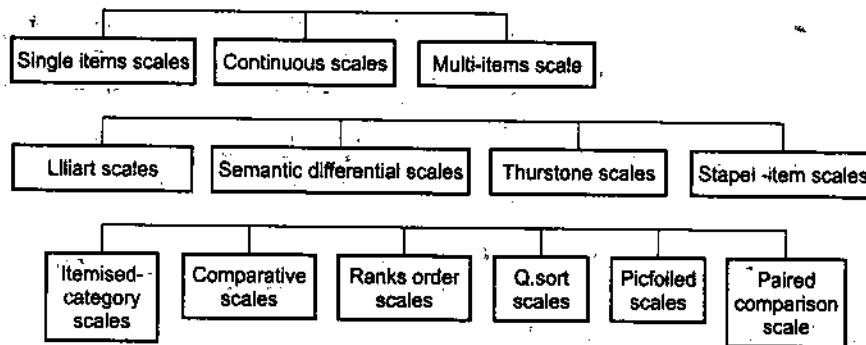
Single-item Scale

As the name itself suggests, single-item scales are those that have only one item to measure a conduct. Under the single-item scale, the itemized-category scale is most widely used by researchers.

Itemised-category Scales

These are four categories from which respondents can choose to indicate their overall level of satisfaction with their present banking facilities.

- Very satisfied
- Quite satisfied
- Somewhat satisfied
- Not at all satisfied

The itemised scales are also known as satisfaction scales with following characteristics.

- All categories are labelled.
- The respondent is forced to make a choice.
- There is no explicit comparison of the respondents.

A numerical scaling of the response categories form $+2$ to -2, as presented in the following chart.

Very satisfied				Very dissatisfied
+2	+1	0	−1	−2

Comparative Scales

Another version of the preceding scale would label the categories "excellent" "very good" "good" "fair" and "poor" thereby eliminating the implicit comparison.

The problem with a comparative scale is that the reference point is unclear and different respondents may use different reference points or standards.

For example: Comparison of public school in an area with government school in terms of quality of education.

Very	Neither superior	Very
Superior	Nor inferior	Inferior

Rank Orders Ordinal Scale

Ordinal scales represent numbers, letters or other symbols used to rank items. It can be classified not only on the basis of whether they share some characteristic with another item but also whether they have more or less of this characteristic than some other object. The ranking of certain attributes/benefits as deemed important by the respondent is obtained through this scale.

Example

Rank the following attributes on a scale of 1-5 according to their importance to a washing machine.

- Company image
- Functions
- .Price
- Comfort
- Design

Suppose that the attribute ratings received from a sample of 100 washing machine owners are as follows:

Attribute rating	Number of respondents giving rating
1	40
2	60
3	40
4	30
5	30

A mode or a median may be used. The model attribute rating is '2', as it is for the median. A mean should not be calculated because the differences between ordinal scaled values are not necessarily the same.

Q-Sort Scaling

When the number of objects or characteristics that are to be rated or ranked is very large, it becomes rather tedious for the respondents to rank order or do a pairwise comparison.

If the respondent is forced to do a rank ordering or a pairwise comparison, a number of problems and biases creep into the study. In Q-sort scaling the respondents are asked to sort the various characteristics or objects that are being categorised into various groups, such that the distribution of the numbers of objects or characteristics in each group follows a normal distribution.

Constant-Sum Scales

Constant-Sum scales require respondents to allocate a fixed·number of rating points among several objects, to reflect the relative preference of each object. It is widely used to measure the relative importance of attributes, as in the following example:

Please divide 100 among the following characteristics so the division reflects the importance of each characteristic to you in the selection of a management institute.

Placement   _____

Faculty   _____

Location   _____

Computer Centre   _____

Library   _____

Interval Scale

Interval scale represents numbers used to rank items such that numerically equal distances on the scale represent equal distances in the property being measured. It involves qualitative description of number of aspects of a product or traits of a person.

Example

How do you rate your present washing machine on the following qualities?

A: Product design						
Poor	1	2	3	4	5	Good
B: Brand name						
Lesser known	1	2	3	4	5	Well known
C: Price						
Low	1	2	3	4	5	High
D: After sales services						
very dissatisfied	1	2	3	4	5	Very satisfied

Ratio Scale

Ratio scales consist of numbers that rank items such that numerically equal distances on the scale represent equal distances in the property being measured and have a meaningful zero. All descriptive measures and inferential techniques are applicable to ratio scaled data. Table 5.1 gives a summary description of each of the four types of scales.

Types of Measurement Scales

Basic Empirical			Typical Statistics	
Scale Inferential	Operations	Typical	Usage	Descriptive
Nominal	Determination of equality	Classification: male-female, purchaser non-purchaser, social class	Percentages, mode	Chi-square, binomial test
Ordinal	Determination greater or less	Rankings: Preference data, market position attitude measures, many psychological measures	Median	Mean-Whitney U, Friedman two-way ANOVA, rank order
Interval	Determination of equality of intervals about brands	Index numbers, attitude measures, level of knowledge	Mean, range, standard deviation	Product moment correlation, t-test, factor analyse ANOVA
Ratio	Determination of equality of ratios	Sales, units produced, number of customers costs	Coefficient of variation	

Source: Adapted from S S Stevens, "On the Theory of Scales of Measurement," *Science*, June 7, 1946, pp. 677-680.

Specialised Scales

The judgements are against other similar objects. The respondents directly compare two or more objects and may choose among them.

Methods of ranking scales are as follows:

Method of Paired Comparison

When there are more stimuli to judge, the number of judgements required in paired comparison is given as

$$N = \frac{n(n-1)}{2}$$

N = number of judgements

n = number of stimuli or objects to be judged

Limitations

If N becomes a big figure, there is a risk of respondents giving all considered answers or no answer at all.

Paired comparisons provide ordinal data. We can reduce the number of comparisons by choosing a few objects which cover the range of attractiveness at equal intervals.

Law of Comparative Judgement by L L Thurstone

It involves converting the frequencies of preferences into a table of proportions. This is then transformed to z matrix by referring to the table of area under the curve.

Response patterns of paired comparison of different chocolate brands.

Dairy Milk	Five Star	Kit-Kat	Perk	Amul
Dairy Milk				
Five Star				
Kit-Kat				
Perk				
Amul				
Total				
Rank Order				

In the above example, there are five brands so the number of comparisons to be made should be 10 which will be as follows:

- Dairy Milk vs Five Star
- Dairy Milk vs Kit-kat
- Dairy Milk vs Perk
- Dairy Milk vs Amul
- Five Star vs Kit-kat
- Five Star vs Perk
- Five Star vs Amul
- Kit Kat vs Perk
- Kit Kat vs Amul
- Perk vs Amul

The strength of the paired comparison approach is the ease with which the respondents compare only two brands/attributes at a time. And, the weakness of paired comparison rating scale is the rapid increase in the number of comparisons to be made in quick succession.

Composite Standard Method

The following steps are used in composite standard method:

Step 1: Comparing the total number of proposals or preferences for each.

Step 2: Using the data, column mean can be calculated by using the following formula.

$$MP = C + 0.5\ (N)$$

$$n\ (N)\ ,$$

Mp = the mean proportion of columns

C = Total number of choices for a given suggestion

N = Number of stimuli

N = Number of items in the sample

Step 3: When the Mp < 0.5; z is negative, where Mp > 0.5, z is positive, z for Mp is secured from area under the curve.

Step 4: z represents an interval scale, zero is an arbitrary value. Hence, negative value is eliminated considering zero is the lowest.

Graphically it can be represented as


```
D  B                    A  C
|  |                    |  |
|  |                    |  |
|  |                    |  |
|  |                    |  |
|  |                    |  |
0.0        0.1        0.2        0.3.        0.4
```
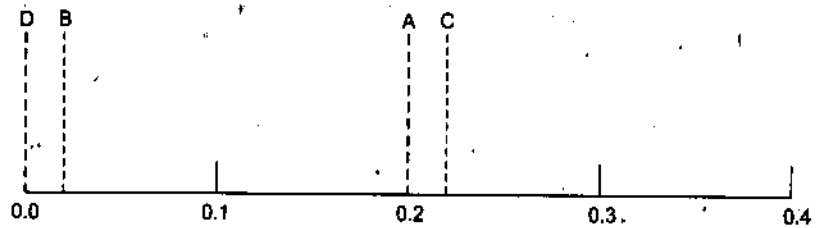
Example

Figures for Top Ten national advertisers are given as a per cent of sales.

Top Ten MNC Advertisers

Rank	Company	Advt. as a % of sales United States	ranking
1.	Procter & Gamble	13.8	II
2.	Pepsi Co.	.6.0	IV
3.	*McDonald's*	18.7	I
4.	Ford	1.1	V
5.	Eastman (Kodak)	6.1	III

Arbitrary Scales

They are developed on an adhoc basis and are designed largely through the researcher's own subjective selection of items. The researcher first collects a few statements or items which he believes are unambiguous and appropriate to a given topic, then a few of them are selected for inclusion in the measuring instrument. People are then asked to check the list for the statement on which they agree.

Merits

- They can be developed very easily and quickly and are relatively less expensive.
- Designed to be highly specific and adequate.

Limitations

- We do not have objective evidence that such scales measure the concepts for which they have been developed.
- We have to rely on the researcher's insight and competence.

Example of an Arbitrary Scale

- Keeping in mind the conditions of Delhi roads owning a luxury, high-cost brand car is:
  ❖ A necessity
  ❖ To satisfy self-esteem
  ❖ For comfort

❖ A status symbol

❖ A prevention against road accidents

Differential Scales—Thurstone-Type Scales

They are developed using consensus scale approach, where the selection of items is made by a panel of judges who evaluate the items in terms of whether they are relevant to that topic area and unambiguous in implication.

It is used to measure attitudes towards various issues like war, religion, etc.

Merits

• These type of scales are most appropriate and reliable when used to measure a single attitude.

Limitations

• More cost and effort is required.

• Values assigned to various statements by the judges may reflect their own attitudes.

• This method is more subjective than objective.

Summated Scales (Likert Type Scales)

They are developed by utilising the item analysis approach wherein a particular item is evaluated on the basis of how well it discriminates between those persons whose total score is high and those whose score is low.

Thus, summated scales consist of a number of statements which express either a favourable or unfavourable attitude towards a given object to which the respondent is asked to react. The respondent indicates his agreement or disagreement with each statement in the instrument. Each response is given a numerical scale/score and these scores are totalled to measure the respondent's attitudes.

Most frequently used summated scales in the study of social attitudes follow the pattern devised by Likert. The respondent may respond in any one of the following ways:

• Strongly Agree

• Agree

• Undecided

• Disagree

• Strongly disagree

Strongly agree (1)	Agree (2)	Undecided (3)	Disagree (4)	Strongly disagree (5)
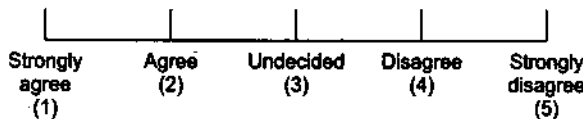
Advantages

• Easy to construct and reliable. It also provides more information and data.

• Each statement included in the Likert type scale is given an empirical test for discriminating ability.

• It permits the use of statements that are not manifestly related to the attitude being studied.

- Such a scale can easily be used in respondent-centred and stimulus-centred studies.
- It takes less time to construct.

Limitations

- We can simply examine whether respondents are more or less favourable to that topic, but we cannot tell how much more or less they are.
- No basis for belief that the five positions are equally spaced. This means that the Likert scale does not rise to a stature more than that of an Ordinal scale.
- There remains a possibility that people may answer according to what they think they should feel rather than how they feel.

An Example of Summated Scale

- Promotion of satellite TV has had a direct influence on the students studies. They have diverted their attention from their studies and spend most of their time watching T.V.
  - ❖ Strongly Agree
  - ❖ Agree
  - ❖ Disagree
  - ❖ Strongly Disagree
  - ❖ Neutral.
- Promotion of cable TV affects the health of a child (physically as well as mentally).
  - ❖ Strongly Agree
  - ❖ Agree
  - ❖ Disagree
  - ❖ Strongly Disagree
  - ❖ Undecided
- Because of the cable network children do not actively participate in extra curricular activities.
  - ❖ Strongly Agree
  - ❖ Agree
  - ❖ Disagree
  - ❖ Strongly Disagree
  - ❖ Undecided
- Cumulative Scales

  It consists of a series of statements to which a respondent expresses his agreement or disagreement. These statements form a cumulative series, i.e., they are related to one another in such a way that an individual who replies favourably to say item no. 3 also replies favourably to items no. 2 and 1 and so on. The individual's score is worked out by counting the number of points concerning the number of statements he answers favourably. If one knows the total score one can estimate as to how a respondent has answered individual statements constituting cumulative scales.

Advantages

- It assures that only a single dimension of attitude is being measured.
- Researcher's subjective judgement is not allowed to influence the development of scale since the scale is determined by the replies of respondents.

Limitations

- In practice perfect cumulative or undimensional scales are very rarely found and we have only to use its approximation, testing it through coefficient of reproducibility.
- Its development procedure is tedious and complex.

An Example of Cumulative Scale

Item Name	Esteem	Cielo	Opel		Escort	Respondent
			Ford	Score		
1. Which is the most luxurious car	— x	— x	— x		x x	2 4
2. Which car provides you best comfort						
3. Which car gives best mileage	x	x		—	x	3
4. Which is the most expensive car.	—	—	—		x	1
5. Which is an economic luxury car	x	x		—	—	2
6. Which car has best service outlets	x	x		—	—	2

Stapel Scale: It is a modification of the differential scale. It differs from the semantic differential scale in that the adjectives or descriptive phrases are tested separately instead of simultaneously as bipolar pairs. Also, the points on the scale are identified by number as these are ten scale positions rather than five or seven as in the required manner.

Please rate AIR India on the following dimensions:

	-5	-4	-3	-2	-1	+1	+2	+3	+4	+5
Courteous service										
Convenient house										
Fares are low										

Fractionation Rating Scale: It requires the raters to rate an object by comparing it with reference point. The goal is a ratio-scale representation of attitudes toward the complete set of objects. An example is presented below:

Please divide 100 points among the following TV brands so as to reflect how much overall quality you believe each one has:

BPL   _____ points

SAMSUNG_____ points

Fishbein's Scale: This scale uses a combination of constant sum and semantic differential scale. To assess, how consumers perceive a set of alternative offerings, this type of scale is used. Here the respondent is first asked to assign a weightage to a set of given attributes. Afterwards the respondent is given some specific choice alternatives. For example, suppose a research study was assessing consumers' attitude towards five leading brands of decorative points in terms of the attributes like durability, washability, finish, range of package size, range of colour, price, etc.

Fishben scale is found useful in problems such as comparing brand image and advertising designs.

Multi-Dimensional Scaling

It is a complicated scaling device. But with this we can scale objects, individuals or both with a minimum of information. MDS can be characterised as a set of procedures for portraying perceptual or effective dimensions of substantive interest. It is used when all the variables (metric or non-metric) in a study are to be analysed simultaneously and all such variables happen to be independent.

Assumptions

"0 people" perceive a set of objects as being more or less similar to one another on a number of dimensions instead of one.

- These techniques attempt to locate the points, given the information about a set of interpoint distances, in space of one or more dimensions such as to best summarise the information contained in the interpoint distances.

An example of MDS
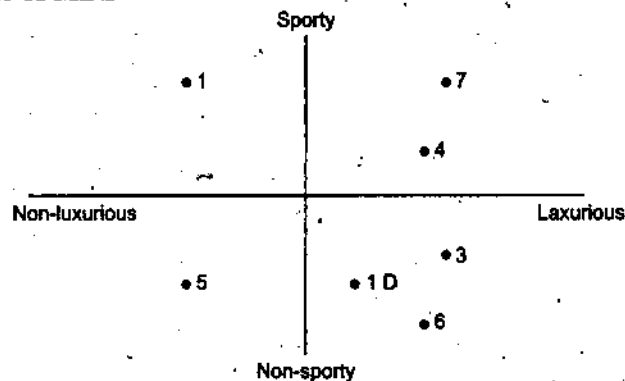
An example of consumer perception of similarities of selected cars on two dimensions.

Uses of MDS

- Market segmentation
- Product life cycle
- Vendor evaluations
- Advertising media selection

Limitations of MDS

- Conceptual problems
- Empirical problems
- Computational problems

MDS has become highly popular with academic students of marketing and is widely used by practitioners. As it is applied by more researchers, the limitations are better understood and, to some extent, solved. Further, refinement is certain to come, and the techniques will continue to contribute to marketers' understanding of consumer behaviour.

Semantic Differential Scaling

It is developed by Charles. E. Osgood. G.J. Suci and P.H. Tennenbnum (1957) is an attempt to measure the psychological meaning of an object to an individual. For instance, the S.D. scale items for analysing candidates for leadership position may be shown as under.

Exhibit 3.5

(E) Successful								Unsuccessful
(P) Severe								Lenient
(E) Heavy								Light
(A) HCl								Cold
(E) Progressive								Regressive
(P) Strong								Weak
(A) Active								Passive
(A) Fast								Slow
(F) True								False
(E) Sociable								Unsociable

Disguised, Structured, Scaling Techniques

For the disguised structured scaling method of data collection, certain projective techniques are used. The popular projective techniques used are (i) Word Association, (ii) Sentence Completion, (iii) Thematic Apperception Test (TAT), (iv) Story-telling, (v) Body-building/House-building.

A. Word Association

Description

A series of situation/words is given to the respondents and they are asked to fill up the first word/brand which comes to their mind.

It is interesting for the respondent to fill up the various word associations. It is also quick and easily understood.

Example

- DOVE: LOVE
- Which brand of cooking oil comes to your mind when speaking of a light and nutritious sunflower oil?

• Who do you think is most likely to use the Bajaj Sunny?
  ❖ A decent college-going student
  ❖ A family man
  ❖ A middle-aged executive
  ❖ A robust youngster

B. Sentence Completion

Description

The respondent is given a number of sentences and asked to complete them. The profile of the respondent as well as his attitude towards certain feelings can be approximated. The responses can be varied and difficult to analyse. The respondent might require more time to fill up the sentences.

Example

If the Times Group is interested in developing a profile of its FM radio listeners of its Time Style programme by asking viewers to check whether there exist any differences between the two, it can administer the following sentences to the respondents.

• A person listening to Times FM radio regularly is _____.
• Time Style viewership will definitely consist of people belonging to
  _____.

C. Thematic Apperception Test

Description

Pictures, instead of, words are used in this technique. A series of pictures are shown to the respondent who may be asked to compare them or answer questions on them. The innermost attitudes of the respondents can get reflected, if the technique is properly administered. It is, however, difficult to interpret the responses at times.

Example

Two typical housewives may be shown. A simple, traditional housewife and a modern working woman. The question could be: Who do you think is most likely to use instant mixes for cakes?

(a)   (b)

D. Story-telling

Description

A situation is described to the respondent who is asked to complete the story based on his opinion and attitude. This technique holds the interest of the

respondent but its results may be difficult to interpret as the responses would be varied. However, it is extensively used to tap any creative responses which can be put to use.

Example

Two children are quarrelling at the breakfast table just before going to school. The younger child has dropped some tomato ketchup on her brother's shirt which he has to wear on the same day for the annual sports day. What will the mother do?

E. House-building/Body-building

Description

The important values for a brand are given to the consumer and he is asked to sort the values such that they can be used to construct a house or build a body. The core values of the brand might form the foundation of the house or the heart of the body. The packaging or the after-sales services might be viewed as the arms/feet or windows as the case may be.

> Determine clearly what you are going to measure
>
> Generate as many items as possible
>
> Ask experts in the find to evaluate the initial pool of items
>
> Determine the type of attitudinal scale to be used
>
> Include some items that will help in the validation of the scale
>
> Evaluate and refine the items
>
> Finally optimise the scale length
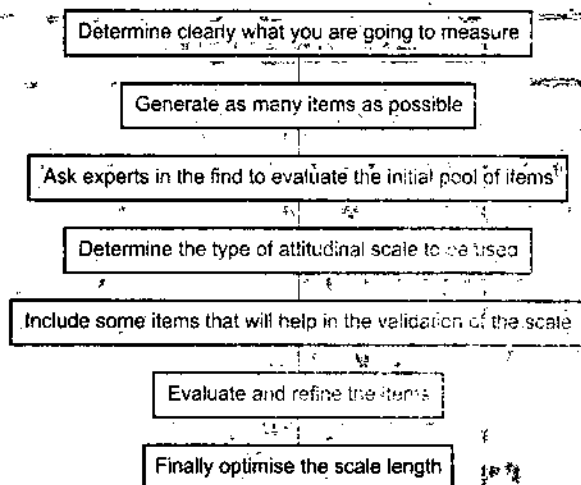
The respondent may not be able to complete the house/body in case the brand has few values. A strong brand, on the other hand, results in a stronger body/house.

Also a situation may be described to the respondent to assess the value of the brand most prone to attack from competition by asking questions like:

- If the body meets with an accident, which parts would survive and which would get severely damaged and which would escape with small cuts and wounds?

General Guidelines for Developing a Multiple-Item Scale

Multiple-item scales often are widely used in social sciences research to measure abstract constructs. The characteristic that is to be measured is generally referred to as the construct. The following steps are used in construction of a scale.

SUMMARY

- The analysis of the content of each question results in the construction of a questionnaire. A questionnaire must serve two functions. It must translate research objectives into specific questions the respondent can answer and it must motivate the respondent to co-operate with the survey and to furnish the information correctly.
- Attitudes are generally considered to have three main components (1) A cognitive component of a person's beliefs about the object of concern, such as its speed or durability (2) An effective component (3) Behavioural component of a person's emotional feelings about the object such as like and dislike, good or bad.
- The term measurement refers to obtaining symbols to represent properties of objects, events, or states. These obtained symbols have the same relevant relationship to each other as do the things which are represented by them. In this unit, we have discussed numerical scales, importance of attitudes, general approaches to attitude measurement, scales for attitude measurement, and multi-dimensional scaling.

REVIEW QUESTIONS

1. Discuss the various steps in questionnaire design.
2. How will you determine the contents of individual questions?
3. How will you determine the type of questions to be used in preparing the questionnaire?
4. What steps are needed most in sequencing the questions in a questionnaire?
5. What are the characteristics of a good questionnaire? Design a small questionnaire to test the fashion adoption characteristics of the behaviour of college going girls.
6. What general guidelines should one follow in designing a questionnaire?
7. What are the advantages and disadvantages of open-ended questions?
8. Briefly describe the observational methods of data collection. What are their advantages and disadvantages? Illustrate with examples.
9. What are the common mistakes made in the construction of a questionnaire? Explain how they can be avoided.
10. Develop a suitable rating scale to measure consumer satisfaction of a product.
11. Outline a suitable Likert scale to examine the corporate image of a bank measured by its location, number of branches, timings, service quality, behaviour of staff, etc.
12. What is a Paired-comparison scale?
13. How is a Likert summated rating scale constructed?
14. What is a semantic differential scale?
15. Distinguish between semantic differential scale and Likert scale. Give examples.

16. Briefly explain the primary forms of computerised databases.
17. What are the primary scales of measurement? Illustrate.
18. Distinguish between semantic differential scale and Likert's scale. Give examples.
19. What are the primary scales of measurement?
20. Briefly explain the primary forms of computerised databases.
21. Describe the differences between a nominal and an ordinal scale.
22. What are the advantages of a ratio scale over an interval scale? Are these advantages significant?
23. Identify the type of scale (nominal, ordinal, interval, or ratio) being used in each of the following. Please explain your reasoning.
   ❖ I like to solve cross-word puzzles.
      Disagree Agree
      1   2   3   4   5
   ❖ How old are you?
   ❖ Please rank the following activities in terms of your preference by assigning ranks 1 to 5:
      ◆ Reading magazine
      ◆ Watching television
      ◆ Dating
      ◆ Shopping
      ◆ Eating out
   ❖ What is your income tax number?
   ❖ On an average week day, how much time do you spend doing your homework and class assignments:
      ◆ Less than 15 minutes
      ◆ 15 to 30 minutes
      ◆ 31 to 60 minutes
      ◆ 61 to 120 minutes
      ◆ More than 120 minutes
      ◆ How much money did you spend last month on entertainment?
24. What is measurement? What are the scales of measurement? What information do they provide?
25. Develop a battery of attitude scales to predict whether or not people who currently smoke will try to evade/give up smoking within the next year.
26. How are attitude rating scales most commonly applied in marketing research?
27. What decisions must a researcher make in designing a single-item scale for these purposes?
28. Develop a multi-item scale to measure a student's attitudes toward the present system of grading. How would you assess the reliability and validity of this scale?
29. Describe the procedure for developing a sound measure of a marketing concept.

f

30. Give one conceptual and two or more operational definitions for each of the following concepts

❖ Satisfied customer

❖ Department store

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CASE-STUDY–1: ALL THAT FLICKERS

Finally, something positive has emerged from the BAT-IT alliance. ITC, alongwith Benson and Hedges International, a subsidiary of BAT, has launched Benson and Hedges (B&H) cigarettes in India.

This is the best-known foreign brand (main markets: Australia, New Zealand and the UK) of cigarettes to have entered India so far. And it is expected to 'play the role of a pace-setter', according to Amal Pramanik, Bank Group manager, ITC, who points out that Rothmans has had too chequered an existence in India to play that role. Marlboro is still to come.

Being rolled out from ITC's Bangalore plant, B&H is selling at kiosks and other outlets in Mumbai, the city that accounts for two of every five premium cigarettes sold in India. The price: ₹ 50 for a pack of 20 sticks. This is roughly what the smuggled B&H sell for, though very few kiosks carry smuggled sticks that haven't got states permission.

The brand is available in two variants: B&H Special and B&H lights, with its white filter tip, is a recent launch even in the West. Pramanik says that the introduction of a 'lights' variant at the very beginning is in keeping with ITC's belief that there is a distinct and separate segment for lights. The B&H loyalist must have the option. Furthermore, the move was spurred by ITC's success with its other milds and ultra-milds offerings in the king-size segment.

Kurush N. Grant, Executive Vice-President, brands, is confident of maintaining the brand's international taste and quality standards. No particular technological investments in the Bangalore plant, however, were needed. "It follows worldwide standards," says Grant, "and the product is subject to 400 quality checks during the course of the manufacturing process."

Will Classic and India Kings, ITC's erstwhile top-end brands, be cannibalised by B&H? No, feels Pramanik, confident that the pricing and positioning platforms

of all the brands have taken care of any such thing happening. What's more, says Grant, "B&H has always been available in the market, so smokers of India Kings and Classic always had a choice."

The company has always made it a point to ensure that premium products do not sell merely because they are status symbols by virtue of their price tags. Instead, they should have personalities. It's worth noting that B&H, isn't the most expensive offering from ITC. That honour remains with India Kings, at ₹ 55 per pack, which continues to sell on its Maharaja image at the very top. Classic, which is rather English in personality, and is often the choice of the wearing executives, sells at ₹ 40-45 per pack. B&H, with its Gold Heritage, comes between the two and is expected to occupy a unique spot in the target consumer's mind.

Who is this target consumer? The young, globalised male in the 27-30 year age group.

Bates Clarion, the agency on the account, is sticking to the international theme campaign for B&H, which began in India several months ago. 'Turn to Gold', is the adline, which preserves the brand's heritage (its association with the splendour of the world's most sought-after metal). But the current campaign differs from the advertising of the 1980s (which had molten gold being poured into bar moulds) in a significant way. The overall ad sends out cleverly designed reminders of the pack and this is done by injecting a sense of outdoor action (a helicopter against a unseating sky, for example). This is a major move away from the static, indoor aristocracy that has always characterised most British smokes. Some analysts saw this sort of ambience losing out slowly to the casual, adventuresque, even gruffly American brands like Marlboro and Kent. With this campaign, B&H adds drama to the brand without forfeiting the sophisticated gold association.

Apart from advertising through print and the outdoor media, ITC also plans extensive consumer contact programmes at hotels, restaurants and other public places. A well-focused direct selling effort is also being undertaken.

The target sales? ITC wants B&H to achieve an 8-10 per cent share of the premium segment in the next three-five months. The brand should be available all over India by the end of the year.

CASE STUDY–2: MEMBER SATISFACTION SURVEY OF AIMA

INTRODUCTION

All India Management Association is conducting a survey to measure the satisfaction level of its members. Please respond to the following statements, as your opinion is valuable to us. Kindly send the filled questionnaire back to us as soon as possible. A short summary of the survey results will also be provided to you on its completion.

Thank you for your cooperation in helping us to improve further.

Name (optional)...

Membership Number ....

Category of Membership ....

Please tick the appropriate ....

- ❖ I am ....with the AIMA membership registering process.
    - ◆ Extremely Satisfied
    - ◆ Satisfied
    - ◆ Dissatisfied
    - ◆ Extremely Dissatisfied
- ❖ If Dissatisfied:
- I am dissatisfied with the membership registering process because (Tick more than one if applicable)
    - ◆ The application form was difficult to understand and complete.
    - ◆ The processing of application took a very long time.
    - ◆ There is communication gap between the members and the membership department.
    - ◆ Any other dissatisfaction regarding the membership process.
    Suggestions (if any)
- I attach ....value to my membership title (i.e., MIMA, FIMA)
  Encicle the appropriate:
  Low High
  1 2 3 4
- Rank the following services of AIMA from 1 to 7 according to the usefulness/utility for you.
    - ❖ AIMA News   Indian Management
    - ❖ Evening Lectures   Education Programmes
    - ❖ Library & Information   Management Development &
      Services   Training Programmes
    - ❖ National events like annual convention (NMC, NCYM)
- ❖ I am ....receive the AIMA publications (like Indian Management, AIMA News).
    Always   Often
    Sometimes   Rarely
    Never
- ❖ Quality of these publications:

Indian Management	AIMA News
Selection of contents	Selection of contents
Good	Good
Satisfactory	Satisfactory
Not so good	Not so good
Quality of print	Quality of print

- ❖ The overall quality of these publications has
    Improved   Deteriorated
    Suggestions (if any)
- ❖ In my opinion the management development and training programmes are

      Excellent   Good

      Satisfactory   Not so good

❖ The overall quality of these programmes has

      Improved   Deteriorated

      Suggestions (if any)

❖ I feel that most of the evening lectures are

        Very interesting   Quite interesting

        Okay   Not at all interesting

❖ The quality of these lectures has

      Improved   Deteriorated

      Suggestions (if any)

❖ The library and information services are

        Excellent   Good

        Satisfactory   Not so good

❖ These services have

        Improved   Deteriorated

        Suggestions (if any)

❖ I have availed the following services of AIMA
(Tick more than one if applicable)

      Discounted rate on room tariff of various hotels;

      Discounted rate on new membership of the Automobile Association;

      Special discount rates on purchase from publishers.

❖ I am.................with these services.

      Extremely   Satisfied   Satisfied

      Dissatisfied   Extremely   Dissatisfied

      Suggestions (if any)

❖ Are you member of any other professional association?

      Yes   No

❖ If yes, what extra services do they provide other than those provided by AIMA.

• Evaluate the questions on this content, type, wording, sequence and layout as well as the type of scale used for measuring attitudes.

UNIT

4

STATISTICAL METHODS

4.1 INTRODUCTION

Primary data collected by surveys, experiments or observations by the field investigators are hastily entered into questionnaires. Owing to the pressure of interviewing, the researcher has to write down the responses immediately

and often not very systematically. The information, thus, collected may be illegible, incomplete and inaccurate to a certain extent. Also the information, thus collected is contained in a scattered way in several data collection formats. The data lying in such a crude form are not ready for analysis. Keeping this in mind, the researcher must take some measures to organise the data so it can be easily analysed. The various steps which are required to be taken for this purpose are: editing, coding and tabulating. Editing entails inspecting, correcting and modifying the collected data. Coding refers to assigning numbers or other symbols to each answer or placing them in categories to prepare data for tabulation. Tabulating is the bringing together of similar data and totalling them in an accurate and meaningful manner.

The following steps are involved in editing:

- **Deciphering:** If the handwriting of a data collector is difficult to read, to make the data readable deciphering is done by the editor.

- **Checking entries:** The editor must also scrutinise the data of schedule to see if any entry is missing or incomplete. The editor must also look over schedules for inconsistencies, *e.g.* entries of age and date of birth must not be inconsistent.

- **Approximation:** This is the most important work the editor has to perform. Big figures as reported by the enumerator may be complex and difficult to understand, hence to have data which is meaningful and useful they must be approximated. Approximation is the basis of rounding off the figures with a view to simplify them and to make them suitable for analysis without impairing the standard of reasonable accuracy. Many times, it is not necessary to give actual numbers and approximate figures serve the purpose. Thus the process of approximation enables a clear and easy grasp of figures and facilitates calculation and comparison. The extent to which approximation should be done depends upon the degree of accuracy desired in the data.

4.2 PRECAUTIONS IN EDITING

Editors while editing the collected data must exercise caution and restraint. Good editors employ following procedures/directions:

- They are well aware of instructions provided to investigators who collect the data. Also they must be well versed with direction given to them to edit the data.

- While correcting a data they should do so in a manner, so that the original data remains legible for any future reference, if so needed.

- Ideally, they should use a different colour ink for any entries made by them.

- All data changes or missing answers supplied by them must be initialled.

- All edited forms or schedules must be datelined and initialled by the editor.

4.3 EDITING

The activity of inspecting, correcting and modifying the collected data can be carried out in two stages: (*i*) field editing and (*ii*) office editing.

- *Field editing*: When personal interviews are held to collect data, field editing becomes important. This is because, it is not possible for the interviewer to fill up the entire questionnaire during the interview. The interviewer uses brief notes or symbols to record the answers. Just after the interview, he reviews, corrects and makes answers more specific on the questionnaires. This type of field editing, where the interviewer himself carries out the editing work, is called field editing by the interviewer.

  The other form of field editing is called field editing by the supervisor. When a team of interviewers are employed for conducting major surveys, the supervisor with each team has to undertake the work of editing. The supervisor of each team carries out a quick field editing to remove any mistakes in the records of answers made by the interviewers working on a sample of respondents to ensure the quality and honesty of his team of interviewers.

- *Office editing*: The office scrutiny and correction of data is more accurate in office editing. Office editing is carried out at some central place where all interview schedules, mail questionnaires or telephone survey responses are brought together or collected. Office editing is more important in the case of mail surveys. This is because interview schedules and telephone survey responses may be edited at the field level also. But the mail survey responses are not edited or processed at all before they reach the central office. So the office editing for the mail questionnaires has crucial value because the information received through this mode is in an unabridged form.

4.4 PROBLEMS IN EDITING

These are some of the major problems faced by editors while editing the collected data:

Fictitious Interviews

Sometimes in personal interviews and telephone surveys, some interviewers may fabricate the data and fill these out in the questionnaires or interview forms without actually interviewing the respondents. Such fraud practices can be detected by an alert editor. Interviewers who try to give 'phony' returns or take

data can be easily detected by an alert editor. Such interviewers who fabricate data are lacking in imagination and knowledge to fabricate the interviewing results.

Cheating of this type can be identified when the answers show unusual inconsistencies and uniformity. For example, the survey of a Muslim-dominated area shows an average number of Muslims only. Similarly, indicating small children in all the houses surveyed may be taken as clues to detect such fictitious interviewers.

To minimise such fictitiousness in interviews to a greater extent, it is advisable for occasional checks to be carried out at random by selected interviewers using the telephone or post cards to establish whether an actual survey was conducted. It may be brought to the knowledge of interviewers beforehand that such checks will be conducted. This may lessen the interviewer's inclination to cheat or fabricate the data.

Inconsistencies or Contradictions

There may be inconsistencies in the answers given. For instance, it may be noted at the beginning that there are no children in a specific house. In the latter section of the questionnaire, ages of children might be listed. Still in the third section, the likings or dislikings (or attitudes) of the children might be given. In such a case, the editor may adjust the first answer to the latter two. This word obviously means that the first noting is a mistake on the part of the interviewer.

Illegible Responses

The handwriting of the interviewer might be illegible in some cases. In such cases, the interviewer may be recalled to decipher or interpret the responses. However, if the handwriting is unreasonable in the mail surveys there is no alternative but to disregard that particular questionnaire. The problem of illegible handwriting is more acute when open-ended questions are used.

Incorrect Answers

Suppose in a study of a particular TV programme the answer gives the time a respondent watched this programme. It is, however, found through evidence that the respondent indeed watched the TV programme but the data given is wrong. The editor must rewrite the data himself because obviously the time has been mistakenly noted by the interviewer.

Incomplete Answers

In a TV brand preference study, suppose a respondent gives the names of various brands available without giving his own TV brand. But in the latter section of the questionnaire, he says that 'BELTEK' is the best brand. It may be assumed by the editor that the respondent possesses a 'BELTEK' TV set and the answer may be adjusted accordingly.

Don't Know and No Answers

When the respondent shows his inability to respond to a question because of the lack of sufficient information, that answer is called a 'don't know answer'. On the other hand, when the respondent is reluctant to answer a particular question because his personal life is linked with it the answer is called a 'no

answer'. The 'no answer' mostly occurs in the case of mail questionnaires when the respondent leaves a question blank.

In certain surveys, the number of 'don't know' or 'no answer' responses are so small that they can be ignored in the analysis. But at times the number of these responses is so large that the results of the study are greatly influenced by them. This is true especially in the case of political polls. Suppose, there are 43% responses in favour of 'A' candidate, 44% in favour of 'B' candidate and 13% are 'don't know'. Then eventually 'don't know' determines the outcome of the election. 'Don't know' answers fall into three categories:

(a) Legitimate don't knows

As they exist in the above example pertaining to a political election. At the time of interview, many voters were not aware of any opinion.

(b) Confused don't knows

In which the respondent may not know the meaning of the terms used. For example, in a study of pricing, various terms used may confuse the respondent (*viz.*, cost discount, quantity discount, etc.) In such a confusing state, the (respondent) may check the 'don't know' choice or leave the question blank on the questionnaire.

(c) Reluctant don't knows

Sometimes, when the respondent's personal life or his organisation is involved in the question, he may hide himself in the shelter of a 'don't know' answer. Take, for example, a survey where a question is asked as 'what do you think about your company's policies regarding allocation of sales territories?' The salesman hides himself under the 'don't know answer' particularly when the survey is being conducted by his sales manager.

Adjusting Don't Knows and no Answers

It is generally believed that the 'don't knows' and 'no answers' should best be shown in the formal results as follows:

Favourable responses	45
Unfavourable responses	40
No opinions	10
No answers	5
Total	100

Alternatively, researchers may divide the 'no opinions' or 'no answers' on a ratio based on existing answers.

Thus, the favourable answer becomes $\frac{45}{85} \times 15$ and unfavourable answer becomes $\frac{45}{85} \times 15$.

This is a highly objectionable technique since it assumes that 'don't knows' will eventually follow the pattern of those people who already have a preference. In reality, the 'don't knows' could be a very homogenous group and eventually act in unison when making a final decision.

The editors should not always follow the foolish practice of throwing out the illegible or incomplete questionnaires, since this may eliminate a large number of questionnaires often having useful information. 'Don't know' and unanswered questions are likely to occur in all types of studies and must be anticipated and adjusted by the researcher.

Following instructions must be adhered to while editing survey questionnaires or data forms:

- Be familiar with the editing instructions, as well as the instructions given to interviewers and coders.
- While editing, don't make the original entry illegible. Make the needed changes, but retain the original response.
- Initial all changes made and date each survey editing.
- Make all changes in a distinctive colour and follow a consistent pattern in the way these changes are made. If these instructions are kept in view, there is hardly any scope for mistakes to creep in while editing the data of a particular survey.

4.5 CODING

As already stated at the outset of this chapter, coding is the process of assigning numbers or symbols to the answers to prepare them for tabulation. When computers are to be used for tabulation, it is necessary to replace the answers given on the returned printed questionnaires with code numbers that can be transferred to punch cards. Even for hand tabulation, it is usually better to code the replies rather than maintain the answers in their original survey form.

In some cases, coding questionnaires and editing can be done simultaneously. But this will be an inefficient procedure if numerous alterations in categories eventually result from editing changes. Generally, it is better to postpone coding activities until the editing complete.

Categorising Quantitative Data: The edited data is to be placed into categories. These categories are established keeping in view the information needed to accomplish the study objectives. Suppose, a respondent is asked to check the rupees figure that identifies, from among the given choices, the gross income of his household last year:

- Less than ₹ 5,000
- ₹ 5,001 to ₹ 8,000
- ₹ 8,001 to ₹ 14,000
- ₹ 14,001 to ₹ 20,000
- More than ₹ 20,000

These five categories would then be used in coding the responses. When open-ended questions are asked then a variety of answers for a particular question may emerge. In such circumstances categories are established so that all the answers are covered within different categories. For instance, 'what was the approximate gross income of your household last year?' ₹ 12,400. Various such answers can be covered by forming categories as mentioned above.

When numerical data concerning incomes, sales, frequency of use, miles travelled, number of TV watching hours, etc., are involved, the following guidelines should be adhered to place such data into intervals or ranges:

- It is essential to know the type of analysis to be done. For this purpose, the categories and their intervals should be built around the study objectives and hypotheses.
- The intervals should be set in such a manner that the numbers most cited are near the interval's mid-point. In a TV watching survey, for instance, one group gives the number of hours spent watching TV as 20 hours per week and the other section of respondents puts down 30 hours a week. In such a case, the categories should be specified *viz.* 16-25 hours, 26-35 hours, etc.
- Categories should be established in such a manner that the intervals are mutually exclusive. For example, in categories 16 to 25 hours, 26 to 35 hours, 36 to 45 hours, 46 to 55 hours, categories like 15 to 25 hours, 26 to 35 hours, 36 to 45 hours, 46 to 55 hours, etc., do overlap and can create confusion in the minds of respondents, coders and analysts.
- Categories should be established in such a way that they coincide with these categories used in other studies with which you intend to make comparisons. Suppose, a comparison is intended between the Punjab National Bank's customers' incomes and the average incomes of other households in Chandigarh city, then both sets of income categories should be similar.
- It is better to have many categories than too few. It is easy to combine many categories into fewer ones, if required, in the later stages of a study. On the other hand, a few categories used initially cannot be increased into many, if required. Take for instance the TV viewing hours categories 0-3, 4-6, 7-9, 10-18, 19-28, etc. But, if these fewer categories, are to be converted into many categories we have to go back and recede all the original surveys.
- In the case of any doubt regarding how the data will be analysed, multiple categories should be used. In the TV example, cited above we can note the respondent's answer of 20 hours of TV viewing as a specific answer (*i.e.*, 20 hours) or in an appropriate category. Suppose, the categories are like: (*a*) 0-8, (*b*) 9-15 and (*c*) 16-25, the answer should be recorded in category (*c*).

Classifying Qualitative Data

Where qualitative data is involved (*viz.*, type of occupation, brand of cigarettes used, type of vehicles driven, etc.), the following guidelines must be kept in mind by the researcher:

- Final decision of which categories to use in the coding process should be made after a representative number of responses have been reviewed.
- Categories should enable comparisons to be made with other comparable data.
- Categories should be precise and mutually exclusive.
- All possible answers should be included in the categories.

The process of coding can be increasingly simplified if preceded questionnaires are used. For this purpose, the coder uses the section on the right border of the

questionnaire. While going through the replies, he should check the proper code number. The advantages of preceding are speed, accuracy and ease of reading by the key punctures or tabulators. The main drawback of preceded forms is that all possible answers must be anticipated prior to sending out the questionnaire. One extra number can be used in each question to include any new categories which may sometimes emerge. The following question shows the example of coding in a questionnaire.

Of the following, please mark your favourite form of entertainment:

Movies	1
T.V. Watching	2
Boating	3
Playing Others (describe)	4
	5

Coding for Computers

When tabulation is to be done by computers, all the answers received on questionnaires are to be converted into numeric form which is adaptable to punch cards. The following are a few questions from a questionnaire used to study people's attitude to canned frozen foods:

- Check the approximate per cent of each type of food used in your weekly diet (*i.e.*, how often you take each type of food):

	Never (1%)	Seldom (1-30%)	Frequently (30-70%)	Usually (70-90%)	Always (90-100%)
Fresh food	–	–	–	–	– 1-2
Canned food	–	–	–	–	– 2-3
Canned frozen food	–	–	–	–	– 3-4
Dry food	–	–	–	–	– 4-2

- When buying canned frozen food, indicate how important each of the following factors is in influencing your purchasing decision:

	No influence	Some influence	Important	Very important	
Price	–	–	–	–	5 - 1
Contents 1% of meat, etc.)	–	–	–	–	6 - 2
Brand name	–	–	–	–	7 - 3
Nutritional value of the food	–	–	–	–	8 - 4

- Do you feel most canned frozen foods meet your daily nutritional needs?

    9 - 3

  .... Yes .... No .... Don't know

- Do you supplement your diet with vitamin drops or pills?   10 - 2

  .... Yes .... No .... Sometimes

• Do you like canned frozen food better than other foods?   11 - 14

.... Yes .... No .... Sometimes

If one hundred such questionnaires were used in a survey, the responses from each of the respondents interviewed should be placed on a separate punch card. All the data will then be transferred to one hundred punch cards. Sometimes, in certain surveys long questionnaires are used where a respondent's answers may exceed the 80 columns provided on normal computer cards. Two or more cards may then have to be used. In such cases, each of the respondents should be provided an identification number and that should be used on all cards belonging to a particular respondent. This helps in identifying the cards.

In the questions given above numbers 3, 4 and 5 pose no coding problems. Answers to each can be covered in four rows on the punch card. For example, in question 3, the four possible row entries would be 'know' noted in the third row; 'no' noted in the second row; 'Don't know' noted in the third row; and 'no answer' would be acknowledged in the fourth row. It should be emphasised here that a 'no' answer of unanswered question (see question 5) should not be treated as a 'Don't know'.

The coder places on the right hand border of the questionnaire the hand written code number against each answer to a particular question (as shown in sample questions 1, 2, 3, 4 and 5). In the case of question 4, the code 10-2 means column 10, row 2. It can then be transferred to a coding sheet. Card punching from a coding sheet is much faster than having the card puncher work from each individual questionnaire.

When open-end questions are used in the questionnaire, it becomes difficult to assign code numbers to lengthy and different replies given by different respondents. Let us consider the following question used in our survey of canned frozen foods. 'What should be done to increase the sales of canned frozen foods?' The respondent answers as follows:

• Bigger cans should be used.

             Or

• Quality should be improved further.

             Or

• Other suggestions for sales increase.

To solve the above coding problem in the case of open-ended questions, all the replies must be studied. Those which are similar should be assigned similar numbers. For instance, bigger cans should be used or quality should be improved further, may be the answers of a larger percentage of respondents. So these can be given separate code numbers, *viz.*, bigger cans (code no. 1) and quality improvement (code no. 2) and other answers can be put in a separate category (code no. 3).

It should be ensured in coding that all the replies are acknowledged and recorded. If the readers are interested in seeing the punch cards they should consult the computer programmers in their university or other institutions having computers. Of late, the punch card system has been replaced by the floppy or tape system.

4.6 NATURE AND FUNCTION OF STATISTICAL ANALYSIS

Before discussion, we need to define statistical analysis—the refinement and manipulation of data that prepares them for the application of logical inference. Statistical analytical methods may be used in valid or invalid ways. This depends both on the honesty of the researcher in selecting the appropriate formulas and data inputs and on his understanding of the formulas and their outputs.

We are going to take up each analytical method in the approximate sequence that would be used for the mass of data assembled from field or secondary sources. There are three main phases:

- Bringing the raw data into measured order.
- Summarising the data.
- Applying analytical methods to manipulate the data so that their interrelationships and quantitative meanings become evident.

Exhibit 4.1: Overview of data analysis process

```
                   ┌─────────────────────┐
                   │  Assemble the data  │
                   └─────────────────────┘

        ┌───────────────────────────────────────────────┐
        │         Bringing the data into order           │
        │ (areas, tabulations, establishing categories   │
        │                 percentages)                   │
        └───────────────────────────────────────────────┘

  ┌────────────────────────────────────────────────────────────┐
  │                  Summarise the data                         │
  │ (statistical summerisation-measures of central tendency and │
  │        dispersion, graphical presentation                   │
  └────────────────────────────────────────────────────────────┘

        ┌───────────────────────────────────────────────┐
        │ Select appropriate analytical methods          │
        │            (selection criteria)                │
        └───────────────────────────────────────────────┘

  ┌────────────────────────────────────────────────────────────┐
  │                                                            │
  └────────────────────────────────────────────────────────────┘

  Examine              Analyse              Investigate
  differences:         experimental data    associations;
                                            read chapters
```

The first two stages should not be difficult to understand. It is the third stage that can appear highly complex, but not necessarily so if you understand each step along the way. You will find this clarified by Exhibit 10.1, which outlines the various analytical stages and methods and where the relevant techniques are discussed.

4.7 DIFFERENT WAYS OF INTERPRETING THE COLLECTED DATA

Interpretation, in our usage of this word, means to bring out the meaning of data or, one might say, to convert mere data into information. The climax of the research process is approached as one prepares to draw conclusions from the data analysed. The whole investigation culminates and reaches fruition in drawing inferences that lead to conclusions as to the cause of action or problem solution. This phase calls for a high degree of interpretive skill, both quantitative and logical.

There are two phases of logical thought used in drawing inferences from data which we all practice, consciously or otherwise: induction and deduction. Beverage describes them as follows:

Logicians distinguish between inductive reasoning (from particular instances to general principles, from facts to theories) and deductive reasoning (from the general to the particular, applying a theory to a particular case). In induction, one starts from observed data and develops a generalisation that explains the relationships between objects observed. On the other hand, in deductive reasoning, one starts from some general law and applies it to a particular instance.

The classical illustration of deductive logic is the familiar syllogism:

'All men are mortal' (major premise).

'Socrates is a man' (observed fact or minor premise).

'Therefore, Socrates is mortal' (inferred conclusion).

You might follow up this deductive exercise with an empirical test of Socrates's mortality. Using inductive logic, you might begin by noting that Socrates is mortal (observed fact) and observing a number of other men as well. You might then note that all the observed men were mortals (observed facts). Thereby, from these separate instances of observations, the following generalisation emerges—that all men are mortal.

The scientific norm of logical reasoning provides a bridge between theory and research. Scientific research in practice typically involves an alternation between deduction and induction. During the deductive phase, we reason towards observation; during the inductive phase, we reason from observations. Both logic and observation are essential. This interrelationship may be better illustrated with an example, so let us cite three hypothetical steps in the logic of Delta brand's marketing manager.

Induction. Delta's share of market, for that type of consumer product, has slipped from 16 to 13 per cent over the recent period while its share of new users has slipped from 18 to 10 per cent. Deduction. Delta falls into a general class of brands, in past marketing, extracting fewer new users. These should be checked in induction method.

W.I.B. Beverage, The Art of Scientific Investigation, New York, Vintage Books, 1950, p. 113.

Investigation of this matter finds that Delta has done about as much to attract new users as its competitors in various methods, except offering price inducements.

From these two basic dimensions evolve numerous method inferences (that is, an indirectly derived conclusion usually act as the major premise in a deductive argument). There is really nothing bewildering about effective interpretation. The process merely involves accumulating the proper evidence so that conclusions can be drawn from this evidence. In the case of drawing conclusions from deductive reasoning, the major concern should be that the premises used in the argument are valid, whereas in inductive reasoning towards a conclusion, the major concern should be that the various bits of empirical evidence are accurate.

Now that some general aspects of data analysis and interpretation have been answered, we turn our attention to the interrelationship between these two

activities. If either activity is not properly executed, the success of the other will be jeopardised.

Improper Interpretation

Consider the following actual exchange regarding survey data obtained in a study of housewive's attitudes toward gas and electric kitchen ranges conducted for a utility company that sells both gas and electricity. The researcher was discussing some data with a merchandising manager for the utility company.

Researcher

Look at these replies to the question, "if you were buying an electric range completely equipped with all modern features, what would its price probably be? For a gas range also completely equipped with all modern features, what would its price probably be? The average price for electric range was $238 and for gas range was $ 205. I'd say that is an advantage for gas."

Merchandise Manager

I wouldn't say that at all. It seems to me what that shows is that most women cannot perceive of a gas range that has all the features of a modern electric range. So that is a mark against gas.

Exhibit 4.2: Sales impact of different ads

Advertisement	Sales of Boxes Associated with each Ad
1	2396
2	3654
3	2576

If the researcher's conclusions were put into action, the company would have concentrated on gas ranges. In light of the data collected, a proper analysis had been made by the researcher. However, the interpretation made was faulty because the data he had was not properly related to other information that the merchandise manager introduced the conversation.

Improper Analysis

The previous example is an illustration of proper analysis but improper interpretation. The following example will illustrate improper analysis: A detergent manufacturer is trying to decide which of the three advertisements would be the most effective in increasing sales of their biodegradable detergent. They test the three ads by running each one different times in newspapers in six different cities. Exhibit 10.3 lists the sales supposedly caused by the differences in the ads themes.

There sales results would indicate that the second advertisement was the most effective in developing sales. The logical action flowing from the analysis wouldn't be to use this advertisement for the nationwide newspaper campaign. But was a proper analysis conducted on the data collected? After examining the results, the researcher's hypothesis is that another variable may be interacting with that of the advertising theme and so decides to analyse the data using a different analytical technique. If the researcher were to 'block' the six cities a different method of finding emerge. In performing a two way analysis of variance,

the researcher disclosed that the three ads did not differ significantly in sales impact.

Exhibit 4.3: Sales impact of ads in six different test cities

Advertisements	City						
	A	B	C	D	E	F	Total
1.	379	400	420	380	421	396	2396
2	401	284	1527	424	447	471	3654
3	429	351	451	425	487	433	2576

If the researcher used the data in Exhibit 10.1, the proper interpretation of the data would have been to select the second advertisement for national use; however, this interpretation would have been based on an improper analysis. To re-emphasise the point at the beginning of this section: analysis and interpretation are interdependent. The sophisticated analytical methods available to analyse data will be useless unless the resulting data are properly interpreted. Conversely, the quality of the interpretation will only be as good as the analytic methods used.

4.8 THE INTERPRETATIVE PROCESS OF MARKETING RESEARCH DATA

Our perceptions can be distorted and limited very easily, and our thinking processes can take wrong turns too readily. There is no truth in the adage that 'figures speak for themselves'. People state what the figures mean when they have the figures to interpret and regardless of the statistical refinements on the data dangerous errors are often committed. Firm discipline over one's mental processes and the ability to work as dispassionately as possible are necessary.

Let us make this plea for sound logic more concrete and helpful. Our discussion of interpretation, for this purpose, concludes with several maxims that every researcher would do well to heed. Produce honest and sober interpretations. Do not dramatise and exaggerate or distort the findings to gain attention.

Keep objectives and simple principles in the front. Any concepts and analysis should proceed from the simpler, more fundamental aspects so as not to appear confusing. Also data analysis should not be done just to be or appear to be sophisticated. Beware of the limitations of small samples. Do not be tempted to 'blow up' results obtained from a sample into generalities describing a large population. Give due attention to infrequent significant answers. Do not miss the significance of some answers because they are found in very few of the responses obtained in a survey. Recognise averages as merely tendencies. Beware of drawing conclusions that relate to a few typical that are described by the averages.

Distinguish between opinion and fact. We may tend to be impressed by numbers as being facts. A wise course would be to review the whole data-gathering process and to reconsider the reliability of data before proceeding to interpret them.

4.9 TABULATION

When raw data is received, the researcher divides these data into groups and counts various numbers which fall into these groups. Tabulation depends on establishing categories of raw data, editing and coding of responses. Researcher must develop tabulation plans simultaneously as they draft or construct the data collection instruments and make sampling plans because they are familiar enough with the research problem. Tabulation may be done either manually or by computerisation. A experienced researcher must plan what method of tabulation he would use. It can be decided on the basis of cost, time, personnel, etc. We can review the merits of these two methods of tabulation:

- Manual tabulation involves more clerical work and is time consuming, whereas computerised tabulation facilitates speed.
- Computerised tabulation facilitates cross classifications. In large samples, where many variables are to be correlated or cross-classified, computerised tabulation is preferable. But if the samples are small in number or size, manual counting of them in accordance with the cross classification may be relatively economical.
- When there is a great deal of coded information and several analyses are required, computerised tabulation may be preferable.
- The process of sorting counting is less likely to produce errors if done by computers than if done manually.
- Computerised tabulation is costly in comparison with manual tabulations.
- The consideration of convenience can hardly be ignored. If computerised tabulation demands dispatching of raw material to some distance away from the project office, inconveniences involved are packing, transportation, etc.

Sorting and Counting of Data

There are various methods of sorting and counting of data. Manual tabulation may require the following methods of sorting and counting:

Exhibit 4.4: Sorting of data

Company Name	No. of Dealers (Tally marks)			Frequency
Tatafone	||||			5
Panasonic	||||	|||		8
BPL	||||	||||	||	12
Godrej	||||	||		7
Beetel	||||	||||	|||	13

In the above table, we have indicated a number of dealers for various companies. In a computerised table, we can use more columns and rows and it is automatically done by computers. The following example explains the percentage using any advertising for the different brands of telephones:.

Exhibit 4.5

Media Company Name	Newspaper		Magazines		Television	
	No.	%	No.	%	No.	%
Tatafone	39	78%	24	48%	7	14%
BPL	34	68%	21	42%	4	8%
Beetel	33	66%	9	18%	6	12%
Panasonic	25	50%	36	72%	28	56%
Godrej	15	30%	20	40%	11	22%
C. Greaves	7	14%	21	42%	4	8%

Types of Tabulation

There are three types of tables which are used in marketing research:
- Simple or one-way tabulation
- Cross tabulation or two-way tabulation
- Higher-order tabulation

1. Simple or one-way tabulation

In a simple table only one characteristic is used in the tabulation. It is also known as one-way tabulation. The following is the example of such a table:

Exhibit 4.6: Number of consumers influenced by media

Media	No. of consumers	%
Television	38	76%
Print	28	56%
Hoardings	1	2%
Personal Selling	6	12%

This table shows the majority of consumers influenced by television, print media is also playing an important role to impress the consumers. According to the above table, hoardings do not impress much and push the consumers to purchase. However, it plays an important role in creating awareness among the consumers of any product.

Cross Tabulation or Two-way Tabulation

This is a table showing two characteristics and it is formed when two variables can be divided into two coordinate parts. The following is the example of such a table:

Exhibit 4.7: Use of fruit juice 'Brand A'

Income range per month (₹)	Number of children per family				
	1	2	3	4	Total
Below - 2000	10	15	18	23	66
2000 - 4000	120	25	30	40	115
4000 - 6000	25	30	35	45	135

6000 - 8000	17	12	18	15	62
More than 8000	12	13	17	18	60
Total	84	95	118	141	438

Higher-order Tabulation

Higher-order tabulation incorporates several kinds of data, both related or unrelated. It is a composite tabulation ready for research work. In this tabulation, unlimited information is provided and it can be used as a multipurpose table. This tabulation does not serve a specific purpose, but it is used for multipurposes. The researcher can use selected data and ignore the unrelated data.

4.10 TYPES OF DIAGRAMS

In marketing research, various types of diagrams are used for presentation of data. The different types of diagrams are divided under the following heads:

- One-dimensional diagrams, e.g., bar diagrams
- Two-dimensional diagrams, e.g., squares and circles

One-dimensional diagrams

Bar diagrams are the most common type of diagrams used by researchers. They help even those unaccustomed to reading charts to understand them easily.

Types of Bar Diagrams

- Simple bar diagrams
- Multiple bar diagrams
- Percentage bar diagrams
- Deviation bars

(A) Simple Bar Diagrams

A simple bar diagram is prepared on the basis of one variable. For example: owners of different brands of telephone instruments in a village.

Exhibit 4.8: Owners of different brands of telephone instruments in a village
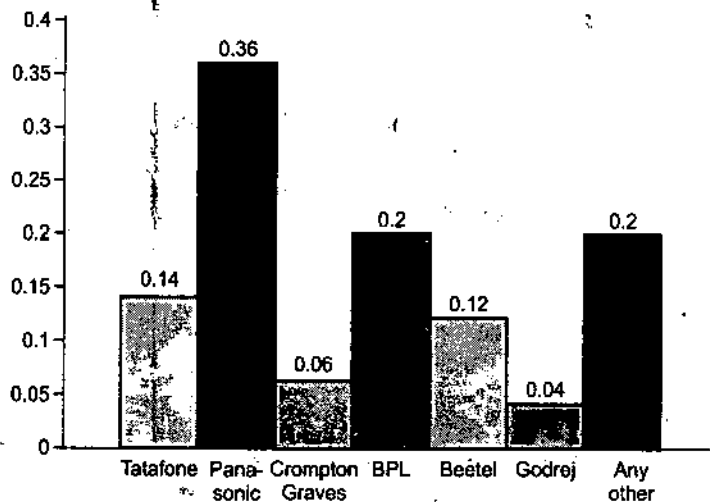
(B) Multiple Bar Diagrams

It is used when two or more sets of interrelated data are represented. This type of diagram is the same as a simple bar diagram. The only difference is that in multiple bar diagram more than one phenomenon is used.

Example

Represent the following corporate data of M.B.A. Ltd., in a multiple bar diagram:

	1996-97	1997-98
Sales (₹ Crores)	3100	3200
Cost of production (₹ Crores)	1600	1400
Profit (₹ Crores)	800	500

Exhibit 4.9: Corporate data of M.B.A. Ltd
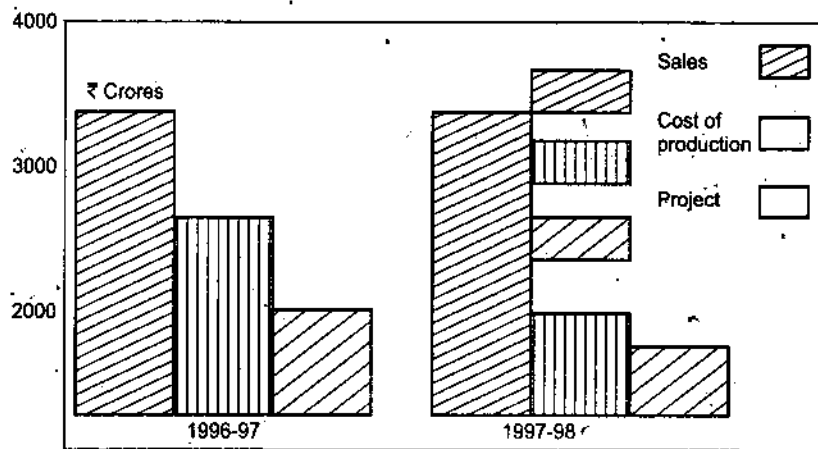
(C) Percentage Bar Diagrams

Percentage bar diagrams are useful in marketing research, in which data are required to be represented by percentages. Example: Factors influencing the choice of a consumer while purchasing a phone.

Exhibit 4.10: Factors influencing the choice of consumer while purchasing a phone
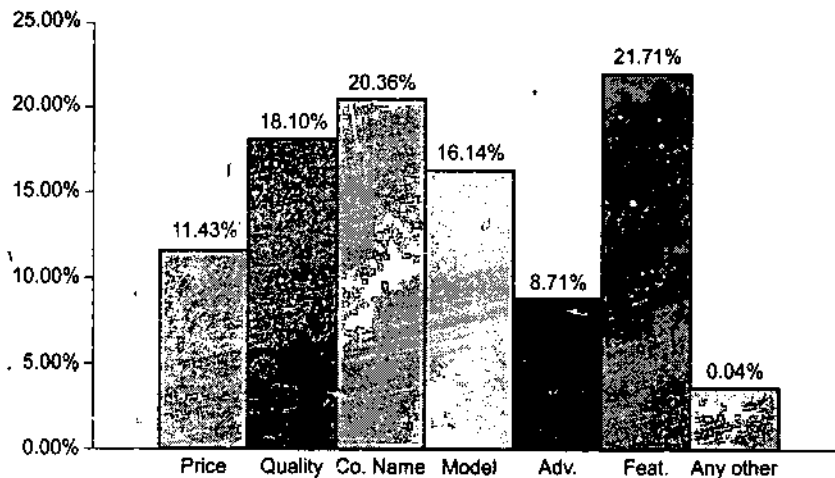
(D) Deviation Bars

Deviation bars are normally used for representing both positive and negative values. Positive values are shown above the line and negative values below it. The following example explains this type of diagram.

Two-dimensional diagrams

In two-dimensional diagrams, the squares and circles are used for research purpose. For example, the percentage of telephone instruments sales in various sectors:

Exhibit 4.11: Percentage of telephone instrument sales to the sectors
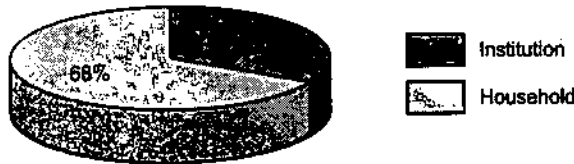
4.11 TESTING OF HYPOTHESIS

Steps involved in the process of hypothesis testing are given by the diagram.
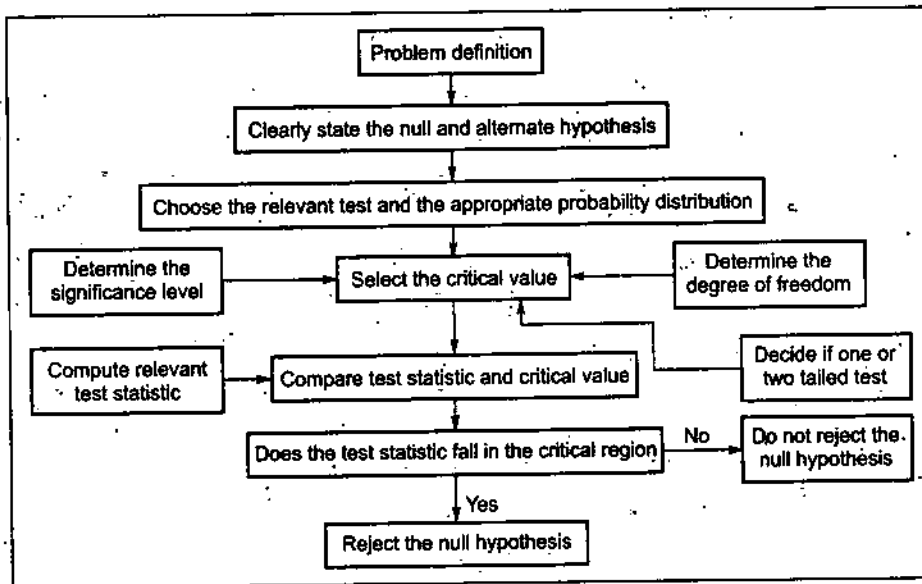
Hypothesis Testing and Associated Statistical Tests

Two conditions are required to use the test of significance:

Ist Condition: Researcher will have observed some difference between two or more groups, *i.e.* town *x* versus town *y*, educated versus uneducated.

Hypothesis Testing	No. of Groups/ Samples	Purpose	Statistical Test	Assumptions/ Comments
Frequency	One	Goodness of Fit	x^2	
Distributions	Two	Test of Independence	x^2	
Proportions	One	Comparing sample and populations proportions	Z	If r is known, and for large samples
	Two	do	t	If r is unknown and for small samples
	Two	Comparing two samples proportions	Z	If r is known
		do	t	If r is unknown
Means	One	Comparing sample and population mean	Z	If r is known
		do	t	If r is unknown
	Two	Comparing two samples mean	Z	If r is known
		do	t	If r is unknown
		From independent samples	t	If r is unknown
	Two or More	Comparing multiple sample means	F	using Analysis of variance
Variance	One	Comparing sample and population variance	X^2	
	Two	Comparing sample variance	F	

IInd Condition: Researcher will have asked same question of each group and/or measured the same thing within each group (*e.g.*, usage of a certain product or brand.)

4.12 STANDARD ERROR

The standard deviation of a sampling distribution is called standard error of that statistic. For example;

- The standard deviation of the means of all possible samples of the same size drawn from a population is known as the standard error of the mean.

- The standard deviation of the proportions of all possible samples of the same size drawn from a population is known as standard error of proportion.

NOTE

The difference between the terms "Standard Deviation" and "Standard Error" lies in the fact the S.D. deals with original values and S.E. deals with statistics computed from the samples of original values.

Importance of the Concept of Standard Error

- It can be used in testing hypothesis. For example,

  Let the level of significance for testing a particular hypothesis be 5%. We know that corresponding to this level the value of standard error is 1.96 S.E. Now if the difference between the observed and expected means comes out to be more than 1.96 S.E. then the result of the experiment does not support the hypothesis which it supports otherwise.

- Standard error can be used to determine the limits for parameter values.

- Standard error provides an idea about the unreliability of the sample. Because if the standard error has a large value then there is great difference between the actual and expected frequency. Hence greater is the unreliability of the sample. In general, we have

$$\text{Reliability (R)} \propto \frac{1}{\text{S.E.}}$$

Difference between Large and Small Samples

It is very difficult to draw a clear cut line of demarcation between large and small samples, it is normally agreed amongst statisticians that a sample is to be recorded as large only if its size exceeds 30. The tests of significance used for dealing with problems relating to large samples are different from the ones used for small samples for the reason that the assumptions that we make in case of large samples do not hold good for small samples The assumptions made while dealing with problems relating to large samples are:

- The random sampling distribution of statistic is approximately normal, and

- Values given by the samples are sufficiently close to the population value and can be used in its place for calculating the standard error of the estimate.

Example

Calculate standard error of mean from the following data showing the amount paid by 100 firms in Delhi on the occasion of Durga Pooja.

Mid Value (₹)	39	49	59	69	79	89	99
No. of firms	2	3	11	20	32	25	7

Solution

$$\text{S.E. } \bar{X} = \frac{\sigma}{\sqrt{n}}$$

$$\sigma = \sqrt{\frac{\Sigma fd^2}{N} - \left(\frac{\Sigma fd}{N}\right)^2} \times i$$

$$= \sqrt{\frac{236}{100} - \left(\frac{80}{100}\right)^2} \times 10$$

$$= 13.11$$

$$\text{S.E.} = \bar{X} = \frac{13.11}{\sqrt{100}} = 1.311$$

Table 4.1

Mid-value m	$m - 69/10$			
	f	d	fd	fd^2
39	2	-3	-6	18
49	3	-2	-6	12
59	11	-1	-11	11
69	20	0	0	0
79	32	$+1$	$+32$	32
89	25	$+2$	$+50$	100
99	7	$+3$	$+21$	63
	$N = 100$		$\Sigma fd = 80$	$\Sigma fd^2 = 236$

Case I: Standard Deviation σ Unknown and $n \geq 30$

In this case, the sample standard deviation is calculated as:

$$\delta = \sqrt{\frac{\Sigma(x_1 - \bar{x})^2}{n}}$$

This value of δ is used as an estimate of σ (provided that $n \geq 30$). In this case, the values are given by:

$$Z = \frac{\bar{x} - \mu_o}{s/\sqrt{n}}$$

Here
- Critical Values:

$$\bar{X}_L = \mu_o - Z\alpha\frac{\delta}{\sqrt{n}} \text{ when } H_1 : \mu < \mu_o$$

$$\bar{X}_U = \mu_n + Z\alpha\frac{\delta}{\sqrt{n}} \text{ when } H_1 : \mu > \mu_o$$

Example

A sample of 64 farm labourers engaged in paddy harvesting operations shows an average monthly wage rate of ₹ 200 with a standard deviation of ₹ 9. Using 0.05 level of significance, verify if the sample result indicates that their current average monthly wage rate is higher than ₹ 198.

Solution

- $H_0 : \mu = ₹\ 198$.
- $H_1 : \mu > ₹\ 198$.
- $\alpha = 0.05$.
- **Critical region:** $Z \geq Z_\alpha$, where $Z_\alpha = 1.645$.
- **Computations:**

    For $\bar{x} = 200$, $\sigma = s = 9$, and $n = 64$,

    $$z = \frac{\bar{x} - \mu_0}{s / \sqrt{n}} = \frac{200 - 198}{9 / 8} = 1.78$$

- **Conclusion:** Since $z = 1.78$ is greater than $z_\alpha = 1.645$, H_0 is rejected and we conclude that the current wage rate is higher than ₹ 198.

Case II: Population Standard Deviation σ Unknown

Many a times situations do arise when neither σ is known, nor is it possible to draw a sample of size $n \geq 30$ to allow the use of S_2 as an unbiased estimator of σ^2. That is, when $n < 30$ and σ unknown, testing H_0 concerning the population mean μ is based on the sample statistic

$$T = \frac{\bar{X} - \mu_0}{\hat{S} / \sqrt{n}}$$

Which is a random variable having t distribution with $v = n - 1\ df$.

As usual, we draw a sample of size $n < 30$ and compute the sample mean $\bar{x}$ and the sample standard deviation

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

For a sample of size $n < 30$,

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

Example

15 workers are selected at random from a large no. of workers in a factory. The number of items produced by them on a certain day are found to be:

$$53 \quad 52 \quad 54 \quad 53 \quad 51 \quad 53 \quad 59 \quad 58 \quad 56 \quad 56 \quad 57 \quad 54 \quad 50 \quad 59 \quad 60$$

Would it be appropriate to suggest that the mean of the number of items produced in the population is 59.

Solution

Let us first calculate sample mean and standard deviation:

X	X-55	(X-55)²
53	−2	4
52	−3	9
54	−1	1
53	−2	4
51	−4	16

53	-2	4
59	4	16
58	3	9
56	1	1
56	1	1
57	2	4
54	-1	1
50	-5	25
59	24	16
60	5	25
825		136

$$\overline{X} = \frac{\Sigma x}{n} = \frac{825}{15} = 55$$

$$\delta = \sqrt{\frac{\Sigma (x - \overline{x})}{n - 1}} = \sqrt{\frac{136}{14}} = \sqrt{9.71}$$

Test Involving Two Different Populations

There may be cases when we have to deal with populations instead of population and sample.

Example

- A doctor may be interested in knowing whether a new medicine A is better than new medicine B in curing a particular disease.
- A farmer may be interested in knowing whether a new variety of wheat seed will result in more yield per hectare than that of some other variety.

Let the mean of first population $= \mu_1$

Let the mean of second population $= \mu_2$

In their case, we have

Null hypothesis $\quad H_0 = \mu_1 - \mu_2 = do = $ (say)

Alternative hypothesis $\quad H = \mu_1 - \mu_2 \neq do$ (Two in tail test)

$\qquad\qquad\qquad\qquad = \mu_1 - \mu_2 > do$ (in one tail test)

$\qquad\qquad\qquad\qquad = \mu_1 - \mu_2 < do$ (in one tail test)

Solution

Note: If mean of two populations are equal

i.e. $\qquad \mu_1 = \mu_2 \Rightarrow do = \mu_1 - \mu_2 = 0$

Then $\qquad H_0 : \mu_1 = \mu_2$

$\qquad\qquad H_\alpha = \mu_1 \neq \mu_2, \mu_1 > \mu_2, \mu_1 < \mu_2$

Case

- Population variances σ_1^2 and σ_2^2 are not known
- $\sigma_1^2 = \sigma_2^2$
- $n_1, n_2 < 30$

This test is based on t-distribution null hypothesis and alternative hypothesis have already stated. In this case, t-test becomes

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - do}{S_P \sqrt{\left(\frac{1}{n_1}\right) + \left(\frac{1}{n_2}\right)}}$$

Here

$\bar{x}_1, \bar{x}_2$ are sample means.

$do = \mu_1 - \mu_2$, where μ_1, μ_2 are population means

$n_1 + n_2$ are size of the two random samples

Sp^2 Common Variance

$$Sp = \sqrt{\frac{n_1 s_1^2 + n_2 s^2}{n_1 + n_2 - 2}}$$

Here degree of freedom, $d_f = n_1 + n_2 - 2$

Example

Consider two groups A and B of 10 and 15 students each respectively, Group A is being taught with traditional method and group B with some new method. After the completion of the course a test was conducted with the same question paper for the two groups. It was found that on an average group A obtained 65 marks with a standard deviation of 7 marks and group B obtained 68 marks with a standard deviation of 4 marks. Assuming the populations to be normal and having the same variance, test the hypothesis at 0.01 level of significance that the two methods are equally effective.

Solution

Here we have to examine for the two methods to be equally effective. Let μ_1 and μ_2 be the average marks obtained by the two groups respectively, then $\mu_1 - \mu_2 = 0$.

- Null hypothesis $\quad H_0 = \mu_1 - \mu_2 = 0$

$$= \mu_1 = \mu_2$$

- Alternative hypothesis $H_1 = \mu_1 \neq \mu_2$
- $\alpha = 0.01$
- d.f $= n_1 + n_2 - 2 = 10 + 15 - 2 = 23$

Now

$$t \, (d.f = 23) = -2.807$$

$$\alpha = 0.01$$

Apply t-test

$$t = \frac{(\bar{x}_1 - \bar{x}_2)}{S_P \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

Here

$$\bar{x}_1 = 65, \bar{x}_2 = 68$$

$$n_1 = 10, n_2 = 15$$

$$S_p = \sqrt{\frac{n_1 s_1^2 + n_2 s_2^2}{n_1 + n_2 - 2}}$$

$$= \sqrt{\frac{10 \times 7^2 + 15 \times 4^2}{10 + 15 - 2}}$$

$$= \sqrt{31.7}$$

So,

$$t = \frac{165 - 681}{\sqrt{31.7}\sqrt{1/10 + 1/15}}$$

$$= \frac{-516}{5.63 \times \left(\sqrt{0.1 + 0.06}\right)}$$

$$= \frac{-516}{5.63 \times \sqrt{0.16}}$$

$$= \frac{-516}{5.63 \times 0.4}$$

$$= \frac{-516}{2.252}$$

$$= -229.129$$

Since calculated value is more. So,

H$_0$ is accepted.

Case III: Population Variances σ_1^2 and σ_2^2 Unknown, $\sigma_1^2 \neq \sigma_2^2$, and $n_1 \neq n_2 < 30$

Some decision problems involving tests concerning the difference of means may be characterized by the following:

- The two populations are approximately normal with $\sigma_1^2 \neq \sigma_2^2$, and
- The sample sizes n_1 and n_2 are less than 30 $n_1 \neq n_2$.

In such problem situations, testing the null hypothesis H$_0$: H$_0$: $\mu_1 - \mu_2 = d_0$ against the alternative hypothesis

$$H_1 : \mu_1 - \mu_2 \neq d_0, \ \mu_1 - \mu_2 > d_0, \ \text{or} \ \mu_1 - \mu_2 < d_0$$

is based on the test statistic T whose distribution is approximately like a t distribution with degrees of freedom

$$v = \frac{\left[\left(\frac{\hat{S}_1^2}{n_1}\right) + \left(\frac{\hat{S}_2^2}{n_2}\right)\right]^2}{\left[(\hat{S}_1^2/n_1)^2 / (n_1 - 1)\right] + \left[(\hat{S}_2^2/n_2)^2 / (n_2 - 1)\right]}$$

where a particular t value is defined as

$$t = \frac{(\overline{x}_1 - \overline{x}_2) - d_0}{\sqrt{\left(\frac{\hat{s}_1^2}{n_1}\right) + \left(\frac{\hat{s}_2^2}{n_2}\right)}}$$

Example

A random sample of 10 acres wheat crop selected from Region I showed an average yield of 20 qtls per acre with a standard deviation $\hat{S}_1 = 5$ qtls. Another random sample of 15 acres of wheat crop selected from Region II offered an average

yield of 18 qtls per acre with a standard deviations $\hat{S}_2 = 3$ qtls. Assuming that the per acre wheat yield in the two states is normally distributed with different variances, test the hypothesis at 0.05 level of significance that the average per acre wheat yield is the same in the two regions against the alternative that it is higher in Region I than II.

Solution

Let μ_1 be the average per acre wheat yield in Region I and μ_2 in Region II.

- $H_0 : \mu_1 = \mu_2$
  $H_1 : \mu_1 > \mu_2$
- $\alpha = 0.05$.
- Critical region:

$$\text{For } v = \frac{\left(\dfrac{\hat{s}_1^2}{n_1} + \dfrac{\hat{s}_2^2}{n_2}\right)}{\left[\left(\hat{s}_1^2/n_1\right)^2 \big/ (n_1-1)\right] + \left[\left(\hat{s}_2^2/n_2\right)^2 \big/ (n_2-1)\right]}$$

$$= \frac{\left(\dfrac{25}{10} + \dfrac{9}{15}\right)^2}{\left[\dfrac{(25/10)^2}{9}\right] + \left[\dfrac{(9/15)^2}{14}\right]}$$

$$= 13,$$

the tabulated T value for $\alpha = 0.05$ with $v = 13df$ is $t_\alpha = 1.771$, and the critical region is $t \geq t_\alpha$.

- Computations:For $\bar{x}_1 = 20$, $\hat{S}_1 = 5$, $n_1 = 10$,
  $\bar{x}_2 = 18$, $\hat{S}_2 = 3$, $n_1 = 15$,

$$t = \frac{(\bar{x}_1 - \bar{x}_2)}{\sqrt{\left(\dfrac{\hat{S}_1^2}{n_1}\right) + \left(\dfrac{\hat{S}_2^2}{n_2}\right)}} = \frac{20 - 18}{\sqrt{\left(\dfrac{25}{10}\right) + \left(\dfrac{9}{15}\right)}} = 1.136$$

- Conclusion: Since $t = 1.136$ is less than $ta = 1.771$, H_0 is accepted. It means that there is no difference between the average per acre wheat yield in the two regions.

X^2 Test (Chi Square Test)

The X^2 Test is one of the simplest and most widely used non-parametric tests in statistical work. The symbol X^2 is the Greek letter Chi. This test gives the magnitude of discrepancy between theory and observation. It is defined as

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

Where O is observed frequency, E is expected frequency.

In general expected freq. is given by

$$E = \frac{RT \times CT}{N}$$

Here,   RT = Row Total containing the cell.

CT = Column Total containing the cell.

N = Total No. of observations.

Degree of Freedom (V):

The Chi square test is based on degrees of freedom. This is obtained as

- In case of one dimension (row or column) there are K–1 degrees of freedom, where K is number of categories of observed frequencies.
- In case of contingency table

$$v = (r - 1)(c - 1)$$

Here, r = is total no. of rows

c = is total no. of columns

Characteristics of Chi Square Test:

- This test is based on frequencies or events as against the and the t tests based on parameters like the mean and standard deviation.
- This is applied for drawing inference only.
- This possesses additive properties so that when X_1^2 and X_2^2 are independent and have a Chi square distribution with n_1 and n_2 degrees of freedom, will also be distributed as a Chi square distribution with $n_1 + n_2$ degree of freedom.
- It is a general purpose test and is very useful in research work.

Chi square analysis can be used when the data satisfy four conditions:

- There must be two observed sets of data or one observed set of data and one expected set of data.
- The two sets of data must be based on the same sample size.
- Each cell in the data contains an observed or expected count of five or larger.
- The different cells in a row or column must represent categorical variables.

There are three main encountered applications of Chi square analysis. Perhaps the most common occurs when researchers observe that, for a certain product, men show a different distribution of consumption rates than women. Researchers often must test whether the difference in such distributions are statistically significant.

Example

On the basis of the information given below about the treatment of 200 patients suffering from a disease, state whether the new treatment is better or not? (Check at 5% level of significance).

No. of Patients

	Favourable	Not Favourable	Total
New	60	30	90
Conventional	40	70	110
	100	100	200

Solution

- **Null hypothesis:** (H_0) There is no difference between new and conventional method.

- **Degrees of Freedom**

$$V = (r - 1)(c - 1)$$
$$= (2 - 1)(2 - 1)$$
$$= 1$$

- **Expected frequency for each cell** $= \dfrac{RT \times CT}{N}$ *i.e.*, expected frequencies are:

$\dfrac{100 \times 90}{200}$	$\dfrac{100 \times 90}{200}$	
$\dfrac{100 \times 110}{200}$	$\dfrac{100 \times 110}{200}$	

i.e.

45	45	90
55	55	110
100	100	200

We calculate value of X^2 as following:

O	E	O^2	O^2/E
60	45	3600	80.09
40	55	1600	29.00
30	45	900	20.00
70	55	4900	89.09
			218.18

$$X^2 = \Sigma \left(\frac{O^2}{E} \right) - N = 218.18 - 200 = 18.18$$

or we can calculate

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

Here, table value of X^2 for $V = 1$ and $p = 0.5$ is 3.84

Calculated value is 18.18 So, $X^2_{col} > X^2_{table}$

So, null hypothesis is rejected and so the new method is better.

Example

Following is the information about the number of clerk committing errors and not committing Errors among trained and untrained clerks.

	No. of Clerks Committing Errors	No. of Clerks not Committing Errors
Trained	70	530
Untrained	155	745

Test the effectiveness of training in preventing the errors.

Solution

H_0 : Training is not effective in preventing errors. We compute expected frequencies as:

Expected Frequencies

	No. of Clerks Committing Errors	No. of Clerks not Committing Errors
Trained	$\dfrac{600 \times 225}{1500} = 90$	$\dfrac{600 \times 1275}{1500} = 510$
Untrained	$\dfrac{900 \times 225}{1500} = 135$	$\dfrac{900 \times 1275}{1500} = 765\,*$

We calculate the value of X^2 as

Observed frequency o	Expected frequency $\in$	$o - \in$	$(o - \in)^2/\in$
70	90	–20	4.444
530	510	20	0.7843
155	135	20	0.29630
745	765	–20	0.5230
			$X^2 = 8.7147$

$$\therefore \qquad X^2_{col} = 8.7147$$

Here
$$V = (2 - 1)(2 - 1) = 1$$

$$X^2_{0.05} \ (\text{for } V = 1) = 3.84$$

$$X^2_{col} > X^2_{0.05}$$

So, null hypothesis is rejected and training is effective in preventing the errors.

Example

200 digits were selected at random from a set of tables. The frequencies of the digits were:

Digit	0	1	2	3	4	5	6	7	8	9
Freq.	18	19	23	21	16	25	22	20	21	15

Use X^2 test to test if the digits were distributed in equal numbers.

Solution

H_0 : The digits are distributed in equal numbers.

Here expected frequency of each digit

$$= \frac{18 + 19 + \text{........} + 15}{10} = \frac{200}{10} = 20$$

Digit	Frequency		$o - \in$	$\dfrac{(o - \in)^2}{\in}$
	o	$\in$		
0	18	20	-2	0.2
1	19	20	-1	0.05
2	23	20	3	0.45
3	21	20	1	0.05
4	16	20	-4	0.8
5	25	20	5	1.25
6	22	20	2	0.2
7	20	20	0	0
8	21	20	1	0.05
9	15	20	-5	1.25
$X^2 = 4.30$				

4.13 ANALYSIS OF VARIANCE

It is an useful technique concerning researches in the fields of economics, education, business and in other disciplines. This technique is used when multiple samples cases are involved. The significance of the difference between the means of two samples can be found out through Z test or t test, but the problem arises when we happen to examine the significance of difference amongst more than two sample means at the same time.

4.14 BASIC PRINCIPLE OF ANALYSIS OF VARIANCE (ANOVA)

The basic principle is to test for difference among the means of the populations by examining the amount of variation within each of these samples, relative to the amount of variation between the samples. In terms of variation within the given population, it is assumed that the value of (X_{ij}) differs from the mean of this population only because of random effects, *i.e.,* there are influences (X_{ij}) which are unexplainable, whereas in examining differences between populations we assume that the difference between the mean of the jth population and the grand mean is attributable to what is called a 'specific factor' or what is technically described as treatment effect. Thus, while using ANOVA we assume that each of the samples is drawn from a normal population and that each of these populations has the same variance. We also assume that all factors other than the one or more being tested are effectively controlled.

4.15 THE F TEST (VARIANCE RATIO TEST)

The F-test is named in honour of the great statistician R A Fisher. It is used to find out whether the two independent estimates of population variance differ significantly. For carrying out the test of significance, we calculate the ratio F. F is defined as:

$$F = \frac{S_1^2}{S_2^2}$$

Where,

$$S_1^2 = \frac{(X_1 - \bar{X}_1)^2}{n_2 - 1}$$

and

$$S_2^2 = \frac{\Sigma (X_2 - \bar{X}_2)^2}{n_2 - 1}$$

Note that S_1^2 is always greater than S_2^2

i.e.

$$S_1^2 > S_2^2$$

Therefore,

$$F = \frac{\text{Larger estimate of variance}}{\text{Smaller estimate of variance}}$$

$$V_1 = n_1 - 1$$
$$V_2 = n - 2$$

V_1 = degrees of freedom for sample having larger variance.

V_2 = degrees of freedom for sample having smaller variance.

The calculated value of F is compared with the table value (given at 5% or 1% level of significance). If the calculated value of F is larger than the table value of F, the null hypothesis is rejected otherwise it is accepted.

Example

Two samples are drawn from two normal populations. From the following data test whether the two samples have the same variance at 5% level.

Sample 1: 60 65 71 74 76 82 85 87

Sample 2: 61 66 67 85 78 63 85 86 88 91

Solution

Null hypothesis H_0: $\sigma_1^2 = \sigma_2^2$, *i.e.*, samples have been drawn from two normal populations with the same variance.

Computation of Sample Variances

Sample 1			Samples 2		
X	X – X̄	$(X - \bar{X})^2$	Y	Y – Ȳ	$(Y - \bar{Y})^2$
60	–15	225	61	–16	256
65	–10	100	66	–11	121
71	–4	16	67	–10	100
74	–1	1	85	8	64

76	1	1	78	1	1
82	7	49	63	−14	196
85	10	100	85	8	64
87	12	144	86	9	81
			88	11	121
		636	91	14	196
					1200

$$\bar{X} = \frac{600}{8} = 75 \qquad \bar{Y} = \frac{770}{10} = 77$$

$$S_1^2 = \frac{1}{n_1 - 1} \quad \Sigma(X - \bar{X})^2 = \frac{636}{7} = 90.8$$

$$S_2^2 = \frac{1}{n_2 - 1} \quad \Sigma(Y - \bar{Y})^2 = \frac{1200}{9} = 133.33$$

Clearly, $\qquad S_1^2 > S_2^2$

$$\Rightarrow \qquad F = \frac{S_2^2}{S_1^2} = \frac{133.33}{90.8} = 1.467$$

Degrees of freedom $F(n_2 - 1, n_1 - 1) = F(9, 7)$

Now, tabulated value for F at d.f 9 and 7 and 5% level = 3.68 since

$$F_{cal} < F_{table}$$

$\Rightarrow$ Null hypothesis is accepted.

Example

The time taken by workers while performing a job by two methods m_1 and m_2 are given as:

m_1	30	15	29	26	21	25	
m_2	26	30	40	31	34	19	27

Check if the data show that the variances of time distribution in a population from which these samples are drawn do not differ significantly.

Solution

Null hypothesis $H_0: \sigma_1^2 = \sigma_2^2$,

There is no significant difference between the variance of the time distribution by the workers in performing a job by m_1 and m_2.

M₁			M₂		
X	X − X̄	(X − X̄)²	Y	Y − Ȳ	(Y − Ȳ)²
30	4	16	26	−5	25
15	−11	121	30	−1	1
29	3	9	40	9	81

26	0	0	31	0	0
31	5	25	34	3	9
25	−1	1	29	−2	4
			27	4	16
156		172	217		136

$$\bar{X} = \frac{156}{6} = 26 \qquad \bar{X} = \frac{156}{6} = 26$$

$$S_1^2 = \frac{1}{n_1 - 1} \quad \Sigma(X - \bar{X})^2 = \frac{172}{5} = 34.4$$

$$S_2^2 = \frac{1}{n_2 - 1} \quad \Sigma(Y - \bar{Y})^2 = \frac{136}{6} = 22.66$$

Since, $\qquad S_1^2 > S_2^2$

$\Rightarrow \qquad\qquad F = \frac{S_1^2}{S_2^2} = \frac{34.4}{22.66} =$

Degrees of freedom $F(n_2 - 1, n_1 - 1) = F(6, 5)$

$\Rightarrow \qquad\qquad F_{table} = 4.95$

Since $\qquad F_{cal} < F_{table}$

$\Rightarrow$ Null hypothesis is accepted.

Example

Perform a two way ANOVA on the following data

		T_1		
		I	**II**	**III**
T_2	i	30	26	38
	ii	24	29	28
	iii	33	24	35
	iv	26	31	30
	v	27	35	33

Use 30 as the code value.

Solution

Since 30 is the code value. So, subtracting 30 from all cells we have

		T_1			Total
		I	**II**	**III**	
T_2	i	0	−4	8	4
	ii	−6	−1	2	−9
	iii	3	−6	5	2

	iv	6	1	0	7
	v	–3	5	3	5
Total		0	–5	18	T = 9

Correction Factor (C.F.) $\quad = \dfrac{T^2}{N} = \dfrac{9^2}{15} = 5.40$

Total sum of squares (SST) $\quad = O^2 + (-6)^2 + 3^2 + 6^2 + (-3)^2 +$

$\qquad\qquad\qquad\qquad\qquad (-4)^2 + \ldots (0)^2 + 3^2 - \text{C.F.}$

$\qquad\qquad\qquad\qquad = 271 - 5.4$

$\qquad\qquad\qquad\qquad = 265.63$

Sum of squares for variance between T_1 (*i.e.* columns) sample

i.e. $\qquad\qquad \text{SSC} = \left[(O)^2 + (-5)^2 + \dfrac{14^2}{5} \right] - 5.4$

$\qquad\qquad\qquad = 38.8$

Sum of square of variance between T_2 samples (*i.e.* Row)

$$\text{SSR} = \left[4^2 + (-9)^2 + (7)^2 + (5)^2 \big/ 3 \right] - 5.4$$

$\qquad\qquad = 52.93$

The error sum of squares (SSE)

$\qquad\qquad \text{SSE} = \text{SST} - \text{SSR} - \text{SSC}$

$\qquad\qquad\qquad = 265.6 - 52.93 - 38.8$

$\qquad\qquad\qquad = 173.87$

ANOVA Table is Given as Under

Source of Variance	Sum of Square	D.f.	Mean Squares	Variance Ratio
Between treatment are samples	38.80 (SSC)	2 (n – 1)	$\text{MSC} = \dfrac{\text{SSC}}{n-1}$ = 19.40	$F_C = \dfrac{\text{MSC}}{\text{MSC}}$ = $\dfrac{21.73}{19.40}$ = 1.12
Between treatment the samples	52.93 (SSR)	9 (K – 1)	$\text{MSR} = \dfrac{\text{SSR}}{K-1}$ = 13.23	$F_R = \dfrac{\text{MSR}}{\text{MSE}}$ = $\dfrac{13.23}{21.13}$ = 0.61
Error	173.87 SSE	8(n – 1) (k – 1)	$\text{MSE} = \dfrac{\text{SSE}}{(n-1)(k-d)}$ = 21.73	
Total	265.60 SST	19 (hk – 1)		

Degree of Freedom $= (10 - 1) = 9$

Now $\quad X^2_{0.05}(v = a) = 16.919$

Here $\quad X^2_{Cal} < X^2_{Table}$

So, null hypothesis is accepted.

4.16 ANALYSIS OF CO-VARIANCE (ANOCOVA)

The object of experimental design in general happens to be to ensure that the result observed may be attributed to the treatment variable and to no other casual circumstances. For instance, the researcher studying one independent variable X, may wish to control the influence of some uncontrolled variable Z, which is known to be correlated with the dependent variable, y, then he should use the technique of analysis of co-variance.

Assumptions in ANOCOVA

- Various treatment groups are selected at random from the population.
- The groups are homogenous in variability.
- The regression is linear and is same from group to group.

ANOCOVA Technique

While using ANOCOVA technique, the influence of uncontrolled variable is usually removed by simple linear regression method and the residual sums of square are used to provide variance estimate which in turn are used to make test of significance. In other words, covariance analysis consists in subtracting from each individual score (Y_i) that portion of it Y: that is predictable from uncontrolled variable (Z_i) and then computing the usual analysis of variance on the resulting (Y–Y)s, of course making the due adjustment to the degree of freedom because of the fact that estimation using regression method requires loss of degree of freedom.

Example

The following are paired observations for three experimental groups.

Group I		Group II		Group III	
x	y	x	y	x	y
7	2	15	8	30	15
6	5	24	12	35	16
9	7	25	15	32	20
15	9	19	18	38	24
12	10	31	19	40	30

Degree of freedom associated with adjusted sums of square will be as under:

Between	K-1
Within	N-K-1
Total	N-2

Y is the co-variate variable, calculate the adjusted total, within groups and between groups, sums of squares on X and test the significance of difference between adjusted means on X by using the appropriate F-ratio, also calculate the adjusted means on X.

Solution

We apply the technique of analysis of covariance and work out the related measures as under.

	Group I		Group II		Group III	
	x	*y*	*x*	*y*	*x*	*y*
	7	2	15	8	30	15
	6	5	24	12	35	16
	9	7	25	15	32	20
	15	9	19	18	38	24
	12	10	31	19	40	30
Total	49	33	114	72	175	105
Mean	9.8	6.6	22.8	14.4	35.0	21.0

$$\Sigma X = 49 + 114 + 175 = 338$$

Correction factor for X $= \dfrac{(\Sigma X)^2}{N} = \dfrac{(338)^2}{5} = 7616.27$

$$\Sigma Y = 33 + 72 + 105 = 210$$

Correction factor for Y $= \dfrac{(\Sigma Y)^2}{N} = \dfrac{(210)^2}{5} = 2940$

$$\Sigma X^2 = 9476 \quad \Sigma Y^2 = 3734 \quad \Sigma XY = 5838$$

Correction factor for XY $= \dfrac{\Sigma X . \Sigma Y}{N} = 4732$

Hence total SS for X $= \Sigma X^2 -$ correction factor for X
$$= 9476 - 7616.27 = 18\,59.73$$

SS between for $X = \left(\dfrac{(49)^2}{5} + \dfrac{(114)^2}{5} + \dfrac{(175)^2}{5} \right) -$ (Correction factor for X)
$$= (480.2 + 2599.2 + 6125) - (7616.27)$$
$$= 1588.13$$

SS within for X $=$ (Total SS for X) $-$ (SS between for X)
$$(1859.73) - (1588.13) = 271.6$$

Similarly we work out the following values in respect of Y

Total SS for Y $\quad = \Sigma Y^2 -$ correction factor for Y

$\qquad = 3734 - 2940 = 794$

SS between for Y $\quad = \left(\dfrac{(33)^2}{5} + \dfrac{(72)^2}{5} + \dfrac{(105)^2}{5}\right) -$

(Correction factor for Y)

$(217.8 + 1036.8 + 2205) - (2940) = 519.6$

SS within for Y $\quad = $ (Total SS for Y) $-$ (SS between for Y)

$794 - 519.6 = 274.4$

We work out the following values in respect of both X and Y.

Total sum of product for XY $= \Sigma XY -$ correction factor for XY

$5838 - 4732 = 1106$

SS between for XY $\quad = \left(\dfrac{(33)^2}{5} + \dfrac{(72)^2}{\cdot 5} + \dfrac{(105)^2}{5}\right) -$

Correction factor for XY

$= (323.4 + 1641.6 + 3675) - (4732) = 908$

SS within for XY $\quad = $ (Total sum of product)

$\qquad - $ (SS between for XY).

$1106 - 908 = 198$

ANOVA table for X, Y and XY can now be set up as shown below.

Source	d.f.	SS for X	SS for Y	Sum of product XY
Between group	2	1588.13	519.60	908
Within group	12	Exx 271.6	Err 274.4	Exy 198
Total	14	Txx 1859.73	Trr 794.00	Txy 1106

Adjusted total $\quad$ SS $= \text{Txx} - \dfrac{(\text{Txy})^2}{\text{Tyy}}$ or $1859.73 - \dfrac{(1106)^2}{794}$ or

$1859.73 - 1540.6 = 319.13$

Adjusted SS within group $\quad = \text{Exx} - \dfrac{(\text{Exy})^2}{\text{Eyy}} = 271.60 - \dfrac{(198)^2}{274.4}$

$= 271.6 - 142.87 = 128.73$

Adjusted SS between groups $\quad =$ Adjusted total SS $-$ Adjusted SS within group

$(319.13 - 128.73) \qquad = 190.4$

ANOVA Table for Adjusted X

Source	d.f.	SS	MS	F-ratio
Between group	2	190.4	95.2	8.14
Within group	11	128.73	11.7	
Total	13	319.13		

At 5% level the table value of F for $V_1 = 2$ and $V_2 = 11$ is 3.98 and at 1% level the table value of F is 7.21. Both these values are less than the calculated value and according we infer that F-ratio is significant at both levels, which means the difference in group means is significant.

Adjusted mean on X will be worked out as follow regression coefficient for X on Y *i.e.*,

$$b = \frac{\text{Sum of product within group}}{\text{Sum of square within group for Y}}$$

$$= \frac{198}{274.40} = 0.7216$$

Deviation of initial group means from general mean (= 14) in case of Y Final means of group in X (unadjusted)

Group I	– 7.40	9.8
Group II	0.40	22.8
Group III	7.00	35.0

∴ Adjusted means of groups in X = (Final mean) –*b* (deviation of initial mean from general mean in case of Y).

Hence,

Adjusted mean for group I = $9.8 - .7216\,(-7.4) = 15.14$

Adjusted mean for group II = $22.80 - .7216\,(.40) = 22.51$

Adjusted mean for group III = $35.00 - .7216\,(7.00) = 29.95$

4.17 MULTIVARIATE ANALYSIS

Multivariate analysis or multivariate techniques may be defined as the collection of methods for analysing data in which a dependent variable is represented in terms of several independent number of observations which are available to define such relationship. In brief, techniques that take account of the various relationships among variables are termed multivariate analysis or multivariate techniques. Mathematically, multivariate analysis was defined by Takeuchi, Yanai and Mukherjee as, "forming a linear composite vector in vector space, which can be represented in terms of projection of a vector on to certain specified subspaces."

Objectives of Multivariate Analysis

The basic objectives of multivariate analysis are:

- To represent the collection of large set of data in a simplified way, by transforming large number of observations into smaller composite scores.
- To predict the variability of the dependent variable based on its covariance with all the independent variables.

• To classify individuals or objects into one of the two or more mutually exclusive and exhaustive groups on the basis of a set of independent variables.

Exhibit 4.12
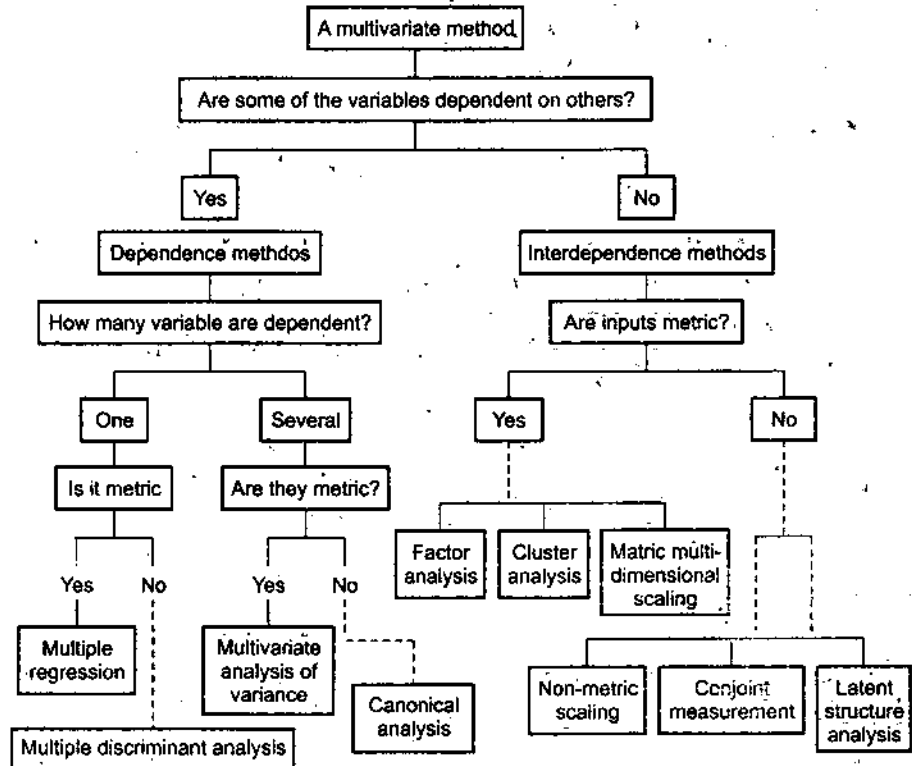
Advantages of Multivariate Analysis

The main advantage of multivariate analysis is that since it takes into account more than one factor/element of independent variables which affect the variability of dependent variable, the conclusions drawn are more accurate. The conclusions are more realistic and nearer to the real life situation.

Disadvantages of Multivariate Analysis

• It requires rather complex computations to arrive at a satisfactory conclusion.
• Due to the above fact that a large number of observations for large number of variables need to be collected and tabulated, it is a rather time consuming process.
• Obviously due to (*i*) and (*ii*) above, at times multivariate analysis proves to be an expensive proposition, in terms of cost.
• Specialised trained staff is required to process and analyse the complex data utilising multivariate techniques.

Applications of Multivariate Analysis

These techniques are successfully employed in the following areas:

- *Econometrics or Decision-making in Economics*: Such as impact of inflation, money circulation, lowering of tariffs, etc., on price rise.
- *Sociological Decision-making*: Such as divorce rates, and their cause-effect relationships, with marriage, social demographics and income levels.
- *Agrarian Predictions*: Such as impacts of rain, fertilisers and mechanisation on agricultural yields per acre.
- *Drug Testing*: Such as impact of new drugs on the main disease and other side effects.
- *State Fiscal Decision-making*: Such as impact of tax structure, duties, penalty rates, etc., on the government revenues.
- *Industrial Decision-making*: Such as plant location which depends on infrastructure, availability of raw materials, distribution channel, etc.

4.18 FACTOR ANALYSIS

It is one of the more popular "analysis of interdependence" techniques. In studies of interdependence, all the variables are on an equal footing, and the analysis is concerned with the whole set of relationships among the variables that characterise the objects.

Unlike regression or discriminant analysis, factor analysis would focus on the whole set of inter-relationships displayed by the variables. At the conceptual level, a factor is a qualitative dimension of the data that attempts to depict the "way in which entities differ, much as the length of an object or the flavour of a product defines a qualitative dimension on which objects may or may not differ."

Factor analysis is a procedure that takes a large number of variables or objects and searches out factors in common which account for their inter-correlation. For example, we can attribute the high association between grades in computer courses to the factor of intelligence or the association between certain attributes of coffee and factor of acidity.

Application of Factor Analysis in Marketing Research

There are a number of applications in marketing research. These includes data reduction, structure identification and scaling.

Data Reduction: Factor analysis is used for reducing a mass of data to a manageable level. For example, the marketing researcher who has collected data on 40 attributes of a brand. This analysis and understanding of this data may be aided by reducing 30 attributes and having only 10 attributes.

Factor analysis has been employed to "purify" original sets of scale items by isolating those items that do not reflect a common core and also to name the dimensions captured by measure. It is also used in the study of lifestyles and psychographic research problems in which it is used to develop consumer profiles that reflect people's attitudes, activities, interests, opinions, perceptions and preferences, so as to better predict their consumption and purchase behaviour. One of the major impetuses of lifestyles and psychographic research has been the generally inadequate nature of market segments defined using traditional demographic measures.[2]

***Structure Identification*:** Factor analysis may be used to understand the basic structure underlying a set of measures. For example, the above 30 attributes may be reduced to ten factors identified by the researcher.

***Scaling*:** A marketing researcher may develop a scale on a research topic. One problem that may occur in developing any scale is in weighing the variables being combined to form the scale.

Limitations of Factor Analysis

- The factor analysis is not strongly supported by statistical methods.
- The different results can be obtained by using loading factors in different manners.
- A large number of attributes are required to study factor analysis.
- In some cases, complex factors are used which respondents find difficult to understand.

Exhibit 4.13: Coffee attributes and intercorrelations among attribute ratings

14 coffee flavours – Unpleasant flavour
Stagnant, muggy taste – Sparkling, refreshing taste
Mellow taste – Bitter taste
Cheap taste – Expensive taste
Comforting, harmonious, smooth, friendly taste – irritating
Discordant, rough, hostile taste
Dead, lifeless, dull taste – Alive, lively, peppy taste
Tastes warmed over – Tastes just brewed
Hearty, full-bodied, full flavour – Watery, thin, empty flavour
Pure, clear taste – Muddy, swampy taste
Raw taste – Roasted taste
Fresh taste – Stale taste
Overall preference : Excellent quality – Very poor quality

Note: Ten blank boxes separated each set of opposing statements. Subjects checked the position that came closest to describing how they felt towards the product.

Exhibit 4.14: Intercorrelations among attribute ratings

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	Pleasant flavour	1.00	.76	.81	.79	.83	.81	.74	.66	.65	.71	.76	.65	.71	.75
2.	Sparking taste		1.00	.78	.85	.77	.87	.83	.65	.70	.78	.85	.69	.74	83
3.	Mellow taste			1.00	.77	.85	.81	.77	.60	.65	.64	.75	.69	.69	.74
4.	Expensive taste				1.00	.78	.87	.83	.76	.69	.81	.81	.64	.71	.87
5.	Comforting taste					1.00	.82	.77	.66	.60	.69	.82	.69	.69	.74
6.	Alive taste						1.00	.88	.70	.74	.80	.81	.65	.77	.87
7.	Taste like real coffee							1.00	.67	.76	.75	.79	.62	.76	.87
8.	Deep distinct flavour								1.00	.51	.84	.70	.54	.59	.70

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
9.	Tastes just brewed									1.00	.67	.65	.67	.80	.75
10.	Hearty flavour										1.00	.83	.65	.72	.76
11.	Pure clear taste											1.00	.83	.65	.72	76
12.	Roasted taste												1.00	.78	61
13.	Fresh taste													1.00	.73
14.	Overall preference														1.00
Mean rating*		4.5	4.3	4.4	4.6	4.4	4.2	4.2	4.3	4.3	4.2	4.3	4.4	4.6	6.85
Standard deviation		1.6	1.3	14	1.4	1.3	14	1.6	1.5	15	1.5	1.4	1.2	14	2.7

* The 10 scale categories were assigned successive integers, beginning with 1 at the favourable side of the scale. Thus, ratings could vary from 1 (very good) to 10 (very bad) on an attribute.

Source: Updated to 1995 from Bishwa Nath Mukherjee "A Factor Analysis of Some Qualitative Attributes of Coffee", Journal of Advertising Research, Vol. 5, p. 36, March '95. Used with permission.

Four factors underlying the 14 attributes. The elements in this matrix listed under the factors are called *unrotated factor loadings*. The loadings measure which variables are involved in which factor pattern, to what degree and in what direction. They can be interpreted as correlation coefficients. The square of the loading equals the proportion of the variation that a variable has in common with an unrotated factor.

Another way to conceptualise this relationship is to remember that a loading is a correlation coefficient between a variable and a factor. In essence, when we square a loading we are calculating a coefficient of determination, h^2, between a variable and a factor. Thus, the squared loading represents the amount of shared variation between a variable and a factor.

The h^2 measures are called *communalities*. Communality is the proportion of a variable's total variation that is involved in the factors. Mathematically h^2 equals the sum of the squared loading of a variable on all factors. For example, for attribute 1:

$$h^2 = (.86)^2 + (-.01)^2 + (-.20)^2 + (.04)^2 = .78$$

Communality may be interpreted as a measure of uniqueness. By subtracting h^2 from 1.0 the degree to which a variable is unrelated to the others may be calculated. Here we note that 78 per cent of the variation in scores on attribute 1 can be predicted from the other variables, leaving 22 per cent uniquely related to this attribute.

To get the percentage of total variance in the data explained by the four factors, we simply calculate H where

$$H = \frac{\text{Sum of all } h^2 \text{s}}{\text{Number of variables}} \times 100$$

$$= \frac{11.61}{14} \times 100$$

$$= 83\%$$

This value is called the common variance explained by the factors.

To calculate the amount of variation in the data accounted for by a factor, we square each loading for a factor, add and then divide the result by the number of variables. For example, for factor 1 the value is

$$(.86)^2 + (.91)^2 + (.86)^2 + \ldots \ldots \ldots + (.90)^2 = 10.42$$

This value is called an eigen value in the vocabulary of factor analysis. Thus, the percentage of total variance explained by factor 1 is 10.42/14 = 74.4 per cent. The percentage of common variance explained by this factor is then 10.42/11.61 = 90 per cent. We note that the percentages of both common variance and total variance are presented in Exhibit 4.15.

In order to obtain an interpretation of the result, we examine the rotated factors. Exhibit 4.16 presents one such interpretation. There the factors have been placed with high-loading variables and each given a creative name by the author of the study. Note that there is no unique definition of the meaning of any factor; it is up to the creativity of the researcher.

Exhibit 4.15: Factor loadings

	Principal factor matrix					Rotated (varimax) matrix				Oblique factor matrix			
	I	II	III	IV	h^2	A	B	C	D	A	B	C	D
1	86	−.01	−.20	0.4	.78	.63	.38	.36	.34	.34	.01	.07	−.03
2	.91	−.01	−.01	−.09	.83	.48	.43	.53	.38	.14	.04	.23	.04
3	.86	.11	.28	.002	.83	.70	.26	.38	.36	.36	.13	−.003	−.01
4	.91	.15	−.001	−.10	.87	.46	.53	.54	−.29	.16	.05	.34	−.07
5	.87	.002	−.31	.10	.87	.74	.38	.30	.32	.47	.01	−.004	−.08
6	.93	.03	−.02	−.16	.90	.49	.43	.59	.35	.12	.07	.30	−.01
7	.90	−.02	.04	−.21	.86	.42	.38	.64	.37	.03	.11	.33	.04
8	.77	.36	−.11	−.16	.77	.31	.74	.27	.22	.24	−.40	.32	−.10
9	.79	−.28	.24	.09	.76	.23	.24	.52	.62	.15	.11	.14	.37
10	.87	.25	.22	.17	.89	.28	.75	.33	.39	.14	.38	.31	.07
11	.89	.11	.05	.10	.82	.51	.55	.36	.36	.28	−.15	.17	−.01
12	.76	−.29	.04	.27	.74	.43	.28	.16	.67	.18	−.08	.18	.38
13	.84	−.27	.19	.12	.83	.33	.32	.36	.70	.01	−.03	−.001	.41
14	.90	.04	.08	−.23	.86	.38	.43	.65	.34	.002	.08	.39	.01
Percent common variance	90.0	4.1	3.3	2.6									
Percent total variance	74.4	3.4	2.7	2.6									

Source: Adapted and updated to 1995 from Bishwa Nath Mukherjee. "A Factor Analysis of Some Qualitative Attributes of Coffee", Journal of Advertising Research, Vol. 5, p. 37, March 1965. Used with permission.

Exhibit 4.16: Table interpretation of factors

Variable	Attribute	Varimax	Oblique
Factor A (Comforting quality)			
1	Pleasant flavour	.625	.340
3	Mellow taste	.698	.359
5	Comforting taste	.736	.465

11	Pure clear taste	.512	.283
Factor B (Heartiness)			
8	Deep distinct flavour	.742	.396
10	Hearty flavour	.745	.380
Factor C (Genuineness)			
2	Sparking taste	.524	.232
4	Expensive taste	.541	.334
6	Alive taste	.594	.301
7	Tastes like real coffee	.636	.328
8	Deep distinct flavour	.268	.323
10	Hearty flavour	.332	.310
14	Overall preference	.653	.387
Factor D (Freshness)			
9	Tastes just brewed	.621	.359
12	Roasted taste	.670	.465
13	Fresh taste	.698	.238

Source: Updated to 1995 from Bishwa Nath Mukherjee, "A Factor Analysis of Some Qualitative Attributes of Coffee", Journal of Advertising Research, Vol. 5, p. 37, March 1965. Used with permission.

Unfortunately, researchers can all too easily fool themselves with wonderful sounding interpretations. Great care must be taken in this regard.

The presentation of factor analysis has concentrated on the nature of the input and output. There are many more issues on all aspects of factor analysis not covered here. You should consult a more advanced reference if you are interested.

Difficulties, Problems and Cautions

Cost: Factor analysis involves the study of various factors. To study a large number of factors, the researcher has to spend a lot of time. Therefore, it is considered an expensive analysis. But now, we can use computers to get faster results.

Reliability: A factor analysis starts with a set of imperfect data. Data change because of changes in the sample, changes in data gathering procedures or any of the numerous kinds of measurement errors, the results of any single analysis are, therefore, always less than perfectly dependable.

4.19 CLUSTER ANALYSIS

Cluster analysis is used by the researcher to place variables or objects into subgroups or clusters. These clusters are not defined by the researchers but are formed by the cluster analysis procedure itself. The following factors are considered for cluster analysis:

• They form subgroupings and assign variables or objects to these groups.

- They take as input a matrix of association between variables or objects.
- They assume that natural clusters exist within the data.

Example of Cluster Analysis[3]

A two-dimensional perceptual Exhibit has been drawn on the basis of data relating to 15 individuals A to O, on the basis of (*i*) Number of vacation days (*ii*) expenditure on vacations during a given year.

Exhibit 4.17: Cluster analysis
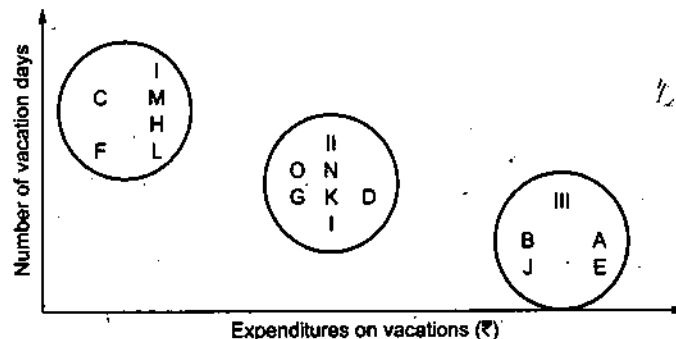
It will be seen that there are three distinct clusters. The first cluster comprising five individuals C, F, H, L and M shows that although these individuals take too many vacations, they do not spend much on their vacations. The second cluster comprising six individuals D, G, I, K, N and O shows that they take vacations moderately and also spend moderately. Finally, the third cluster comprising three individuals A.B. and J shows that they have relatively few vacation days but spend substantially more on their vacations.

Discriminant Analysis

Discriminant analysis is a technique that is appropriate with a nominal dependent variable and interval independent variables. Nominal dependent variables are very common in marketing. For example, a satisfied customer, an unsatisfied customer, service seeker customer, non-service seeker customer. This is the reason why discriminant analysis has received extensive application in marketing research.

The basic idea is to find out the linear combination of the independent variables that make the mean scores across categories of the dependent variable on this linear combination maximally different. This linear combination is called the discriminant function. It can be represented in the following way:

$$DF = V_1 X_1 + V_2 X_2 + \ldots + V_m X_m$$

The criterion used to decide when group means are maximally different is the familiar ANOVA (F-Test) for the differences among means thus, the V's are derived such that

$$F = \frac{SS\ between}{SS\ within} \text{ is maximised}$$

Exhibit 4.18: Predicted category

Actual category	Satisfied	Unsatisfied
Satisfied	400	20
Unsatisfied	30	50

The output of discriminant analysis includes the values of the V's plus what is called a confusion matrix. This matrix compares the category of the dependent variable that the discriminant functions predict a subject will be in with the category involved in it. The example of pain relievers explains the complete analysis of discriminants.

Discriminant Analysis in Marketing: This analysis has been used quite extensively in marketing. The following aspects can be studied by this type of analysis:

- Identification of new buyer group.
- Consumer behaviour toward new products or brands.
- Brand loyalty study.
- Relationship between variables.
- Checklist of properties of new products.

The targeting strategy of various pain relievers needs to be discriminant targeting different characteristics as perceived by consumers. The survey of 1000 consumers have been marked on a 5 point scale. The pain relievers characteristics need to be grouped and marketed accordingly.

Exhibit 4.19

|	Pain Relievers Characteristics	I Moov	II Iodex	III Zandu	IV Amrutanjan	V Medicream	VI Relaxyl	VII Spray
1.	Joint Pains	4.2	3.4	3.3	3.3	4.3	5.0	2.3
2.	Muscular Pain	3.3	4.3	3.0	2.0	4.3	4.3	4.5
3.	Backache	4.2	4.2	3.0	1.5	3.2	5.3	3.3
4.	Sciatica (Nerve)	3.1	3.1	2.1	2.0	3.2	4.3	4.5
5.	Headache	1.0	0.0	4.2	4.0	0.0	0.0	0.0
6.	Cold (Coryza)	0.0	0.0	3.3	3.0	0.0	0.0	0.0
7.	Rheumatism	2.1	1.0	1.2	1.1	3.2	4.0	1.5
8.	Arthritis	2.1	1.0	1.2	1.2	3.2	4.0	1.5
9.	Gout	3.2	2.0	1.5	1.2	2.5	4.0	1.0
10.	Smell/Aroma	4.5	1.0	2.0	2.0	4.0	4.0	3.5
11.	Non Greasiness	4.0	1.0	1.5	1.5	4.0	5.0	5.0
12.	Ease of Application	4.5	2.0	2.0	2.5	4.0	4.5	5.0
13.	Cooling/ Warming	4.0(W)	20(W)	3.0(C)	3.5(C)	4.0(W)	3.5(W)	5.0(C)

Discriminant analysis technique can be used by the marketing manager who wants to have an idea about the market in terms of certain profile of pain relievers from a data about particular types of pain relievers. The method derives the relative weights to the different types of pain relievers needs. Thus, the discriminant functions show the common patterns of pain relievers for various types of pain relievers. In this example, the market is initially segmented on the basis of product types and then we attempt to discriminate each of the products on the basis of the specific combination of pain relievers needs that they may be serving.

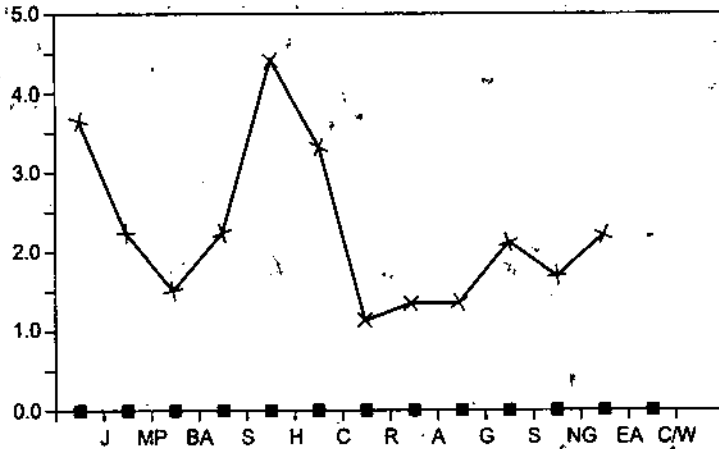**Pain Reliever Needs for Moov**
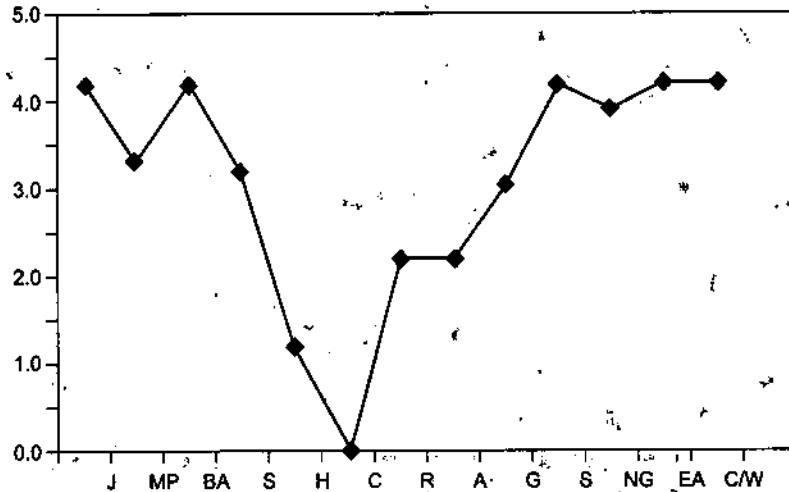
Pain Reliever Needs for Iodex
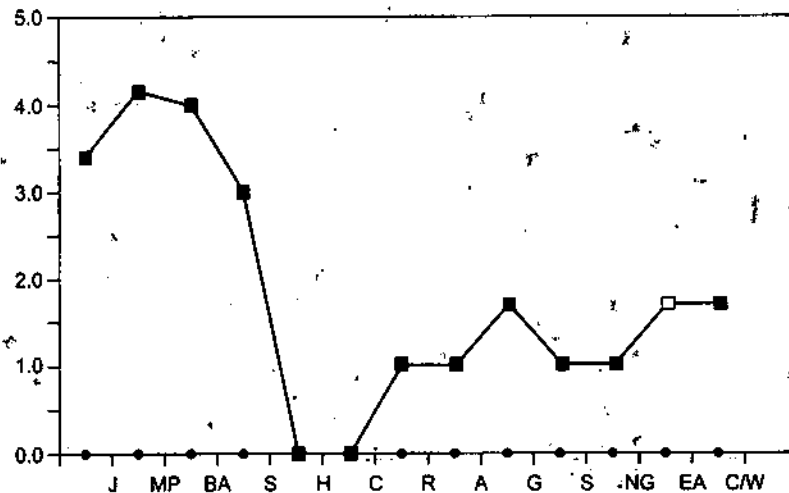
J = Joint Pains	MP = Muscular Pain	BA = Backache	S . = Sciatica (Nerve)
H = Headache	C = Cold (Coryza)	R = Rheumatism	A = Arthritis
G = Gout	S = Smell/Aroma	NG = Non-Greasiness	EA = Ease of Application
C/W = Cooling/Warming			

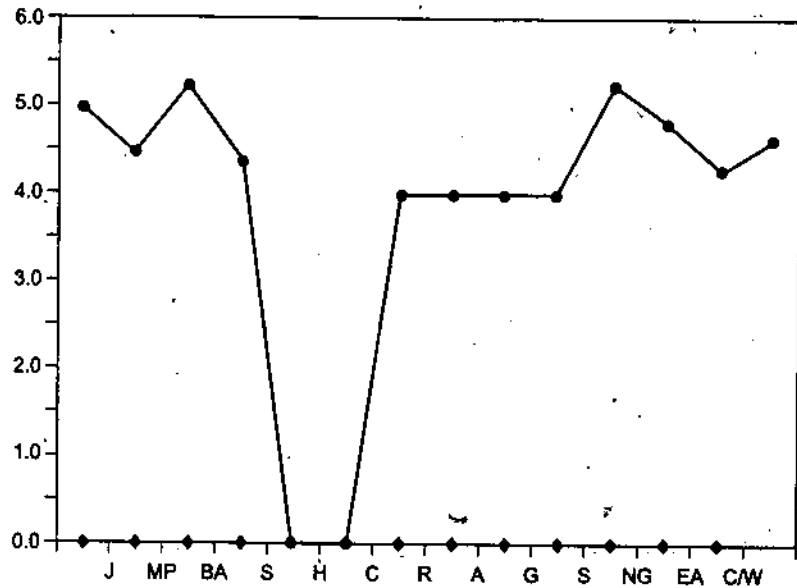## Pain Reliever Needs for Zandu
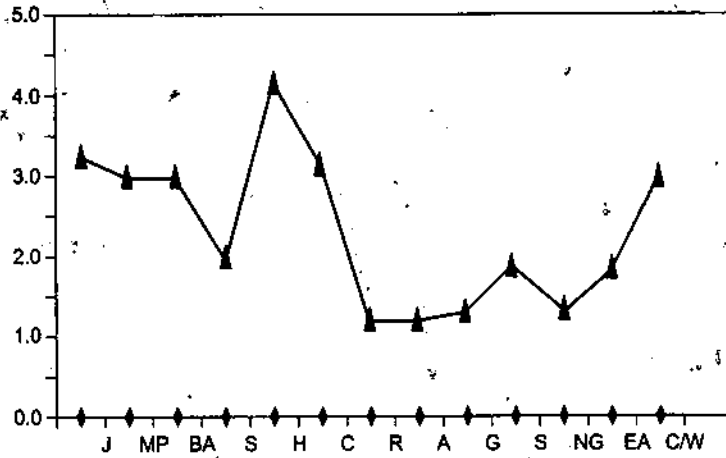
Pain Reliever Needs for Amrutanjan

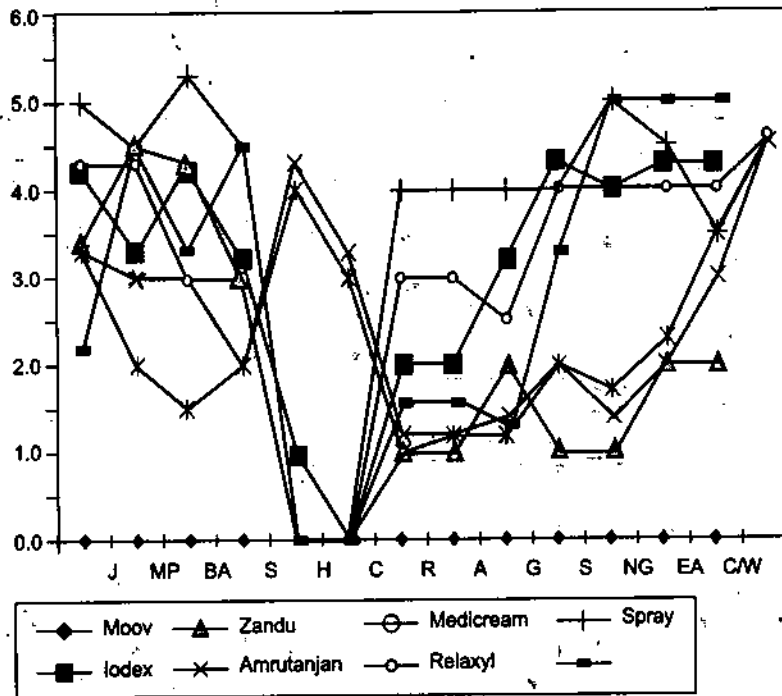|			
J = Joint Pains	MP = Muscular Pain	BA = Backache	S = Sciatica (Nerve)
H = Headache	C = Cold (Coryza)	R = Rheumatism	A = Arthritis
G = Gout	S = Smell/Aroma	NG = Non-Greasiness	EA = Ease of Application
C/W = Cooling/Warming			

Pain Reliever Needs for Medicream
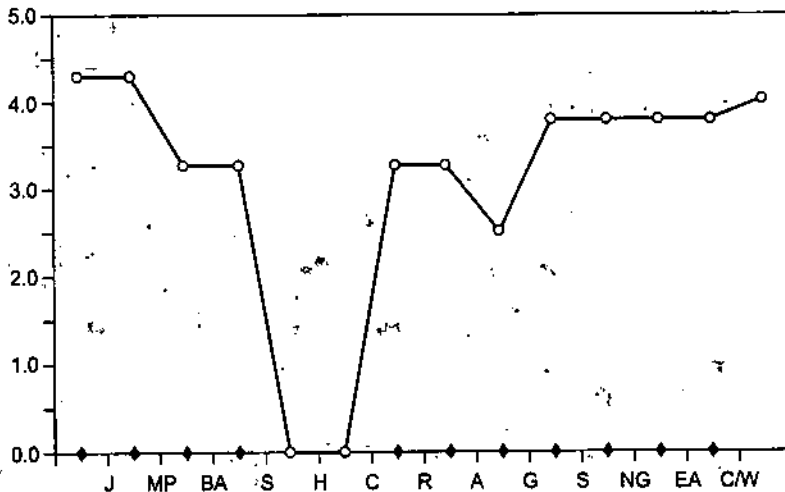
Pain Reliever Needs for Relaxyl

J	= Joint Pains	MP = Muscular Pain	BA = Backache	S	= Sciatica (Nerve)
H	= Headache	C = Cold (Coryza)	R = Rheumatism	A	= Arthritis
G	= Gout	S = Smell/Aroma	NG = Non-Greasiness	EA = Ease of Application
C/W	= Cooling/Warming				

Pain Reliever Needs for Spray
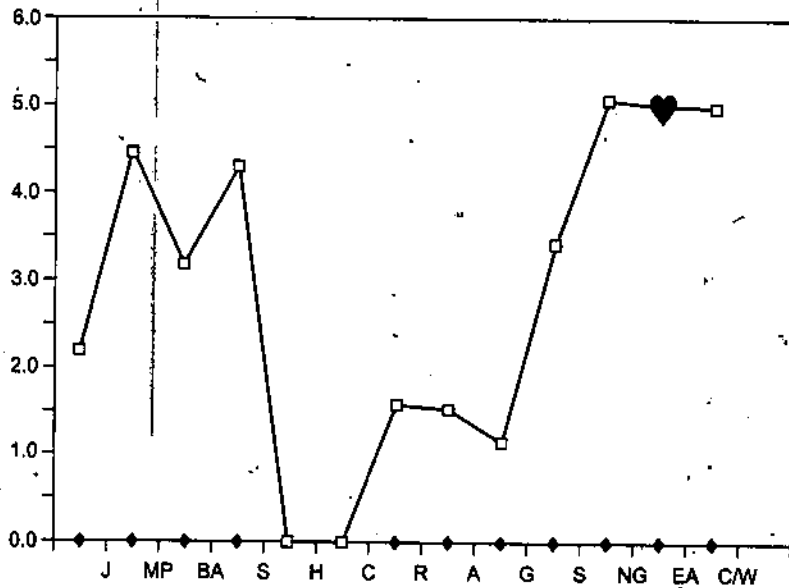
J	= Joint Pains	MP = Muscular Pain	BA = Backache	S	= Sciatica (Nerve)
H	= Headache	C = Cold (Coryza)	R = Rheumatism	A	= Arthritis
G	= Gout	S = Smell/Aroma	NG = Non-Greasiness	EA = Ease of Application
C/W	= Cooling/Warming				

J = Joint Pains   MP = Muscular Pain   BA = Backache   S = Sciatica (Nerve)

H = Headache   C = Cold (Coryza)   R = Rheumatism   A = Arthritis

G = Gout   S = Smell/Aroma   NG = Non-Greasiness   EA = Ease of Application

C/W = Cooling/Warming

4.20 CONJOINT ANALYSIS

Conjoint analysis is concerned with the measurement a combination of two or more attributes that are important in marketing decisions from customers point of view. In this analysis, marketing research suggests a new combination on the basis of existing attributes. For example: A bank would like to know which is the most desirable combination of attributes to frequent borrowers — rate of interest, instalment amount, date of payment of instalment.

Conjoint analysis is useful for products which can be offered in different combinations for which the consumer has to make a trade-off.

As such it is more useful for products which require a longer buying process for consumers.

The attributes for which the different levels are to be tested might not be the ones that the consumer considers important while making a choice. It is not always right to add the utility scores across respondents unless the researcher is sure that they belong to a homogenous group.

Numerical Example

Consider a situation in which a manufacturer different colours of paints is interested in measuring consumers' trade offs among the following attributes:

Brand	*Price*
Alpha	50 per litre
Gamma	60 per lire
Beta	70 per litre
Life	*Colours*
3 Years	Pink
4 Years	Green
5 Years	

Potential replacement paint purchasers are recruited and presented with the 18 alternatives shown in Exhibit. Each respondent is asked to rate each of the alternatives on a 0–10 scale, where 0 indicates absolutely no interest in purchasing and 10 indicates extremely high interest in purchasing.

Illustratively, Figure 8.8 shows the 18 evaluations made by one respondent. Although a total of $3 \times 3 \times 3 \times 2 = 54$ combinations of attribute levels could be made up, the respondent needs to evaluate only 18 of these. However, this specific set of 18 should be selected in a particular way, as will be noted later.

Figure 8.9 shows graphs of the implied values for each of the attribute levels; these can be obtained from an ordinary multiple regression program using dummy variable coding. All one needs to do to estimate the respondent's original evaluations is to add each separate value (The regression's intercept term may be added in later if there is interest in estimating the absolute level of purchase interest.) For example, to obtain the respondent's estimated evaluation of card 1, one reads off the part worths:

Value of Alpha	= 2.4
Value of 3 years	= 0
"Value" for ₹ 50 per litre (a ₹ 20 cost saving)	= 1.6
Value for Green Colour	= 1.2
	= 55.2

In this instance we obtain an almost perfect prediction of the person's overall response to card 1. Similarly, we can find the estimated total evaluations for the other 17 options and compare them with the respondent's original evaluations.

The regression technique guarantees that the (squared) prediction error between estimated and actual response will be minimised.

The information also permits the researcher to find estimated evaluations for all combinations including the $54 - 18 = 36$ options never shown to the respondent. Moreover, all respondent's separate part-worth functions as illustrated for person can be compared in order to see if various types of respondents (e.g. high versus low income respondents) differ in their separate attribute evaluations.

In short, while the respondent evaluates complete bundles of attributes, the technique solves for a set of part-worths — one for each attribute level that are

computed from the overall trade offs. These part-worths can then be combined in various ways to estimate the evaluation that a respondent would give to any combination of interest. It is this high leverage between the options that are actually evaluated and those that can be evaluated (after the analysis) that makes conjoint analysis a useful tool.

Exhibit 4.20: Product descriptions for conjoint analysis

Card 1	
Brand	Alpha
Life	3 Years
Price	₹ 50
Colour	Green

Respondent's rating...5.2

Card 2	
Brand	Alpha
Life	4 Years
Price	₹ 60
Colour	Green

Respondent's rating...7.3

Card 3	
Brand	Alpha
Life	5 Years
Price	₹ 70
Colour	Green

Respondent's rating...5.7

Card 4	
Brand	Gamma
Life	3 Years
Price	₹ 60
Colour	Green

Respondent's rating...4.8

Card 5	
Brand	Gamma
Life	4 Years
Price	₹ 70
Colour	Green

Respondent's rating...7.2

Card 6	
Brand	Gamma
Life	5 Years
Price	₹ 50
Colour	Green

Respondent's rating...9.3

Card 7	
Brand	Beta
Life	3 Years
Price	₹ 70
Colour	Green

Respondent's rating...0.8

Card 8	
Brand	Beta
Life	4 Years
Price	₹ 50
Colour	Pink

Respondent's rating...3.2

Card 9	
Brand	Beta
Life	5 Years
Price	₹ 60
Colour	Green

Respondent's rating...6.4

Card 10	
Brand	Alpha
Life	3 Years
Price	₹ 70
Colour	Pink

Respondent's rating...2.2

Card 11	
Brand	Alpha
Life	4 Years
Price	₹ 50
Colour	Green

Respondent's rating...8.1

Card 12	
Brand	Alpha
Life	5 Years
Price	₹ 60
Colour	Green

Respondent's rating...8.3

Card 13	
Brand	Gamma
Life	3 Years
Price	₹ 50
Colour	Green

Respondent's rating...6.3

Card 14	
Brand	Gamma
Life	4 Years
Price	₹ 60
Colour	Pink

Respondent's rating...7.4

Card 15	
Brand	Gamma
Life	5 Years
Price	₹ 70
Colour	Green

Respondent's rating...7.3

Card 16	
Brand	Beta
Life	3 Years
Price	₹ 60
Colour	Green

Respondent's rating...2.2

Card 17	
Brand	Beta
Life	4 Years
Price	₹ 70
Colour	Pink

Respondent's rating...4.3

| Card 18	
Brand	Beta
Life	5 Years
Price	₹ 50
Colour	Pink

Respondent's rating...5.7

Reliability and Validity Checks

In carrying out a conjoint analysis it is useful to include the following ancillary analysis:

(1) test-retest reliability, (2) a comparison of actual utilities with those of random respondents and (3) an internal validity check on model-based utilities.

Exhibit 4.21: Part-Worth functions obtained from conjoint analysis (hypothetical data)
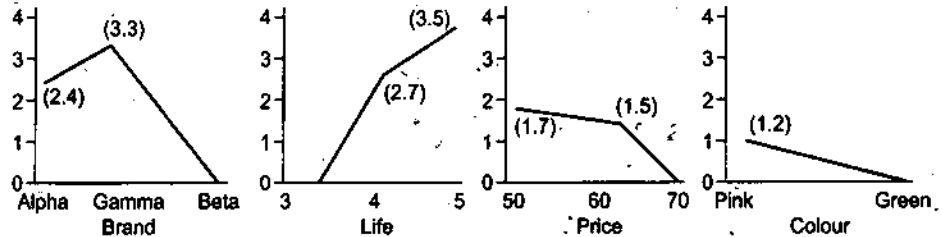
The test-retest reliability can be conducted by including a few replicate judgements (drawn from the original set of 18) at a later stage in the interview. The purpose here is to see if the judgements are highly correlated, on a test-retest basis, to justify the analysis of the respondent's data.

Random-respondent utilities are obtained by running a sample of pseudo subjects. The pseudo subjects input data consist of random ratings or rankings as the case may be. As the sample size increases we would expect, on an average, equal utilities within each set of factor levels. However, any specific pseudo subject would depart from this expected value through sampling variability alone. By analysing a sample of 100 or so pseudo subjects the researchers can develop a crude type of confidence interval around each set of averaged part-worths with which to compare real respondents results.

4.21 GUIDELINES FOR USE OF MULTIVARIATE ANALYSIS IN MARKETING RESEARCH

As we have already discussed, there are a large number of applications of multivariate analysis which can performed by multivariate analysis. Jagdish N. Sheth, in "Seven Commandments for uses of Multivariate Methods", *Multivariate Methods for Market and Survey Research* offers a number of guidelines to the marketing researcher who intends to use multivariate methods.

- The marketing researcher should not try to be technique-oriented. If he develops a fancy for one or two particular techniques and uses them indiscriminately without checking their suitability in a given case, it will harm the interests of marketing research. It may also bring about the downfall of multivariate methods.
- He should not be carried away in building models, disregarding the fact that multivariate models are information inputs to facilitate management in the process of decision-making.

- He should remember that multivariate methods are not substitutes for his skills and imagination in the design of research. These are necessary in conceptualising the problem.
- He should not overlook the need for lucid communication with the management. A first rate study using sophisticated techniques may go to waste if the management is unable to understand it.
- He should not make statistical inferences about the parameters of multivariate models. Such inferences are not possible on account of the sizeable existence of non-sampling or measurement errors in the data in the social sciences. Such techniques should be seen as descriptive statistical techniques for reducing large data to a summarised and meaningful form.
- Sometimes, the researcher may be carried away by a random relationship among the variables and put substantive meanings into the data, which may not be true. This is especially true of some multivariate methods such as cluster analysis, multidimensional scaling and conjoint measurement as there is no sampling theory behind them. Therefore, these are heuristics. To guard oneself against this error, it may be advisable to use at least two different techniques.
- Finally, he should exploit the complementary relationship inherent in the structural and functional multivariate methods. In other words, he should substantiate a number of judgements which he has to make with structural multivariate analysis of data. For example, it is advisable to use cluster analysis first to specify mutually exclusive groups before using a multiple discriminant analysis.

SUMMARY

- The data, after collection, has to be processed and analysed in accordance to the outline laid down for the purpose at the time of developing the research plan. The term analysis refers to the computation of certain measures along with search for patterns of relationship that exist among data-groups. The following operations are required in data processing: (1) Editing (2) Coding (3) Classification (4) Tabulation. In data analysis the following series of distinct actions are to be taken:
  ❖ Formulate data analysis goals
  ❖ Specify the hypothesis
  ❖ Choose the appropriate statistical test
  ❖ Determine significance levels
  ❖ Calculate test statistic
  ❖ Observe the critical value of test statistic from the statistical table
  ❖ Draw necessary inferences
- This chapter presents the fundamental underpinnings of hypothesis testing methodology. In this chapter parametric and non-parametric tests are available for testing the hypothesis related to differences. In the parametric case T test is used to examine hypothesis related to the population mean.

Different forms of T test are suitable for testing the hypothesis based on one sample, two independent samples, or paired samples, in the non-parametric case popular one-sample test include chi-square (X^2) test. In ANOVA and ANOCOVA, the dependent variable is metric and independent variables are all categorical 02 combinations of categorical and metric variables. One way ANOVA involves a single independent categorical variables. Interest lies in testing the null hypothesis that the category means are equal in the population. The total variation in the dependent variable is decomposed into two components – variation related to the independent variable and variation related to error. The null hypothesis of equal means is tested by an F statistic, which is the ratio of the mean square related to the independent variables to the mean square related to error. ANOCOVA includes at least one categorical independent variable and at least one interval or metric independent variable. The metric independent variables, or covariate, is commonly used to remove extraneous variation from the dependent variable.

- Multivariate analysis procedures involve simultaneous analysis of data measured on two or more variables. Multivariate techniques are largely empirical and deal with the reality; they possess the ability to analyse complex data. The basic objective underlying multivariate techniques is to represent a collection of massive data in a simplified way.

- It transforms a mass observation into a smaller number of composite scores in such a way that they reflect as much information as possible contained in the raw data obtained concerning a research study. Multivariate analysis is specially important in behavioural sciences and applied researches for most of such studies involve problems in which several response variables are observed simultaneously.

REVIEW QUESTIONS

1. You are asked to study the habits of people with regard to wearing of ready-made garments. How would you cross-tabulate the data which you can obtain?

2. What do you understand by the term 'cross-tabulation'? Describe various modes in which cross-tabulation can be conducted.

3. Processing of data implies editing, coding, classification and tabulation. Describe these four operations pointing out the significance of each in the context of research study.

4. Why tabulation is considered essential in a research study? Narrate the characteristics of a good table.

5. Distinguish between:
   - ❖ Field editing and central editing
   - ❖ Simple and complex tabulation
   - ❖ Mechanical tabulation and cross-tabulation

6. What problems are faced by the researcher regarding the cross-tabulation analysis?

7. What are the steps involved in data processing?

8. What is coding?

9. "The suitability of data-processing methods depends on the volume of data to be processed". Comment.

10. Describe the principles that should be borne in mind while classifying data into categories.

11. Why do we use hypothesis testing?

12. Why and how would you use t and z test in hypothesis testing?

13. Why and when would you want to use ANOVA in marketing research?

14. What will ANOVA test not tell you, and how can you overcome this problem?

15. Which test is used to check for statistical significance in an ANOVA?

16. What are the commonly occurring dependent variables in marketing applications of ANOVA?

17. Discuss the similarities and differences between analysis of variance and analysis of covariance.

18. What is the relationship between analysis of variance and the t test?

19. What is the null hypothesis in one way ANOVA? What basic statistic is used to test the null hypothesis in one way ANOVA? How is this statistic computed?

20. What is the most common use of the covariate in ANCOVA?

21. What are the major assumptions of ANOVA?

22. Under what conditions should the t test for the mean difference in two related populations be selected.

23. What is the difference between two independent and two related populations?

24. Under what conditions should the F test be selected to examine possible differences in the variances of two independent populations?

25. What are some of the criteria used in the selection of a particular hypothesis-testing procedure?

26. Under what conditions should the two tests be used to examine possible differences in the proportions of two independent populations?

27. Under what conditions should the X^2 test be used to examine possible differences in proportions of two independent populations?

28. What are the similarities and distinctions between the Z and X^2 test for differences in populations proportions?

29. Under what conditions should the X^2 test of independence be used?

30. Calculate standard error of mean from the following data showing the amount paid by 100 firms in Calcutta on the occasion of Durga Pooja.

Mid value (₹)	41	51	61	71	81	91	101
No. of Firms	3	2	12	18	33	18	14

31. 16 workers are selected at random from a large number of workers in a factory. The numbers of items produced by them on a certain day are found to be 52, 53, 53, 54, 53, 51, 58, 56, 59, 54, 57, 56, 59, 50, 60. Would it be appropriate to suggest that the mean of the number of items produced in the population is 59.

32. On the basis of the information given below about the treatment of 200 patients suffering from a disease, state whether the new treatment is better or not? (Check at 56 level of significance).

New Conventional	No. of Patients		Total
	Favourable	Not Favourable	
	80	10	90
	20	90	110
	100	100	200

33. 180 digits were selected at random from a set of tables. The frequencies of the digits were:

Digits	0	1	2	3	4	5	6	7
	15	10	25	30	40	10	30	20

use X^2 test to test if the digits were distributed in equal nos.

34. Two samples are drawn from two normal populations, from the following data test whether the two samples have the same variance at 57 level.

Sample I	50	52	62	70	75	78	80	85		
Sample II	60	67	60	85	78	62	86	85	90	91

35. Perform a two way Anova on the following data.

		MI		
		I	II	III
	I	28	29	35
M2	II	26	24	28
	III	30	26	38
	IV	29	35	33
	V	27	31	30

Use 30 as code value.

36. What do you mean by multivariate techniques? Explain their significance in the context of research studies.

37. What is the significance of using multiple discriminant analysis? Explain in brief the technical details involved in such a technique.

38. Write short notes on:
 ❖ Cluster analysis
 ❖ Conjoint analysis
 ❖ Factor analysis
 ❖ M.D.S

39. Name the important multivariate techniques and explain the important characteristics of each one of such techniques.

40. Differentiate between bivariate and cluster analysis.

41. Explain in brief the 'correspondence analysis' technique.

42. Differentiate between univariate and multivariate analysis.

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CASE STUDY

Your company, a major car manufacturer, has recently received the results of a segmentation analysis of principal benefit of the market as follows:

Principal benefit sought	Segment 1: "Company director" providing the right image	Segment 2: "Wealthy housewife" easy and comfortable to drive
Other segmentation criteria:		
Age	33-55	24-45
Occupation	Businessmen	Parent and homemaker
Income	High	High allowance
Marital status	Married	Married
Location	Prestige areas of large cities	Prestige city and rural areas
Usage rate	Heavy	Light
Usage occasions	Business travel family and individual leisure	Visiting friends Shopping Driving children
Lifestyle/interests	Playing sport Dining out Cultural pursuits Dining out Cultural pursuits	Socialising with friends Fashion Cultural pursuits Fashion Cultural pursuits

Task 1

As the market manager responsible for the launch of new products you have been asked to prepare a brief on the type of marketing mix, i.e., product, price, promotion, and distribution you believe to be appropriate for each of these segments.

Please make your recommendations as detailed as possible and justify them by reference to the characteristics of each segment. For example, the product decision: describe the features and qualities of the vehicle to be manufactured for each segment. Give the product a suitable name. Do the same for each element of the mix for both products.

Task 2

Please list the marketing information you would require before making a definite decision to supply either of these market segments.

Task 3

- Discuss the characteristics of the car manufacturing industry. What implications has this market structure on the pricing and output policy of individual car manufacturers?
- You are told by your market research department that the price elasticity of demand of "segment 1" is 0.8, while the price elasticity of demand of "segment 2" is –1.4. Write a short report explaining how this information can be used to direct your company's pricing policy.

5.

REPORT WRITING

STRUCTURE

5.1   Introduction
5.2   Costing
5.3   The Research Proposal
5.4   Research Report Writing
5.5   Steps In Report Writing Process
5.6   Documentation And Bibliography
       Summary
       Review Questions

5.1   INTRODUCTION

The Formal Marketing Research Proposal can be viewed as a series of steps called the research process. To effectively conduct a research process it is essential to anticipate all the steps and recognise their interdependence. In research proposal, the researcher should get the details of sponsor. The Research proposal could be framed up for one's own company as an aid to marketing decisions, for a client for commercial purpose or by a student of marketing as an academic exercise. In all the three cases, a researcher has to obtain certain details, which would facilitate the researcher to design the market research proposal. The researcher can collect the following information from the sponsor.

- The main objective of research and the detailed objectives of the study and how the relevant information will be used by the sponsor.
- The inhouse information available to assist in preparing the research plan. It should include the details on marketing mix, marketing strategies and sales data.
- The market competition and industry conditions in the market.
- The time framework for the completion of the project.
- Cost considerations, if any, which may have implications on the mode of operations and the area to be covered.
- Any other special considerations.

After collecting the above information and also personal discussion with sponsor, the research agency/researcher can prepare a proposal for carrying out the research work. The following example will help in understanding

details required from the Hero-Honda company regarding market survey on "Psychographic Analysis of Hero-Honda Splendor Owners".
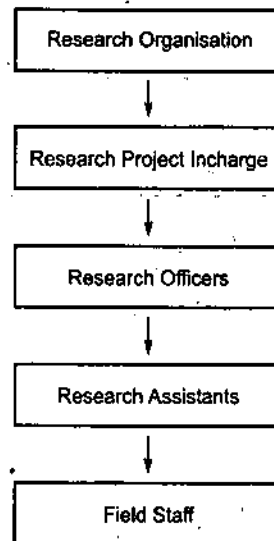
Example

Details from M/s Hero-Honda Ltd. for the market survey of Hero-Honda Splendor Ownerss:

- Product details:_____
  (technical aspects) _____
- Give details on the _____
  exact product mix that is _____
  to be covered for the _____
  market survey_____
- List all present dealers _____
  of the product _____
- List all facilities _____
  available to the customers: _____
- Which are the different_____
  market segments available for _____
  the product?_____
- Which are the known competitive _____
  products available in the market _____
  which fulfil the same needs _____
  of the users?_____
- Who are the major known _____
  competitors at present in _____
  the market? _____
- What is main objective of_____
  this market survey?_____
- What coverage is desired _____
  for this market survey?_____
- What assistance will be provided_____
  by your company?_____
  ❖ Past sales records _____
  ❖ Industry demand _____
  ❖ Sales literature_____
  ❖ Sales display _____

Research Proposal

The research organisation will require a team depending on the scope of the research project. An organisation set-up as given below could normally be used.

```
┌─────────────────────────┐
│  Research Organisation  │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ Research Project Incharge│
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│    Research Officers    │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│   Research Assistants   │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│       Field Staff       │
└─────────────────────────┘
```

The following table shows job description at each level could be as under:

Research Project Incharge	Research Officer	Research Assistants	Field Staff
He is incharge of the research project. He is directly involved with the sponsor and the research team. He will do the costing, preparation of time-schedule and report writing.	Research officer will select the samples, will design the questionnaire and will provide the necessary training to assistants and field staff. He is also involved in the analysis of the data collected, arriving at conclusions and preparing the draft of the report.	The main job would be the supervision over the field staff. They will also help in compilation of all the data in a systematic manner, properly segmented and in tabular forms for easy analysis.	They will carry out the actual field work for data collection and will conduct personal discussions with the samples.

5.2   COSTING

The following headings are to be covered in market research proposal:

- Man-hour costs _____
  (Man-hours × cost + per hour)_____
- Travelling costs _____
- Daily allowances_____
- Cost of stationery, postage, _____
  telephone, fax, internet, etc. _____
- Typing, binding_____
- Admn – charges
  (Normally taken as 7.5% of 1-5) _____
- Profit Margin_____

(Normally taken as 25% of 1-6)_____

Total cost proposed to client _____

5.3 THE RESEARCH PROPOSAL

After several weeks of preparation, a research proposal is developed and sent to the sponsor for review. At a subsequent meeting with the research firm and after a few changes, the proposal is approved. The following is the summary of the finalised proposal submitted to M/s Electrolux by Admar on "Market Mapping Study of Washing Machine".

Rationale for the Study

The rationale is to have an in-depth understanding of the overall durable market as well as that of the washing machine market. This will aid in identifying opportunity segments and the need gaps present in the market.

Based on this, they will be able to develop appropriate positioning strategy for Electrolux. Moreover, it will help in providing specific inputs for development of an effective communication strategy and plan.

Research Objectives

- To understand consumer psychographics with respect to ownership and purchase of durables in general and washing machines in specific.
- To understand existing habits and beliefs that influence the needs and expectations with respect to ownership and purchase of washing machines, its type and brands in specific.
- To map positions of different brands of washing machines in the consumer's mind by perceived strengths and weaknesses of each of its contributors.
- To gauge the existing equity of Electrolux and its variance across different levels of familiarity.

Research Methodology

- The research design will be an exploratory-cum-diagnostic qualitative research study.
- It will involve personal, face-to-face and in-depth interviewing technique with the help of an interview guide.
- The research is to be conducted by the field staff.

Target Respondents

To give the premium pricing strategy of Electrolux range of washing machines the following could be our target groups:

- Monthly household income of ₹ 10,000 plus or owning a new generation car and air-conditioner at home.
- Potential buyers on active search.
- Recent buyers (within 3 months) of washing machines.
- Households having a high level of education as well as high income.
- Either replacement or first time buyers of washing machines.

Research Centres

The centres, we have chosen by contrasting weather and buying habits are two of the largest cosmopolitan cities and the most potential markets in India.

Mumbai — Humid and high monsoon market. A city of middle-class earners.

Delhi — Dry and low monsoon market. A city constituting mostly of business-class earners.

Sample Size and Sample Composition

	Delhi	Mumbai	Total
Recent Buyers	15	15	30
Potential Buyers	15	15	30
Total	30	30	60

- A quota of about 10 to 15 buyers of front loading washing machines.
- 60:40 split between replacement and first time buyer.
- 50:50 split of executives/professionals and businessmen.

Sampling Procedures

- The procedure adopted for this project is purposive sample method.
- The listing of respondents from both households and dealers outlets is spread across 6-8 areas within each city.
- Appointments will be fixed during listing and respondents interviewed at home.

Research Project Execution

- The entire recruitment is carried out and managed by the general field force of ADMAR.
- Research executives carry out all interviews.
- Usual norms of quality are followed both at the recruitment as well as before the interviewing stage to ensure data integrity.
- Research executives analyse all response contents.

Research Units

- Most of the houses surveyed were nuclear families living in flats with 4-6 members.
- Out of them 2-3 were families with school going children.
- The living room wears a functional look with a sofa or sofa-cum-bed, a centre table, wall paintings/hangings, bronze plates, wall paper decorations.
- The flats usually have attached dining and drawing rooms.
- The television and music systems are normally kept in the living room (in Mumbai) and in the bedroom (in Delhi). Normally there is a trend of multiple television ownership in Delhi.
- Washing machines are normally kept in the toilet or dining area.

Samples

- Life revolves around the house and family.
- In Delhi, mainly full-time housewives, whereas in Mumbai, it's the reverse.
- Cooking — she does it herself.
- *Bartan dhona, jharru-pochha* and dusting-the maid/servant does it.
- *Kapra dhona* — she does it herself.
- *Kapra dhona* — she does it herself in Delhi but not so in Mumbai.

Research at a Glance

- Typically the middle class and a few upper middle class families have a functional outlook.
- The housewife almost always holds the rein of the family with the husband as the financier.
- Most of the families apparently seem quite content with what they own.
- Household entertainment and kitchen gadgets form the basic possessions everywhere.
- There is wide variation evident across cities surveyed for items like car, cooler, air-conditioner, oven, vaccum cleaner.
- Washing machine—emerging as a necessity.

Example

Research Project Synopsis
Consumer Behaviour of Titan Quartz Watch

1. Introduction

A business firm comes into being because of the existence of consumers who have unfulfilled needs and wants. To fulfil consumers' needs, organisations are created. The consumer behaviour can be defined as, "The decision process and physical activity engaged in when evaluating, acquiring, using or disposing of goods and services". The term consumer is a far wider term as it comprises of not only the actual buyer or consumer but also users, *i.e.*, customers. There are two situations when this distinction between consumers and customers may occur:

- When the service or product is provided free.
- When the customer is not the actual user of the product or is only one of the many users.

2. Objectives of the Study

The objectives of the study are:

- To find out the consumers of Titan Watches.
- To find out why do these consumers buy this brand and not the competitors' brands.
- To analyse as to how watch consumers perceive Titan products to fulfil their needs.
- To evaluate whether they feel satisfied after having bought Titan product.
- To study the feelings of the consumers as reflected in their behaviour as consumers.

3. Research Methodology used for Carrying out the Study

- *Data Collection:* The study conducted is exploratory in nature. The data will be collected for 100 people — both males and females.
- *Data Analysis:* The technique of sampling used is stratified random sampling. Here the sample is based on three groups. First group is upto post-graduates, second group is employees and third group is above 45 years of age.
- *Statistical Analysis:* Consumer behaviour of users of Titan's Quartz watch is analysed by getting information from friends, newspapers, magazines, television and hoardings about the price and quality of the watch.

4. Application of Consumer Behaviour in Marketing

Marketing is defined as 'Human activity directed at satisfying needs and wants through the exchange process'. Consumer behaviour and marketing go hand in hand. Consumer behaviour has a number of applications in the area of marketing as given below:

- Analysis of Market Opportunity.
- Selection of the target market.
- Determination of the Product Mix.
  - ❖ Product
  - ❖ Price
  - ❖ Distribution
  - ❖ Promotion
- Non-Profit and Social Marketing.
  - ❖ *Analysis of Market Opportunity:* The study of consumer behaviour helps in identifying needs and wants which are not fulfilled. This is done by examining income status, consumers' lifestyle and emerging influences. Its rapidly rising sales graph is an indication of how well the product has satisfied the consumers' needs.
  - ❖ *Selecting the Target Market:* The study of consumers' trend would reveal distinct groups of consumers with very distinct needs and wants. Study of potential consumers for wrist watches reveal that there is a class of consumers who prefer Quartz watches on special occasions and use normal watches in their daily routine.
  - ❖ *Determining the Product Mix:* Having identified the unfulfilled needs slot and having modified the product to suit heterogenous consumers tests, the markets now have to get down to the brass tacks of marketing. They have to determine the right mix of product, price, promotion and advertising.
    - ◆ *Product:* The marketer has the product that satisfies hitherto unfulfilled consumer needs, but he must decide the size, shape and attributes of the products. Titan must figure out conspicuously to have predominant quality over other products to choose from. Does the product require any special kind of packaging? Does it need any guarantee or after sales services? The study of consumer behaviour also guides the marketer in making decisions regarding packaging.

◆ *Price:* Titan Company has already fixed the price the marketer should charge for the product. Should it be the same as that of the competing product or lower or higher? Should the price be market on the product or left to the discretion of the retailer?

◆ *Distribution:* Having determined the product size, packaging, shape and price, the next decision the marketer has to make is the distribution channel. What type of retail outlet should sell the products? Does the consumer look for the nearest convenient location or is he willing to travel some distance for buying the product?

◆ *Promotion:* The marketer here is concerned with finding the most effective methods of promotion which make the product stand out amongst the clutter of so many other brands and products which help to increase the sales objective and yet be within the budget.

❖ *Use in Non-profit and Social Marketing:* The knowledge of consumer behaviour is also useful in the marketing of non-profit or social or governmental service or institution.

5. Contribution from the Study

Consumer behaviour comprises the entire spectrum of activities and processes in which individuals engage when buying, using, acquiring or disposing of goods and services. The purchase is only one part of this range of activities. An understanding of consumer behaviour is of paramount importance to all persons engaged in a marketing activity. Its importance can be measured from the fact that:

• Behaviour of consumers can be understood.

• Behaviour can be influenced.

• The marketer can manipulate the influencing variables to his advantage. Having understood the behaviour of consumers and knowing that their behaviour can be influenced, the company can initiate a number of steps to do so.

5.4 RESEARCH REPORT WRITING

The last step in the research process is the preparation and presentation of the research report. The best of research efforts will be of little value unless the result can be summarised and communicated to marketing management in a form that is both understandable and useful. Preparation and presentation of the research report is the most important part of the research process. If the report is confusing or poorly written, all the time and effort spent on gathering and analysing data would not bring any result.

The purpose of this chapter is to give guidance in preparing a research report, which is simply the presentation of research findings to a specific audience. We will discuss two vital ingredients of this communication process: (1) the written research report and (2) the oral presentation typically provided for those who occupy executive positions. Along the way, we will review some of the more popular devices for graphical and visual support and how statistics can be used or misused to suit your needs.

Types of Research Reports

Depending on its intended audience, the research report may by either technical or popular in orientation. While both approaches describe the research study, its methodology, findings, conclusions and recommendations, they can differ considerably in terms of detail, writing style, use of technical terms and length. In general, the higher the executive status of the audience, the shorter the report will tend to be.

Technical Report

The technical report is generally intended for other researcher, or for research managers. The report should enable another researcher to be a critic of methodology, check calculations and accuracy and to follow everything which is done on a step-by-step basis. A brief definition of any technical term should be given.

The Popular Report

The popular report is intended for a more general audience, one that is not conversant with the details of research methods and terminology. Compared to the technical report, the presentation will be a bit more lively with increased attention to headlines, flow diagrams, charts, tables and occasional summaries for the purpose of stressing major points.

Because different kinds of audience may be interested in the results of the same marketing research study, it is sometimes necessary to write both a technical report and a popular report.

Guidelines for Writing a Report

Researchers who are effective in report writing agree that there are a series of guidelines which should be followed.

Consider the Audience: Make the report clear; use only words familiar to the readers and define all technical terms. To make the comparison of figures easier, use percentages, rounded off figures, ranks or ratios; put the exact data

in a table within the text or in the appendix. Use graphic aids (charts, graphs, pictures, etc.) wherever they help clarify the presentation of data.
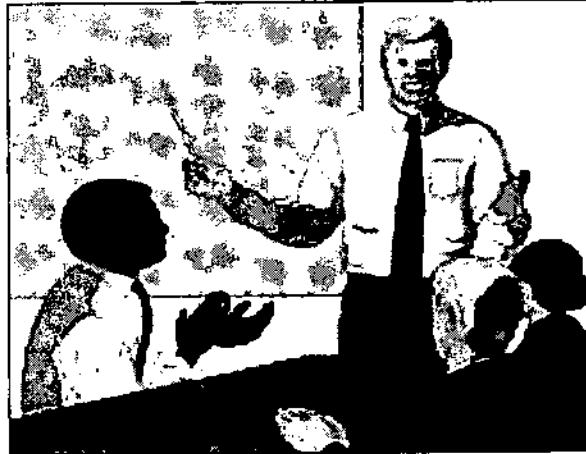
Address the Information Needs: Remember the research report is designed to communicate information to decision makers. Make sure it clearly relates the research findings to the objectives of management.

Be Concise, Yet Complete: Most managers will not want to read about the details of a research report. Knowing what to include and what to leave out is a confusion.

5.5 STEPS IN REPORT WRITING PROCESS

Two main attitudes must be cultivated while preparing to write a project report:

Attitude 1: Adopt the fresh mind approach (FMA)

Attitude 2: Adopt the kiss approach (keep it short and simple)

Fresh-Mind Approach (FMA)

Normally we proceed with a preoccupied mind as if the solution is available and the report is to be made suiting that solution. It is essential that a researcher must clear his mind of all preoccupations about the solution to the problem. If the data collection, investigation and analysis are done properly, the interpretation and recommendations may be quite different from what the researcher expected. Developing the fresh mind approach will help in avoiding the mindset about a situation, which is too common when dealing with a familiar work situation. We are always able to find fault with someone else's work, while we fail to see what is wrong with our own. In light of this, the person who is going to assess your work will adopt the above strategy of evaluating your work if sufficient originality, genuineness and a fresh approach has not be adopted by you. The project assessor certainly possesses the skills of assessing whether the work is done with FMA or otherwise.

Kiss Approach (Keep it Short and Simple)

Your project work is going to be read and evaluated by someone who:

- Maybe outside your organisation.

- May not be quite familiar with the field of study.
- May not be conversant with technical terms.

Therefore, you must write the project study such that:

- It is understandable.
- It is simple.
- It provides sufficient background information.
- It creates a clear picture in the mind of your work environment.
- It helps him understand the problem under study.

For the above you must:

- Use short sentences.
- Use simple language.
- Use logic.

Short sentences will help in avoiding grammatical mistakes, thus creating a good impression of the researcher. Avoid use of technical jargon. This may cause harassment to the assessor. If the use of technical terms in unavoidable, it is desired to include glossary of terms in the project report. Sometimes the researcher uses abbreviations. It is recommended that a page explaining the full form of abbreviations may also be included. In a nutshell, short sentences and simple language should be used throughout the report.

Tips to be followed:

- Use a friendly and informal tone.
- Explain things clearly.
- Avoid overloading with information.
- Use relevant anecdotes.
- Keep sentences, and paragraphs, short.
- Choose simple and familiar words.
- Avoid long phrases. Say although' rather than "Inspite of the fact that".
- Explain jargon and technical terms clearly.

Size.Report

Size of report will depend upon the subject matter and what is involved in the study.

All India Management Association, Centre for Management.Education, suggests that the report should be covered between 60 to 100 typed pages (double space). Each page must be typed only on one side leaving a wide margin.

School of Management Studies, Indira Gandhi National Open University (IGNOU) suggests that the length of the report may be about 50 to 60 double spaced typed pages not exceeding 18000 words (excluding appendices and exhibits). However, 10 per cent variation on either side is admissible.

Faculty of Management Studies, University of Rajasthan suggests an average size of the report is between 100-150 typed pages in 3/2 space.

Bearing in mind the time available to students to complete the report, and to facilitate the understandable anxiety of students who are doing this exercise for the first time, the size of the report is fairly good.

In practice, there is no mandatory length and the students should be guided by their project guides on this matter, in fact, the researcher should deal with the report without regard to its length ensuring that all the information is recorded and the report produced conforms to the requirements of the objectives of the study.

Check List
• Check whether all essential information is included.
• Check for proper structure.
• Check for clarity.
• Check for completeness.
• Check there is no unnecessary pending.
• Check that it essentially contributes to the objectives.
• Check if anything can be curtailed if it is too voluminous

In other words, write everything about the subject under study and structure it with the help or your guide. It is desirable to get the first draft typed in double space with a two inches margin on the right hand side of the page. This will give the opportunity to see:

- What the report looks like.
- What modifications are necessitated.

The margin and the spacing helps in entering corrections and additional information if desired. This also facilitates editing of the report.

Steps in Writing Report

The method of carrying out the study, assembling of data and compiling of a report should be carried on in the following eight (8) stages.

- Preparation
- Gathering the information
- Sorting, selecting, arranging and recording the material
- Writing the introduction
- Recording inferences
- Writing recommendations
- Preparing the report presentation
- Typing the report

Preparation

Ready yourself mentally for the task of project writing as explained in Fresh Mental Approach (FMA).

Be sure you accurately understand the purpose of your report and its objectives as defined in the project synopsis or terms of reference.

Put yourself in the position of the evaluator and ask yourself these questions.

- What information, *i.e.*, evidence and justification, would I require to arrive at a logical inference and make the right decision?
- As an evaluator, how much, if anything, do I already know about this subject? Decide on the following issues.

- ❖ Method of study
- ❖ What information do you need?
- ❖ Who is going to be involved?
- ❖ With whom you going to carry out your study?
- ❖ When are you going to carry out your study?
- ❖ Project plan — time schedule to complete the task.

It is extremely useful to relate the plan to a time schedule so that you know what to do and when, in order to complete the report by the required deadline (Prepare a CPM by breaking down the project activities into sub-tasks and allocate a duration to each sub-task).

Gathering the Material

At this stage, don't attempt to write the report. Collect all the information, *i.e.*, facts, figures and ideas, about the subject by whatever means available. Some of the means used in gathering the information are briefly given as under.

By Observation

Don't rely on your memory. While observing an operation or coincidence or a situation, record the sequence in detail. Look at it, watch it, time it and record everything you see.

By Reading

Published work of other researchers on similar issues, factual documentation produced within the organisation (if the study is about an organisation), documentation of professional bodies will often provide enough information relative to your subject. Give credit in your report to the source of such information.

By Interviews

Interviews can be formal or informal depending upon their nature and the person being interviewed. Keep the following points in mind:

- Plan your interview
- Give your interviewee notice of your subject
- Prepare your questions beforehand
- Don't rush an interview
- Focus on substance
- Be accurate

By Discussion

Hold discussions with your colleagues, guide, and any interested person in the subject. Respect their views.

By Surveys

Surveys are carried out to assess customer opinion and reaction. These are also useful in understanding people's attitudes. Questionnaires are useful instruments in carrying out surveys. Care must be taken in preparing the questionnaire and, if in doubt, seek the advice of your guide. Include copies of the questionnaires and of their analysis in your report.

By Secondary Sources

Secondary sources have been discussed in detail in Chapter 4.

By Enquiries

Enquiries can be made from manufacturing or service industry through letters, fax or telephone.

Explain

- Who you are
- Purpose of your enquiry

Be polite while asking for their help. Generally you will receive a favourable response and these sources of information can be most valuable. Give credit to such informants and always thank them for their help. Acknowledge their support in your report. Use your knowledge and experience

By experiment

Try something and see if it works. Record the details and verify the results. If there is any doubt about the accuracy of the information, try and check and verify it from another source.

If it is not possible to verify the information, discard it or quote it as uncorroborated. Always be sure of the facts.

Make liberal use of visuals, *i.e.*, diagrams, maps, charts, photographs, statistical tables. Even sometimes it may be appropriate to attach sample products to illustrate and explain your text. This will make your report visually attractive and interesting.

Avoid using memory and prejudice. These can often lead to distorted facts. As a report writer always carry a notebook with you and note down pieces of information or ideas or things to do at the time they come to you, instead of relying upon the memory. Once you have written it down you can concentrate on something else.

At this stage you will have sufficient information in the form of notes, collections from various published data, survey data and so on. The next step is to sort it all out.

Sorting, Selecting, Arranging and Recording Material

Having assembled all your material, check to ensure that you have all you need to support your arguments. Arrange it in logical sequence, start to finish, ensuring a natural flow.

The questionnaires, surveys and any other similar document should be explained properly. To ensure clarity to the readers adequate notations should be used for visuals, *i.e.*, diagrams, maps, charts, photographs, statistical tables.

If illustrations are used to explain a particular part of the text and are not going to be referred to several times, insert them in the appropriate position in the text.

If the evaluator needs to refer to these illustrations several times or if they form a supportive material it should be put in the appendices section at the end of the report.

At this stage, clear your mind and go through what you have written. Put following questions to yourself.

- Is it clear?
- Does it make any sense?
- Does it clearly specify or indicate problem areas?
- Does it lead you to the "conclusion" section logically?

Writing the Introduction

While writing the introduction take following points into consideration:

- Create a background of the organisation and work situation for which the project work is being done.
- Describe the purpose of study.
- Describe the method of study.
- Explain difficulties encountered in the preparation of report.
- Introduce yourself, your institution/organisation briefly.
- Ensure continuity between all sections.

Recording Inferences

The conclusions or findings should flow from the outcome of the investigations. These findings should lead to concrete recommendations. While writing conclusions, the objectives of the study should be kept in mind. This will facilitate in understanding the quality of investigations and gauge the success of work. Summary of the problem areas followed by explanation of the various alternative solutions to the problem should be undertaken and the reason for accepting or rejecting the possible alternative should be explained logically.

Writing Recommendations

While writing recommendations you must adopt a positive attitude and enlist those points first, which you really want to be done. You must adopt a constructive approach. This section may be started as follows.

It is recommended that (provide a list of recommendations or action you feel should be taken)

1.
2.
3.
4.
5.
6.
7.

If the recommendations involve financial figures of statements, these should be shown against each item. Don't repeat what you have written. In conclusion, you may give a cross reference of a relevant paragraph if you want to include something in this section.

Give your Report a Positive Ending

At this stage the text of the report is complete and you are ready to go the next stage, *i.e.* presentation of the report.

Report Presentation

Stitch together all the different threads of information into a coherent whole. Present the data in the form as suggested in the chapter plan. Write the first draft. Discuss with your guide and incorporate the suggested modifications. Revise the document and type it finally. The graphics play a significant role in report image and care must be taken about the visual aspects of the report.

Visual Aspects of the Report

Many reports require communication of voluminous and complex information. It is not possible to do this job with words only. Graphics portray things that would take volumes to explain through words. Technical reports, in particular, cannot be completed without use of graphics. The main role of graphics in a report is:

- To support text to communicate report content. To emphasise key points.
- To make the report attractive.
- To add interest.
- To save time.
- To increase credibility.
- To add variety.
- To create impact.
- To help the reader to remember main points.

Before organising the report, you must think and plan:

- What graphics are to be used?
- How many graphics are to be used?
- Where to use graphics in the text?

The graphics used in reports are normally:

- Charts
- Graphs
- Photographs
- Maps

How many graphics are to be used

Each graphic should be selected such that it serves to communicate a specific point of the report. Random use of graphics should be avoided. There is no set rule to determine the number of graphics. However, plan what is required to be communicated effectively through graphics and include these graphics only.

Where to use graphics in the text

The graphics should be placed in such a position that they are likely to be there where they are required to be seen.

Consider following points while placing graphics:

- Place them close to the related text.
- If the graphic is large, and is of full size, place it on the page following the text.

- If the graphic is small, place it appropriately and surround it with the related text.
- Graphics which are not discussed in the main report but support the discussion should be appended.
- Always make reference of the graphic in the text to invite to reader to refer it.
- Always use rules and borders to enhance presentability.
- Use colour if you have access to colour printers.
- Number graphics and title appropriately.

Types of Visual Aids/Graphics

The common type of visual aids used in communicating data are:

- Bar charts
- Line or area charts
- Pictogram
- Pie charts
- Pictorial diagrams

General Points about Charts

Your illustrations should include
- Appropriate title and units
- Scales or labels on axes
- Key
- Source of data (if from outside source)
- Caption to the chart

Bar charts

Bar charts are:
- Easy to draw
- Familiar to all
- Good for making comparison

While using bar charts ensure:

- The order of categories should be logical and match any tallies of the same data.
- The width of all the bars should be kept same.
- Start the vertical axis at zero (0), if possible.
- If it is unavoidable to start at other than zero (0), indicate this clearly by a break in each bar or in the vertical axis, with a zig-zag or wavy stroke across each end of the break.

Stacked Bar Chart

These charts show the total well. It is difficult to compare heights of the sections with stack bar charts. The stacked bar charts should not be used if the total height has no meaning.

Line or Area Chart

Line and area bar charts are used when there is logical order of points. The order of North (N), South (S), West (W), and East (E) could be changed giving a completely different pattern to the graph so it is not a good chart for this data.

Pictograms

A picture or symbol standing for a word or group of words A chart on which symbols are used to represent values.

Pie Charts

Pie charts are the commonly used visual aids. The disadvantage of pie chart is that it is not possible to show any category that has zero (0) frequency.

Use a pie chart when you want to compare a number of elements to each other and in relation to a whole. If you compare the same information expressed as regular rectangular blocks to a pie graph, you see that the bars are more precise in comparing elements to each other, but that the pie graph is much more effective comparing elements to the whole. One of the fundamental rule of using pie chart is "Never include more than 6 elements." If you have more than this number only show six main elements and include the others under a diverse heading. If necessary break down the diverse category into a second pie graph.

The pie graph can be made more attractive by:

- Adding pattern to each part
- Using colours
- Adding depth

Two Variables Diagrams

These diagrams are very important when illustration of more than one variable is needed. It is of great significance to determine, which variable should be put on which axis.

They illustrate the total number of each sex respondents questioned, but this may not be what you want to illustrate. They also illustrate the total number of people in each category clearly.

It is more logical to have 'sexes' on the horizontal axis for a percentage stacked bar chart where the response of sexes are being compared. Illustrates a percentage stacked bar chart where responses of the sexes are compared.

For showing the comparison, multiple bar charts are constructed. Always provide a gap between the bars for clarity.

Area Charts

Area charts illustrate how it stacks the data like a stacked bar chart and so indicates total record data.

Typing the Report

For report typing, A4 size of paper is recommended. It is of a standard size and will present no difficulty with covers, binding, photocopying and dividing cards between the sections. The margins should be kept as suggested earlier in this chapter.

Make sure:

- Each section of the report starts on a new page.
- Indicate where capitals, italics and underlining are required.
- If using DTP indicate bold, capital, front type and font size required.
- All headings and sections and sub-sections are clearly indicated.
- Indicate where any indentations of the text are required for the ease of reading.

It is recommended that a clear system of identification is issued for sections, subsections and paragraphs for the speed of reference. A typical example is as follows:

Section Headings	1	2	3
Sub-sections	1.1	2.1	3.1
	1.2	2.2	3.2
	1.3	2.3	3.3
Paragraphs	1.1.1	2.1.1	3.1.1
	1.1.2	2.1.2	3.1.2
	1.1.3	2.1.3	3.1.3
	1.2.1	2.2.1	3.2.1
	1.2.2	2.2.2	3.2.2
Sub-paragraphs	1.1.1(a)	2.1.1(b)	3.1.1(a)
	(b)	(b)	(b)
	(c)	(c)	(c)

Important Note

The sample reports given in the book, the main reports with appended parts. These are only typical reports to support the report writers in understanding the principles of report writing Each report will be unique depending upon the topic of research.

To submit the report, the prefatory parts should be added in the main report. The typical sample of a prefatory part is given in the book at appropriate places.

Check List for project report before final binding (Typical)
Ensure the prefatory parts are enclosed in the following sequence after the tittle page:

- Approved project proposal proforma
- Synopsis
- The certificate of originality of work
- Letter of authorisation
- Letter of transmittal
- Acknowledgements

> Ensure the main report contains:
> • Table of contents
> • Table of illustrations, glossary of terms, abbreviations, executive summary, introduction, main report with chapter plan, recommendations and limitations.
> Ensure appended parts contains:
> • Bibliography
> • Appendix
> • Any other source of information

Final Remarks

As soon as your project has been typed, read it carefully and correct any errors. Consider following questions about your report.

> • Does it look a presentable document?
> • Does it make sense?
> • Does it meet objectives of study?
> • Is it clear and understandable?
> • Is it factual, logical, conclusive?
> • Will the evaluator/reader be stimulated to read it?
> • Are you satisfied with it?
> • Is your guide satisfied with it?

The researcher should get the report signed by the guide. Determine the number of copies required before going for photocopying. It is preferable, but not necessary, to reproduce photographs and other illustrations in original. The original copy which goes to the assessor and the copy which goes to the library must be presentable. The library copies in all probability may be referred by your juniors.

A bit of advice

Your guide is the person who is supposed to be with you throughout the preparation of the report. Don't hesitate to bring your problems to his notice. Seek his advice. Be guided by him. Respect him. Involve him.

5.6 DOCUMENTATION AND BIBLIOGRAPHY

While writing your report you are likely to use the information which is not your own information. The information which is developed through secondary sources must be foot-noted. It should also be listed in the bibliography. It is always advisable to acknowledge the referred material when it is not a general knowledge. For acknowledging the sources a standard (*e.g.*, BIS, Harward, APA, Chicago, MLA) reference system should be selected. It should be followed throughout the report consistently. Some typical examples of recording informations are discussed below:

Guidelines for Getting Information

Determination is a major word to keep in mind when looking for facts. If you don't find what you need in one reference, look for other sources. Never give up and stop with one or two attempts.

Guidelines for Getting Information
- Scan material to find out if it is relevant to your project study.
- Check the credibility of the material by considering its text:
  - ❖ Source
  - ❖ Publisher
  - ❖ Author
  - ❖ Current data.
- Everything in print is not necessarily true. Check for genuineness.
- Look for several viewpoints on a subject. Don't depend on one

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Guidelines for Recording Information

Although you may find considerable information on a subject, the real test of your research ability comes in getting the important facts down in a form that is easily understandable. Volumes of inconsistent information do not yield adequate information for preparing reports.

Follow these guidelines when taking notes:

Guidelines for Recording Information
- Use separate sheets of paper or help cards for each source.
- Make a tentative bibliography by writing down the titles which appear to offer the information you require.
- Keep the papers or help cards in alphabetical order.
- Write in ink.
- Use a consistent bibliographical form.
- Prepare an outline that will give direction to your investigation.

Note: Usually, bibliography material is recorded on 3 × 5 inch help cards, and notes are made on 4 × 6 inch help cards. Cards are made from thick sheets of paper.
- Place a heading, keyed to your outline, on each help card.
- Use direct quotations only when they are significant. Enclose quoted material in quotation marks, taking care to copy each word exactly as written.
- Use footnotes to give credit for another person's idea which you are using.
- Arrange your notes in the order of the outline to facilitate their use for the basis of the report.

Preparing Footnotes

Footnotes are single spaced and indented five spaces with footnote typed slightly above the line. The names of authors are given in normal order. Commas are used to separate main items. Each footnote ends with a period.

These examples will guide the author to write footnotes:

Books

(One author)
- Robert Cameron, Statistics for Business (New York: Oxford Press, 1971), p. 35.

(Two authors)

- M.K. Rampal and S.L. Gupta, Cases and Simulation in Marketing (New Delhi: Galgotia Publishing Company, 1999), p. 101.

(Three authors)

- Ruth Goldhammer, Arthur McGille, and Clyda Bailey, Marketing Ideas for Today (Columbus: University Printers, 1973), p. 44.

(More than three authors)

- Carla samples et al. Survey Methods for Business (New York: Capital Publishers, 1970), p. 58.

(An editor)

- M.K. Rampal, Cases in Service Marketing (New Delhi: Galgotia Publishing Company, 2000), p. 84.

(Corporate authorship)

- S.R. Lubeck Committee, Administrative Techniques for Corporations (San Francisco: American Administrative Association, 1970), p. 223.

Magazines and Newspapers

(Article in a weekly magazine with no author given)

- "Trends in Office Equipment," Office Equipment, January 1977, pp. 88-90. (Article in a weekly magazine with author given)

- Rajni Rampal, "Motivating Executives, "Marketing News, 20, No. 5 (1999), 52. A news story with author given)

- Ashok Galgotla, "Current Legislation Affecting Business," Delhi Monitor, 16 Feb, 1998, p. 8, col. 4.

(A news story with no author given)

- "Coping with Income Taxes," The Daily News, 4 July 1995, p. 3, col. 1.

Encyclopedias

(An article in reference work with author given)

- "Facts About the Bureau of the Census," Trinity Encyclopedia, 1970, VII, 493. (An article in a reference work with no author given)

- Ben Miller, "Secretarial Skills for the Seventies", Modern Encyclopedia, 1972, X, 477.

Bulletins and Pamphlets

Guidelines for Managers (Washington, D.C.: Associated Managers of the United States, 1977), p. 17.

Highlights of the Annual Meeting of the Personnel Management Association; Personnel Management Association Publication No. A-22 (Washington, D.C.: Washington University Press, 1970), p. 35.

Footnote Pointers

Acknowledgments

- Footnotes are used to acknowledge and document material taken from sources. Failure to give credit for borrowed material is plagiarism.

Placement

- Footnotes may appear at the bottom of the page on which the quoted material is used or at the end of each chapter or at the end of an entire work.

Numbering

- Footnotes may be numbered consecutively throughout the entire work or numbered consecutively by chapter.

Printing

- Footnotes appear in print as single spaced with double spacing separating one footnote from another. However, in manuscript copy, footnotes are double spaced with triple spacing separating one footnote from another.

Referencing the same source

- Use ibid., (in the same place), to indicate that the source is exactly the same one as in the immediately preceding footnote.

Example

(First reference)

- Rampal M.K., Industrial Marketing (New Delhi: Galgotia Publishing Company, 2001), p. 80.

(Repeated reference)

- Ibid., p. 70.

> **NOTE**
> If the page number is not different, simply use Ibid

Preparing Bibliography

Bibliography is a list of publications or works which the researcher has used in the preparation of the report. In other words, this should be a list of acknowledgements of sources of information other than personal contacts.

The need for referencing is two fold:

- It enables the researcher and the evaluator to identify the source of the information or argument, they may consult that source directly when the need arises.
- It helps you to avoid plagiarism, the effects of which may be the payment of a severe penalty.

Referencing Guidelines

Reference is required whenever you:

- Quote anything. If the quotation is taken from a book or article by a third person, then you need to make this clear in your reference; thus you would cite the original source, indicating that it has been quoted by that third person – identifying also that source.
- Refer explicitly to the work of a particular writer, even where no direct quotation is involved.
- Say something which is the most important element in your argument, for which a reference can be given.

No reference is required to support:

- Factual Information or general statements which are clearly common knowledge. An argument that derives from large number of different sources.

The Reference Form

Once again there are no common rules that all researchers follow, but there are two key principles which every effective form of citation follows:

- Whatever system of citation you employ in a particular piece of work, it is crucial that you are consistent. Thus, once you have decided on the set of conventions you are going to follow, make sure that you follow it rigorously and consistently throughout the piece of writing.
- References should always be full enough to enable the reader to follow them up with a minimum of difficulty. Thus, it is essential that every reference identifies the particular page number(s). A reference that leaves the reader to find his or her own way to the appropriate part of the book is of very little value, unless of course it is infact the whole book to which you want to refer.

Books

(One author)

Singh Harpal, Indian Company Law', New Delhi: Galgotia Publishing Company, 1999.

(Two authors)

Bailey, Clyda, and John O'Donnell, The Economic World, American Economists Association, Chicago: Cronkite Publishing House, 1979.

(Three authors)

Gupta Nirmal, Jain R.K. and Malik R.K., Elements of Accounting. New Delhi: Galgotia Publishing Company, 1998.

(More than three authors)

Griffith, Donna Jean, et al, Problems in Editing. Boston: Hartcourt and Company, 1976.

(An editor)

Cammero, T.J., ed. Corporations and Organisational Psychology. New York: Wilson Publishers, 1979.

(Corporate authorship)

Committee on Business Research. Research Design for Business. Pittsbugh: University Press, 1974.

Magazines and Newspapers

(Article in a weekly magazine with no author given)

"Today's Stocks," Business World, 2 April 1977, pp, 21-23.

(Article in a weekly magazine with author given)

Kristen, Dorothy. "Women in Personnel Management." American Management Association, 12 March 1978, pp. 18-20.

(A news story with author given)

Clee, Peter, "Financial Trends." New York Daily, 26 April 1973, p. 4, cols. 3-4.

(A news story with no author given)

"The Rampage of Inflation." The Cleveland Monitor, 16 December 1972, p.5. cols. 1-2:

Encyclopedias

(An article in 8 reference work with author given)

Johnson, Samuel T. "The Design of Organisations." Encyclopedia Britannica, 1970, X, 776.

(An article in a reference work with no author given)

"Career Guidance." The Modern Encyclopedia, 1975, XII, 456-51.

Bulletins and Pamphlets

Organisations Planning, Washington, D.C.: American Association of Administrators, 1978.

Motivating Employees. Dept. of Health, Education, and Welfare. Washington, D.C.: U.S. Government Printing Office, 1971.

Citing Electronic References

This is a relatively new area and stilt in a state of flux however, the basic components of the reference citation are:

- Author [surname comma first initials].
- Title of work.
- Title of complete work.
- Protocol and address.
- Path.
- Date of message or visit.

Abbreviations

cf.	Compare. Also abbreviated cp.
Et. Al,	And others [et al l aliae].
e.g.	for example [example gratial]. Not in italics; preceded by comma.
etc.	And so forth. Should never be used in formal writing .
ff.	following
ibid	in the same place [ibidem]. Used to refer to the book, chapter, article or page cited just before. Not in italics.
Idem	the same as; as mentioned before. Used to indicate a reference previously mentioned, is generally used to refer to the author's name while ibid. refers to the book title.
i.e.	that is [id est]. Not in italics and preceded by a comma.
	inter alia among other things. In italics.
loc. cit.	in the place cited [loco citato]. Not in italics.
op. cit.	in the work quoted (opere citato). Not in italics.
sup.	above [supra]. In italics.
[sic]	thus; so. Used to indicate that a surprising or dubious word, phrase, or fact is not a mistake and is to read as it stands. With brackets.
Ivde	see.
vide infra	see before. In italics.
see supra	see above. In italics; abbreviated v.s.
	vis-a-vis face-to-face. With hyphens.
viz.	namely. Not in italics.

- Practice the presentation several times. If possible, have someone comment on how to improve its effectiveness.
  During the presentation.
- Start the presentation with an overview—tell the audience what you are going to tell them.
- Face the audience directly at all times.
- Talk to the audience or decision makers, rather than read from a script or a projection screen.
- Use visual aids effectively—charts and tables should be simple and easy to read.
- Avoid distracting mannerisms while speaking.
- Remember to ask the audience if they have any questions after your report is concluded.

SUMMARY

A good marketing research report possesses of adhering to the study objectives. A marketing research report must ensure that it has covered all the issues. The marketing researcher should logically justify their choice of data, presentation of data and findings.

The standard format of the research report may also be used for report purpose. Deviations from this are allowed to make it interesting and informative to the reader by incorporating the nature of the product and highlights of the research findings. The user must also have an inherent understanding of the research process used, the assumptions made and limitations of the research, to rule out being taken for a ride on statistical figures which are distorted at times to meet the requirements of the marketer.

- A research report is the presentation of the research findings for a specific purpose. The presentation can be written or given orally or both.
- The guidelines for written and oral reports are (a) consider the audience (b) be concise yet complete and (c) be objective yet effective.
- The main elements of the written report are (a) the title page (b) the table of contents (c) the management summary (d) the body of the report (e) the conclusions and recommendations and (f) the appendix.
- The research data can be presented in tabular or graphic form. The three types of graphic forms are (a) the pie chart (b) the bar chart and (c) the line chart.

REVIEW QUESTIONS

1. Discuss various types of report and guidelines for writing report.
2. Discuss steps involved in report writing process.
3. What do you mean by documentation and bibliography?
4. Write short notes on
   (a) Research Proposal   (b) Costing