

RESEARCH METHODS FOR MANAGEMENT

UNIT I

RESEARCH INTRODUCTION AND DEFINITIONS :

Research is undertaken within most professions.

More than a set of skills, it is a way of thinking: examining critically the various aspects of your professional work.

It is a habit of questioning what you do, and a systematic examination of the observed information to find answers with a view to instituting appropriate changes for a more effective professional service.

DEFINITION OF RESEARCH

When you say that you are undertaking a research study to find answers to a question, you are implying that the process;

1. is being undertaken within a framework of a set of philosophies (approaches);
2. uses procedures, methods and techniques that have been tested for their validity and reliability;
3. is designed to be unbiased and objective .

Philosophies means approaches e.g. qualitative, quantitative and the academic discipline in which you have been trained.

Validity means that correct procedures have been applied to find answers to a question. Reliability refers to the quality of a measurement procedure that provides repeatability and accuracy.

Unbiased and objective means that you have taken each step in an unbiased manner and drawn each conclusion to the best of your ability and without introducing your own vested interest.

(Bias is a deliberate attempt to either conceal or highlight something).

Adherence to the three criteria mentioned above enables the process to be called 'research'.

However, the degree to which these criteria are expected to be fulfilled varies from discipline to discipline and so the meaning of 'research' differs from one academic discipline to another.

The difference between research and non-research activity is, in the way we find answers: the process must meet certain requirements to be called research. We can identify these requirements by examining some definitions of research. The word research is composed of two syllables, re and search. re is a prefix meaning again, anew or over again search is a verb meaning to examine closely and carefully, to test and try, or to probe. Together they form a noun describing a careful, systematic, patient study and investigation in some field of knowledge, undertaken to establish facts or principles.

Importance of Knowing How Research is Done

The study of research methodology gives the student the necessary training in gathering material and arranging or card-indexing them, participation in the field work when required, and also training in techniques for the collection of data appropriate to particular problems, in the use of

statistics, questionnaires and controlled experimentation and in recording evidence, sorting it out and interpreting it. In fact, importance of knowing the methodology of research or how research is done stems from the following considerations:

- (i) For one who is preparing himself for a career of carrying out research, the importance of knowing research methodology and research techniques is obvious since the same constitute the tools of his trade. The knowledge of methodology provides good training specially to the new research worker and enables him to do better research. It helps him to develop disciplined thinking or a 'bent of mind' to observe the field objectively. Hence, those aspiring for careerism in research must develop the skill of using research techniques and must thoroughly understand the logic behind them.
- (ii) Knowledge of how to do research will inculcate the ability to evaluate and use research results with reasonable confidence. In other words, we can state that the knowledge of research methodology is helpful in various fields such as government or business administration, community development and social work where persons are increasingly called upon to evaluate and use research results for action.
- (iii) When one knows how research is done, then one may have the satisfaction of acquiring a new intellectual tool which can become a way of looking at the world and of judging every day experience. Accordingly, it enables use to make intelligent decisions concerning problems facing us in practical life at different points of time. Thus, the knowledge of research methodology provides tools to look at things in life objectively.
- (iv) In this scientific age, all of us are in many ways consumers of research results and we can use them intelligently provided we are able to judge the adequacy of the methods by which they have been obtained. The knowledge of methodology helps the consumer of research results to evaluate them and enables him to take rational decisions.

Research Process

Before embarking on the details of research methodology and techniques, it seems appropriate to present a brief overview of the research process. Research process consists of series of actions or steps necessary to effectively carry out research and the desired sequencing of these steps.

The chart indicates that the research process consists of a number of closely related activities, as shown through I to VII. But such activities overlap continuously rather than following a strictly prescribed sequence. At times, the first step determines the nature of the last step to be undertaken. If subsequent procedures have not been taken into account in the early stages, serious difficulties may arise which may even prevent the completion of the study. One should remember that the various steps involved in a research process are not mutually exclusive; nor they are separate and distinct. They do not necessarily follow each other in any specific order and the researcher has to be constantly anticipating at each step in the research process the requirements of the subsequent steps. However, the following order concerning various steps provides a useful procedural guideline regarding the research process: (1) formulating the research problem; (2) extensive literature survey; (3) developing the hypothesis; (4) preparing the research design; (5) determining sample design; (6) collecting the data; (7) execution of the project; (8) analysis of data; (9) hypothesis testing; (10) generalisations and interpretation, and (11) preparation of the report or presentation of the results, i.e., formal write-up of conclusions reached.

A brief description of the above stated steps will be helpful.

1. Formulating the research problem: There are two types of research problems, viz., those which relate to states of nature and those which relate to relationships between variables. At the very outset the researcher must single out the problem he wants to study, i.e., he must decide the general area of interest or aspect of a subject-matter that he would like to inquire into. Initially the problem may be stated in a broad general way and then the ambiguities, if any, relating to the problem be resolved.

2. Extensive literature survey: Once the problem is formulated, a brief summary of it should be written down. It is compulsory for a research worker writing a thesis for a Ph.D. degree to write a synopsis of the topic and submit it to the necessary Committee or the Research Board for approval. At this juncture the researcher should undertake extensive literature survey connected with the problem.

3. Development of working hypotheses: After extensive literature survey, researcher should state in clear terms the working hypothesis or hypotheses. Working hypothesis is tentative assumption made in order to draw out and test its logical or empirical consequences. As such the manner in which research hypotheses are developed is particularly important since they provide the focal point for research. It also indicates the type of data required and the type of methods of data analysis to be used.

How does one go about developing working hypotheses? The answer is by using the following approach:

- (a) Discussions with colleagues and experts about the problem, its origin and the objectives in seeking a solution;
- (b) Examination of data and records, if available, concerning the problem for possible trends, peculiarities and other clues;
- (c) Review of similar studies in the area or of the studies on similar problems; and
- (d) Exploratory personal investigation which involves original field interviews on a limited scale with interested parties and individuals with a view to secure greater insight into the practical aspects of the problem.

Thus, working hypotheses arise as a result of a-priori thinking about the subject, examination of the available data and material including related studies and the counsel of experts and interested parties. Working hypotheses are more useful when stated in precise and clearly defined terms.

4. Preparing the research design: The research problem having been formulated in clear cut terms, the researcher will be required to prepare a research design, i.e., he will have to state the conceptual structure within which research would be conducted. The preparation of such a design facilitates research to be as efficient as possible yielding maximal information. In other words, the function of research design is to provide for the collection of relevant evidence with minimal expenditure of effort, time and money. But how all these can be achieved depends mainly on the research purpose. Research purposes may be grouped into four categories, viz., (i) Exploration, (ii) Description, (iii) Diagnosis, and (iv) Experimentation. A flexible research design which provides opportunity for considering many different aspects of a problem is considered appropriate if the purpose of the research study is that of exploration. But when the purpose happens to be an accurate description of a situation or of an association between variables, the suitable design will be one that minimises bias and maximises the reliability of the data collected and analysed.

5. Determining sample design: All the items under consideration in any field of inquiry constitute a 'universe' or 'population'. A complete enumeration of all the items in the 'population' is known as a census inquiry. It can be presumed that in such an inquiry when all the items are covered no

element of chance is left and highest accuracy is obtained. But in practice this may not be true.

In practice, several of the methods of sampling described above may well be used in the same study in which case it can be called mixed sampling. It may be pointed out here that normally one should resort to random sampling so that bias can be eliminated and sampling error can be estimated. But purposive sampling is considered desirable when the universe happens to be small and a known characteristic of it is to be studied intensively. Also, there are conditions under which sample designs other than random sampling may be considered better for reasons like convenience and low costs.

The sample design to be used must be decided by the researcher taking into consideration the nature of the inquiry and other related factors.

6. Collecting the data: In dealing with any real life problem it is often found that data at hand are inadequate, and hence, it becomes necessary to collect data that are appropriate. There are several ways of collecting the appropriate data which differ considerably in context of money costs, time and other resources at the disposal of the researcher.

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

- (i) By observation: This method implies the collection of information by way of investigator's own observation, without interviewing the respondents. The information obtained relates to what is currently happening and is not complicated by either the past behaviour or future intentions or attitudes of respondents. This method is no doubt an expensive method and the information provided by this method is also very limited. As such this method is not suitable in inquiries where large samples are concerned.
- (ii) Through personal interview: The investigator follows a rigid procedure and seeks answers to a set of pre-conceived questions through personal interviews. This method of collecting data is usually carried out in a structured way where output depends upon the ability of the interviewer to a large extent.
- (iii) Through telephone interviews: This method of collecting information involves contacting the respondents on telephone itself. This is not a very widely used method but it plays an important role in industrial surveys in developed regions, particularly, when the survey has to be accomplished in a very limited time.
- (iv) By mailing of questionnaires: The researcher and the respondents do come in contact with each other if this method of survey is adopted. Questionnaires are mailed to the respondents with a request to return after completing the same. It is the most extensively used method in various economic and business surveys. Before applying this method, usually a Pilot Study for testing the questionnaire is conducted which reveals the weaknesses, if any, of the questionnaire. Questionnaire to be used must be prepared very carefully so that it may prove to be effective in collecting the relevant information.
- (v) Through schedules: Under this method the enumerators are appointed and given training. They are provided with schedules containing relevant questions. These enumerators go to respondents with these schedules. Data are collected by filling up the schedules by enumerators on the basis of replies given by respondents. Much depends upon the capability of enumerators so far as this method is concerned. Some occasional field checks on the work of the enumerators may ensure sincere work.

The researcher should select one of these methods of collecting the data taking into consideration the nature of investigation, objective and scope of the inquiry, financial resources, available time and the desired degree of accuracy. Though he should pay attention to all these factors but much depends upon the ability and experience of the researcher. In this context Dr A.L. Bowley very aptly remarks that in collection of statistical data commonsense is the chief requisite and experience the chief teacher.

7. Execution of the project: Execution of the project is a very important step in the research process. If the execution of the project proceeds on correct lines, the data to be collected would be adequate and dependable. The researcher should see that the project is executed in a systematic manner and in time. If the survey is to be conducted by means of structured questionnaires, data can be readily machine-processed. In such a situation, questions as well as the possible answers may be coded. If the data are to be collected through interviewers, arrangements should be made for proper selection and training of the interviewers. The training may be given with the help of instruction manuals which explain clearly the job of the interviewers at each step. Occasional field checks should be made to ensure that the interviewers are doing their assigned job sincerely and efficiently. A careful watch should be kept for unanticipated factors in order to keep the survey as much realistic as possible. This, in other words, means that steps should be taken to ensure that the survey is under statistical control so that the collected information is in accordance with the pre-defined standard of accuracy. If some of the respondents do not cooperate, some suitable methods should be designed to tackle this problem. One method of dealing with the non-response problem is to make a list of the non-respondents and take a small sub-sample of them, and then with the help of experts vigorous efforts can be made for securing response.

8. Analysis of data: After the data have been collected, the researcher turns to the task of analysing them. The analysis of data requires a number of closely related operations such as establishment of categories, the application of these categories to raw data through coding, tabulation and then drawing statistical inferences. The unwieldy data should necessarily be condensed into a few manageable groups and tables for further analysis. Thus, researcher should classify the raw data into some purposeful and usable categories. Coding operation is usually done at this stage through which the categories of data are transformed into symbols that may be tabulated and counted. Editing is the procedure that improves the quality of the data for coding. With coding the stage is ready for tabulation. Tabulation is a part of the technical procedure wherein the classified data are put in the form of tables. The mechanical devices can be made use of at this juncture. A great deal of data, specially in large inquiries, is tabulated by computers. Computers not only save time but also make it possible to study large number of variables affecting a problem simultaneously.

Analysis work after tabulation is generally based on the computation of various percentages, coefficients, etc., by applying various well defined statistical formulae. In the process of analysis, relationships or differences supporting or conflicting with original or new hypotheses should be subjected to tests of significance to determine with what validity data can be said to indicate any conclusion(s). For instance, if there are two samples of weekly wages, each sample being drawn from factories in different parts of the same city, giving two different mean values, then our problem may be whether the two mean values are significantly different or the difference is just a matter of chance. Through the use of statistical tests we can establish whether such a difference is a real one or is the result of random fluctuations. If the difference happens to be real, the inference will be that the two samples

come from different universes and if the difference is due to chance, the conclusion would be that the two samples belong to the same universe. Similarly, the technique of analysis of variance can help us in analysing whether three or more varieties of seeds grown on certain fields yield significantly different results or not. In brief, the researcher can analyse the collected data with the help of various statistical measures.

9. Hypothesis-testing: After analysing the data as stated above, the researcher is in a position to test the hypotheses, if any, he had formulated earlier. Do the facts support the hypotheses or they happen to be contrary? This is the usual question which should be answered while testing hypotheses. Various tests, such as Chi square test, t-test, F-test, have been developed by statisticians for the purpose. The hypotheses may be tested through the use of one or more of such tests, depending upon the nature and object of research inquiry. Hypothesis-testing will result in either accepting the hypothesis or in rejecting it. If the researcher had no hypotheses to start with, generalisations established on the basis of data may be stated as hypotheses to be tested by subsequent researches in times to come.

10. Generalisations and interpretation: If a hypothesis is tested and upheld several times, it may be possible for the researcher to arrive at generalisation, i.e., to build a theory. As a matter of fact, the real value of research lies in its ability to arrive at certain generalisations. If the researcher had no hypothesis to start with, he might seek to explain his findings on the basis of some theory. It is known as interpretation. The process of interpretation may quite often trigger off new questions which in turn may lead to further researches.

11. Preparation of the report or the thesis: Finally, the researcher has to prepare the report of what has been done by him. Writing of report must be done with great care keeping in view the following:

1. The layout of the report should be as follows: (i) the preliminary pages; (ii) the main text, and (iii) the end matter.

In its preliminary pages the report should carry title and date followed by acknowledgements and foreword. Then there should be a table of contents followed by a list of tables and list of graphs and charts, if any, given in the report.

The main text of the report should have the following parts:

- (a) Introduction: It should contain a clear statement of the objective of the research and an explanation of the methodology adopted in accomplishing the research. The scope of the study along with various limitations should as well be stated in this part.
- (b) Summary of findings: After introduction there would appear a statement of findings and recommendations in non-technical language. If the findings are extensive, they should be summarised.
- (c) Main report: The main body of the report should be presented in logical sequence and broken-down into readily identifiable sections.
- (d) Conclusion: Towards the end of the main text, researcher should again put down the results of his research clearly and precisely. In fact, it is the final summing up.

At the end of the report, appendices should be enlisted in respect of all technical data. Bibliography, i.e., list of books, journals, reports, etc., consulted, should also be given in the end. Index should also be given specially in a published research report.

2. Report should be written in a concise and objective style in simple language avoiding vague expressions such as 'it seems,' 'there may be', and the like.
3. Charts and illustrations in the main report should be used only if they present the information more clearly and forcibly.
4. Calculated 'confidence limits' must be mentioned and the various constraints experienced in conducting research operations may as well be stated.

TYPES OF RESEARCH DESIGN

MEANING OF RESEARCH DESIGN

The formidable problem that follows the task of defining the research problem is the preparation of the design of the research project, popularly known as the "research design". Decisions regarding what, where, when, how much, by what means concerning an inquiry or a research study constitute a research design. "A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure." ¹ In fact, the research design is the conceptual structure within which research is conducted; it constitutes the blueprint for the collection, measurement and analysis of data. As such the design includes an outline of what the researcher will do from writing the hypothesis and its operational implications to the final analysis of data. More explicitly, the design decisions happen to be in respect of:

- (i) What is the study about?
- (ii) Why is the study being made?
- (iii) Where will the study be carried out?
- (iv) What type of data is required?
- (v) Where can the required data be found?
- (vi) What periods of time will the study include?
- (vii) What will be the sample design?
- (viii) What techniques of data collection will be used?
- (ix) How will the data be analysed?

(x) In what style will the report be prepared?

A brief mention of the important sample designs is as follows:

- (i) **Deliberate sampling:** Deliberate sampling is also known as purposive or non-probability sampling. This sampling method involves purposive or deliberate selection of particular units of the universe for constituting a sample which represents the universe. When population elements are selected for inclusion in the sample based on the ease of access, it can be called convenience sampling. If a researcher wishes to secure data from, say, gasoline buyers, he may select a fixed number of petrol stations and may conduct interviews at these stations. This would be an example of convenience sample of gasoline buyers. At times such a procedure may give very biased results particularly when the population is not homogeneous. On the other hand, in judgement sampling the researcher's judgement is used for selecting items which he considers as representative of the population. For example, a judgement sample of college students might be taken to secure reactions to a new method of teaching. Judgement sampling is used quite frequently in qualitative research where the desire happens to be to develop hypotheses rather than to generalise to larger populations.
- (ii) **Simple random sampling:** This type of sampling is also known as chance sampling or probability sampling where each and every item in the population has an equal chance of inclusion in the sample and each one of the possible samples, in case of finite universe, has the same probability of being selected. For example, if we have to select a sample of 300 items from a universe of 15,000 items, then we can put the names or numbers of all the 15,000 items on slips of paper and conduct a lottery. Using the random number tables is another method of random sampling. To select the sample, each item is assigned a number from 1 to 15,000. Then, 300 five digit random numbers are selected from the table. To do this we select some random starting point and then a systematic pattern is used in proceeding through the table. We might start in the 4th row, second column and proceed down the column to the bottom of the table and then move to the top of the next column to the right. When a number exceeds the limit of the numbers in the frame, in our case over 15,000, it is simply passed over and the next number selected that does fall within the relevant range. Since the numbers were placed in the table in a completely random fashion, the resulting sample is random. This procedure gives each item an equal probability of being selected. In case of infinite population, the selection of each item in a random sample is controlled by the same probability and that successive selections are independent of one another.
- (iii) **Systematic sampling:** In some instances the most practical way of sampling is to select every 15th name on a list, every 10th house on one side of a street and so on. Sampling of this type is known as systematic sampling. An element of randomness is usually introduced into this kind of sampling by using random numbers to pick up the unit with which to start. This procedure is useful when sampling frame is available in the form of a list. In such a design the selection process starts by picking some random point in the list and then every nth element is selected until the desired number is secured.

11. **Stratified sampling:** If the population from which a sample is to be drawn does not

constitute a homogeneous group, then stratified sampling technique is applied so as to obtain a representative sample. In this technique, the population is stratified into a number of non-overlapping subpopulations or strata and sample items are selected from each stratum. If the items selected from each stratum is based on simple random sampling the entire procedure, first stratification and then simple random sampling, is known as stratified random sampling.

12. Quota sampling: In stratified sampling the cost of taking random samples from individual strata is often so expensive that interviewers are simply given quota to be filled from different strata, the actual selection of items for sample being left to the interviewer's judgement. This is called quota sampling. The size of the quota for each stratum is generally proportionate to the size of that stratum in the population. Quota sampling is thus an important form of non-probability sampling. Quota samples generally happen to be judgement samples rather than random samples.
13. Cluster sampling and area sampling: Cluster sampling involves grouping the population and then selecting the groups or the clusters rather than individual elements for inclusion in the sample. Suppose some departmental store wishes to sample its credit card holders. It has issued its cards to 15,000 customers. The sample size is to be kept say 450. For cluster sampling this list of 15,000 card holders could be formed into 100 clusters of 150 card holders each. Three clusters might then be selected for the sample randomly. The sample size must often be larger than the simple random sample to ensure the same level of accuracy because in cluster sampling procedural potential for order bias and other sources of error is usually accentuated. The clustering approach can, however, make the sampling procedure relatively easier and increase the efficiency of field work, specially in the case of personal interviews.

Area sampling is quite close to cluster sampling and is often talked about when the total geographical area of interest happens to be big one. Under area sampling we first divide the total area into a number of smaller non-overlapping areas, generally called geographical clusters, then a number of these smaller areas are randomly selected, and all units in these small areas are included in the sample. Area sampling is specially helpful where we do not have the list of the population concerned. It also makes the field interviewing more efficient since interviewer can do many interviews at each location.

14. Multi-stage sampling: This is a further development of the idea of cluster sampling. This technique is meant for big inquiries extending to a considerably large geographical area like an entire country. Under multi-stage sampling the first stage may be to select large primary sampling units such as states, then districts, then towns and finally certain families within towns. If the technique of random-sampling is applied at all stages, the sampling procedure is described as multi-stage random sampling.
15. Sequential sampling: This is somewhat a complex sample design where the ultimate size of the sample is not fixed in advance but is determined according to mathematical decisions on the basis of information yielded as survey progresses. This design is usually adopted under acceptance sampling plan in the context of

statistical quality control.

STEPS IN SAMPLE DESIGN

While developing a sampling design, the researcher must pay attention to the following points:

- (i) **Type of universe:** The first step in developing any sample design is to clearly define the set of objects, technically called the Universe, to be studied. The universe can be finite or infinite. In finite universe the number of items is certain, but in case of an infinite universe the number of items is infinite, i.e., we cannot have any idea about the total number of items. The population of a city, the number of workers in a factory and the like are examples of finite universes, whereas the number of stars in the sky, listeners of a specific radio programme, throwing of a dice etc. are examples of infinite universes.
- (ii) **Sampling unit:** A decision has to be taken concerning a sampling unit before selecting sample. Sampling unit may be a geographical one such as state, district, village, etc., or a construction unit such as house, flat, etc., or it may be a social unit such as family, club, school, etc., or it may be an individual. The researcher will have to decide one or more of such units that he has to select for his study.
- (iii) **Source list:** It is also known as 'sampling frame' from which sample is to be drawn. It contains the names of all items of a universe (in case of finite universe only). If source list is not available, researcher has to prepare it. Such a list should be comprehensive, correct, reliable and appropriate. It is extremely important for the source list to be as representative of the population as possible.
- (iv) **Size of sample:** This refers to the number of items to be selected from the universe to constitute a sample. This a major problem before a researcher. The size of sample should neither be excessively large, nor too small. It should be optimum. An optimum sample is one which fulfills the requirements of efficiency, representativeness, reliability and flexibility. While deciding the size of sample, researcher must determine the desired precision as also an acceptable confidence level for the estimate. The size of population variance needs to be considered as in case of larger variance usually a bigger sample is needed. The size of population must be kept in view for this also limits the sample size. The parameters of interest in a research study must be kept in view, while deciding the size of the sample. Costs too dictate the size of sample that we can draw. As such, budgetary constraint must invariably be taken into consideration when we decide the sample size.
- (v) **Parameters of interest:** In determining the sample design, one must consider the question of the specific population parameters which are of interest. For instance, we may be interested in estimating the proportion of persons with some characteristic in the population, or we may be interested in knowing some average or the other measure concerning the population. There may also be important sub-groups in the population about whom we

would like to make estimates. All this has a strong impact upon the sample design we would accept.

- (vi) **Budgetary constraint:** Cost considerations, from practical point of view, have a major impact upon decisions relating to not only the size of the sample but also to the type of sample. This fact can even lead to the use of a non-probability sample.
- (vii) **Sampling procedure:** Finally, the researcher must decide the type of sample he will use i.e., he must decide about the technique to be used in selecting the items for the sample. In fact, this technique or procedure stands for the sample design itself. There are several sample designs (explained in the pages that follow) out of which the researcher must choose one for his study. Obviously, he must select that design which, for a given sample size and for a given cost, has a smaller sampling error.

CHARACTERISTICS OF A GOOD SAMPLE DESIGN

From what has been stated above, we can list down the characteristics of a good sample design as under:

- (a) Sample design must result in a truly representative sample.
- (b) Sample design must be such which results in a small sampling error.
- (c) Sample design must be viable in the context of funds available for the research study.
- (d) Sample design must be such so that systematic bias can be controlled in a better way.

Sample should be such that the results of the sample study can be applied, in general, for the universe with a reasonable level of confidence

DIFFERENT TYPES OF SAMPLE DESIGNS

There are different types of sample designs based on two factors viz., the representation basis and the element selection technique. On the representation basis, the sample may be probability sampling or it may be non-probability sampling. Probability sampling is based on the concept of random selection, whereas non-probability sampling is 'non-random' sampling. On element selection basis, the sample may be either unrestricted or restricted. When each sample element is drawn individually from the population at large, then the sample so drawn is known as 'unrestricted sample', whereas all other forms of sampling are covered under the term 'restricted sampling'. The following chart exhibits the sample designs as explained above.

Thus, sample designs are basically of two types viz., non-probability sampling and probability sampling. We take up these two designs separately.

Non-probability sampling: Non-probability sampling is that sampling procedure which

does not afford any basis for estimating the probability that each item in the population has of being included in the sample. Non-probability sampling is also known by different names such as deliberate sampling, purposive sampling and judgement sampling. In this type of sampling, items for the sample are selected deliberately by the researcher; his choice concerning the items remains supreme.

Probability sampling: Probability sampling is also known as 'random sampling' or 'chance sampling'. Under this sampling design, every item of the universe has an equal chance of inclusion in the sample. It is, so to say, a lottery method in which individual units are picked up from the whole group not deliberately but by some mechanical process. Here it is blind chance alone that determines whether one item or the other is selected. The results obtained from probability or random sampling can be assured in terms of probability

COMPLEX RANDOM SAMPLING DESIGNS

Probability sampling under restricted sampling techniques, as stated above, may result in complex random sampling designs. Such designs may as well be called 'mixed sampling designs' for many of such designs may represent a combination of probability and non-probability sampling procedures in selecting a sample. Some of the popular complex random sampling designs are as follows:

(i) Systematic sampling: In some instances, the most practical way of sampling is to select every i th item on a list. Sampling of this type is known as systematic sampling. An element of randomness is introduced into this kind of sampling by using random numbers to pick up the unit with which to start.

(ii) Stratified sampling: If a population from which a sample is to be drawn does not constitute a homogeneous group, stratified sampling technique is generally applied in order to obtain a representative sample. Under stratified sampling the population is divided into several sub-populations that are individually more homogeneous than the total population (the different sub-populations are called 'strata') and then we select items from each stratum to constitute a sample

(iii) Cluster sampling: If the total area of interest happens to be a big one, a convenient way in which a sample can be taken is to divide the area into a number of smaller non-overlapping areas and then to randomly select a number of these smaller areas (usually called clusters), with the ultimate sample consisting of all (or samples of) units in these small areas or clusters.

Thus in cluster sampling the total population is divided into a number of relatively small subdivisions which are themselves clusters of still smaller units and then some of these clusters are randomly selected for inclusion in the overall sample. Suppose we want to estimate the proportion of machine-parts in an inventory which are defective. Also assume that there are 20000 machine parts in the inventory at a given point of time, stored in 400 cases of 50 each. Now using a cluster sampling, we would consider the 400 cases as clusters and randomly select 'n' cases and examine all the machine-parts in each randomly selected case.

(iv) Area sampling: If clusters happen to be some geographic subdivisions, in that case cluster sampling is better known as area sampling. In other words, cluster designs, where the primary sampling unit represents a cluster of units based on geographic area, are distinguished as area sampling. The plus and minus points of cluster sampling are also applicable to area sampling.

(v) **Multi-stage sampling:** Multi-stage sampling is a further development of the principle of cluster sampling. Suppose we want to investigate the working efficiency of nationalised banks in India and we want to take a sample of few banks for this purpose. The first stage is to select large primary

(vi) **Sampling with probability proportional to size:** In case the cluster sampling units do not have the same number or approximately the same number of elements, it is considered appropriate to use a random selection process where the probability of each cluster being included in the sample is proportional to the size of the cluster. For this purpose, we have to list the number of elements in each cluster irrespective of the method of ordering the cluster.

(vii) **Sequential sampling:** This sampling design is some what complex sample design. The ultimate size of the sample under this technique is not fixed in advance, but is determined according to mathematical decision rules on the basis of information yielded as survey progresses. This is usually adopted in case of acceptance sampling plan in context of statistical quality control.

SAMPLE SIZE AND SAMPLING ERROR:

Sampling errors are the random variations in the sample estimates around the true population parameters. Since they occur randomly and are equally likely to be in either direction, their nature happens to be of compensatory type and the expected value of such errors happens to be equal to zero. Sampling error decreases with the increase in the size of the sample, and it happens to be of a smaller magnitude in case of homogeneous population.

Sampling error can be measured for a given sample design and size. The measurement of sampling error is usually called the 'precision of the sampling plan'. If we increase the sample size, the precision can be improved. But increasing the size of the sample has its own limitations viz., a large sized sample increases the cost of collecting data and also enhances the systematic bias. Thus the effective way to increase precision is usually to select a better sampling design which has a smaller sampling error for a given sample size at a given cost. In practice, however, people prefer a less precise design because it is easier to adopt the same and also because of the fact that systematic bias can be controlled in a better way in such a design.

In brief, while selecting a sampling procedure, researcher must ensure that the procedure causes a relatively small sampling error and helps to control the systematic bias in a better way.

Criteria of Good Research

Whatever may be the types of research works and studies, one thing that is important is that they all meet on the common ground of scientific method employed by them. One expects scientific research to satisfy the following criteria:¹¹

1. The purpose of the research should be clearly defined and common concepts be used.
2. The research procedure used should be described in sufficient detail to permit another researcher to repeat the research for further advancement, keeping the continuity of what has already been attained.
3. The procedural design of the research should be carefully planned to yield

results that are as objective as possible.

4. The researcher should report with complete frankness, flaws in procedural design and estimate their effects upon the findings.
5. The analysis of data should be sufficiently adequate to reveal its significance and the methods of analysis used should be appropriate. The validity and reliability of the data should be checked carefully.
6. Conclusions should be confined to those justified by the data of the research and limited to those for which the data provide an adequate basis.
7. Greater confidence in research is warranted if the researcher is experienced, has a good reputation in research and is a person of integrity.

In other words, we can state the qualities of a good research¹² as under:

1. Good research is systematic: It means that research is structured with specified steps to be taken in a specified sequence in accordance with the well defined set of rules. Systematic characteristic of the research does not rule out creative thinking but it certainly does reject the use of guessing and intuition in arriving at conclusions.

2. Good research is logical: This implies that research is guided by the rules of logical reasoning and the logical process of induction and deduction are of great value in carrying out research. Induction is the process of reasoning from a part to the whole whereas deduction is the process of reasoning from some premise to a conclusion which follows from that very premise. In fact, logical reasoning makes research more meaningful in the context of decision making

3. Good research is empirical: It implies that research is related basically to one or more aspects of a real situation and deals with concrete data that provides a basis for external validity to research results.

4. Good research is replicable: This characteristic allows research results to be verified by replicating the study and thereby building a sound basis for decisions

Advantages of Research

- Addition to existing literature
- scientific invention
- intellectual satisfaction
- research is a sharpens mind
- research is a tool of social transformation

Disadvantages of research:

- Time factor
- cost factor
- detail study is not possible
- biased data
- validity of research

UNIT II

Methods of Data Collection: There are two types of data

Primary Data— collected for the first time

Secondary Data—those which have already been collected and analysed by someone else.

Methods of Primary Data Collection

OBSERVATION METHOD:

Types of Observation:

1. Structured – for descriptive research
2. Unstructured—for exploratory research
3. Participant Observation
4. Non- participant observation
5. Disguised observation

SURVEY METHOD

Approach most suited for gathering descriptive information.

Structured Surveys: use formal lists of questions asked of all respondents in the same way.

Unstructured Surveys: let the interviewer probe respondents and guide the interview according to their answers.

Survey research may be Direct or Indirect.

Direct Approach: The researcher asks direct questions about behaviours and thoughts.
e.g. Why don't you eat at MacDonalds?

Indirect Approach: The researcher might ask: "What kind of people eat at MacDonald's?"

From the response, the researcher may be able to discover why the consumer avoids MacDonald's. It may suggest factors of which the consumer is not consciously aware.

CONTACT METHODS:

Information may be collected by

- Mail
- Telephone
- Personal interview

Mail Questionnaires:

Advantages:

-can be used to collect large amounts of information at a low cost per respondent. - respondents may give more honest answers to personal questions on a mail

questionnaire

- no interviewer is involved to bias the respondent's answers. -
- convenient for respondent's who can answer when they have time
- good way to reach people who often travel

Limitations:

- not flexible
- take longer to complete than telephone or personal interview -response rate is often very low
- researcher has no control over who answers.

Telephone Interviewing:

- quick method
- more flexible as interviewer can explain questions not understood by the respondent
- depending on respondent's answer they can skip some Qs and probe more on others
- allows greater sample control
- response rate tends to be higher than mail

Drawbacks:

-Cost per respondent higher

-Some people may not want to discuss personal Qs with interviewer -
Interviewer's manner of speaking may affect the respondent's answers -
Different interviewers may interpret and record response in a variety of ways -
under time pressure ,data may be entered without actually interviewing

Personal Interviewing:

It is very flexible and can be used to collect large amounts of information. Trained interviewers are can hold the respondent's attention and are available to clarify difficult questions.

They can guide interviews, explore issues, and probe as the situation requires.

Personal interview can be used in any type of questionnaire and can be conducted fairly quickly.

Interviewers can also show actual products, advertisements, packages and observe and record their reactions and behaviour.

This takes two forms-

Individual- Intercept interviewing

Group - Focus Group Interviewing

Intercept interviewing:

Widely used in tourism research.

-allows researcher to reach known people in a short period of time.

- only method of reaching people whose names and addresses are unknown - involves talking to people at homes, offices, on the street, or in shopping malls.

-interviewer must gain the interviewee's cooperation

-time involved may range from a few minutes to several hours(for longer surveys compensation may be offered)

--involves the use of judgmental sampling i.e. interviewer has guidelines as to whom to "intercept", such as 25% under age 20 and 75% over age 60

Drawbacks:

-Room for error and bias on the part of the interviewer who may not be able to correctly judge age, race etc.

-Interviewer may be uncomfortable talking to certain ethnic or age groups.

Focus Group Interviewing:

It is rapidly becoming one of the major research tool to understand people's thoughts and feelings.

It is usually conducted by inviting six to ten people to gather for a few hours with a trained moderator to talk about a product, service or organization. The meeting is held in a pleasant place, and refreshments are served to create a relaxed environment. The moderator needs objectivity, knowledge of the subject and industry, and some understanding of group and consumer behaviour.

The moderator starts with a broad question before moving to more specific issues, encouraging open and easy discussion to bring out true feelings and thoughts.

At the same time, the interviewer focuses the discussion, hence the name focus group interviewing.

-often held to help determine the subject areas on which questions should be asked in a later, large-scale, structured-direct interview

Comments are recorded through note taking or videotaped and studied later to understand consumer' buying process.

This method is especially suited for managers of hotels and restaurants, who have easy access to their customers.

e.g. Some hotel managers often invite a group of hotel guests from a particular market segment to have a free breakfast with them. Managers get the chance to meet the guests and discuss what they like about the hotel and what the hotel could do to make their stay more enjoyable and comfortable.

The guests appreciate this recognition and the manager gets valuable information. Restaurant managers use the same approach by holding discussion meetings over lunch or dinner.

Drawbacks:

- Cost: may cost more than telephone survey
- Sampling: group interview studies keep small sample size to keep time and cost down, therefore it may be difficult to generalize from the results.
 - Interviewer bias.

MEASUREMENT SCALES

(a) Nominal scale: Nominal scale is simply a system of assigning number symbols to events in order to label them. The usual example of this is the assignment of numbers of basketball players in order to identify them. Such numbers cannot be considered to be associated with an ordered scale for their order is of no consequence; the numbers are just convenient labels for the particular class of events and as such have no quantitative value

(b) Ordinal scale: The lowest level of the ordered scale that is commonly used is the ordinal scale. The ordinal scale places events in order, but there is no attempt to make the intervals of the scale equal in terms of some rule. Rank orders represent ordinal scales and are frequently used in research relating to qualitative phenomena. A student's rank in his graduation class involves the use of an ordinal scale. One has to be very careful in making statement about scores based on ordinal scales

(c) Interval scale: In the case of interval scale, the intervals are adjusted in terms of some rule that has been established as a basis for making the units equal

(d) Ratio scale: Ratio scales have an absolute or true zero of measurement. The term 'absolute zero' is not as precise as it was once believed to be. We can conceive of an absolute zero of length and similarly we can conceive of an absolute zero of time

SOURCES OF ERROR IN MEASUREMENT

Measurement should be precise and unambiguous in an ideal research study. This objective, however, is often not met with in entirety. As such the researcher must be aware about the sources of error in measurement. The following are the possible sources of error in measurement.

(a) Respondent: At times the respondent may be reluctant to express strong negative feelings or it is just possible that he may have very little knowledge but may not admit his ignorance. All this reluctance is likely to result in an interview of 'guesses.' Transient factors like fatigue, boredom, anxiety, etc. may limit the ability of the respondent to respond accurately and fully.

(b) Situation: Situational factors may also come in the way of correct measurement. Any condition which places a strain on interview can have serious effects on the interviewer-respondent rapport. For instance, if someone else is present, he can distort responses by joining in or merely by being present. If the respondent feels that anonymity is not assured, he may be reluctant to express certain feelings.

(c) Measurer: The interviewer can distort responses by rewording or reordering questions. His behaviour, style and looks may encourage or discourage certain replies from respondents. Careless mechanical processing may distort the findings. Errors may also creep in because of incorrect coding, faulty tabulation and/or statistical calculations, particularly in the data-analysis stage.

(d) Instrument: Error may arise because of the defective measuring instrument. The use of complex words, beyond the comprehension of the respondent, ambiguous meanings, poor printing, inadequate space for replies, response choice omissions, etc. are a few things that make the measuring instrument defective and may result in measurement

errors. Another type of instrument deficiency is the poor sampling of the universe of items of concern.

TESTS OF SOUND MEASUREMENT

1. Test of Validity*

Validity is the most critical criterion and indicates the degree to which an instrument measures what it is supposed to measure. Validity can also be thought of as utility. In other words, validity is the extent to which differences found with a measuring instrument reflect true differences among those being tested.

But one can certainly consider three types of validity in this connection: (i) Content validity; (ii) Criterion-related validity and (iii) Construct validity.

2. Test of Reliability

The test of reliability is another important test of sound measurement. A measuring instrument is reliable if it provides consistent results. Reliable measuring instrument does contribute to validity, but a reliable instrument need not be a valid instrument.

Reliability can be improved in the following two ways:

- (i) By standardising the conditions under which the measurement takes place i.e., we must ensure that external sources of variation such as boredom, fatigue, etc., are minimised to the extent possible. That will improve stability aspect.

3. Test of Practicality

The practicality characteristic of a measuring instrument can be judged in terms of economy, convenience and interpretability. From the operational point of view, the measuring instrument ought to be practical i.e., it should be economical, convenient and interpretable. Economy consideration suggests that some trade-off is needed between the ideal research project and that which the budget can afford. The length of measuring instrument is an important area where economic pressures are quickly felt.

The measuring instrument, in order to be interpretable, must be supplemented by (a) detailed instructions for administering the test;

(b) scoring keys; (c) evidence about the reliability and (d) guides for using the test and for interpreting results.

TECHNIQUE OF DEVELOPING MEASUREMENT TOOLS

The technique of developing measurement tools involves a four-stage process, consisting of the following:

- (a) Concept development;
- (b) Specification of concept dimensions;
- (c) Selection of indicators; and

(d) Formation of index.

The first and foremost step is that of concept development which means that the researcher should arrive at an understanding of the major concepts pertaining to his study. This step of concept development is more apparent in theoretical studies than in the more pragmatic research, where the fundamental concepts are often already established.

The second step requires the researcher to specify the dimensions of the concepts that he developed in the first stage. This task may either be accomplished by deduction i.e., by adopting a more or less intuitive approach or by empirical correlation of the individual dimensions with the total concept and/or the other concepts. For instance, one may think of several dimensions such as product reputation, customer treatment, corporate leadership, concern for individuals, sense of social responsibility and so forth when one is thinking about the image of a certain company.

Once the dimensions of a concept have been specified, the researcher must develop indicators for measuring each concept element. Indicators are specific questions, scales, or other devices by which respondent's knowledge, opinion, expectation, etc., are measured. As there is seldom a perfect measure of a concept, the researcher should consider several alternatives for the purpose. The use of more than one indicator gives stability to the scores and it also improves their validity.

The last step is that of combining the various indicators into an index, i.e., formation of an index. When we have several dimensions of a concept or different measurements of a dimension, we may need to combine them into a single index.

Scaling

SCALE CLASSIFICATION BASES

The number assigning procedures or the scaling procedures may be broadly classified on one or more of the following bases: (a) subject orientation; (b) response form; (c) degree of subjectivity;

(d) scale properties; (e) number of dimensions and (f) scale construction techniques. We take up each of these separately.

1. Subject orientation: Under it a scale may be designed to measure characteristics of the respondent who completes it or to judge the stimulus object which is presented to the respondent. In respect of the former, we presume that the stimuli presented are sufficiently homogeneous so that the between-stimuli variation is small as compared to the variation among respondents

2 Response form: Under this we may classify the scales as categorical and comparative. Categorical scales are also known as rating scales. These scales are used when a respondent scores some object without direct reference to other objects. Under comparative scales, which are also known as ranking scales, the respondent is asked to compare two or more objects. .

3 Degree of subjectivity: With this basis the scale data may be based on whether we measure subjective personal preferences or simply make non-preference judgements. In the former case, the respondent is asked to choose which person he favours or which

solution he would like to see employed, whereas in the latter case he is simply asked to judge which person is more effective in some aspect or which solution will take fewer resources without reflecting any personal preference.

4 Scale properties: Considering scale properties, one may classify the scales as nominal, ordinal, interval and ratio scales. Nominal scales merely classify without indicating order, distance or unique origin. Ordinal scales indicate magnitude relationships of ‘more than’ or ‘less than’, but indicate no distance or unique origin. Interval scales have both order and distance values, but no unique origin. Ratio scales possess all these features.

5 Number of dimensions: In respect of this basis, scales can be classified as ‘unidimensional’ and ‘multidimensional’ scales. Under the former we measure only one attribute of the respondent or object, whereas multidimensional scaling recognizes that an object might be described better by using the concept of an attribute space of ‘n’ dimensions, rather than a single-dimension continuum.

f) Scale construction techniques: Following are the five main techniques by which scales can be developed.

- (i) **Arbitrary approach:** It is an approach where scale is developed on ad hoc basis. This is the most widely used approach. It is presumed that such scales measure the concepts for which they have been designed, although there is little evidence to support such an assumption.
- (ii) **Consensus approach:** Here a panel of judges evaluate the items chosen for inclusion in the instrument in terms of whether they are relevant to the topic area and unambiguous in implication.
- (iii) **Item analysis approach:** Under it a number of individual items are developed into a test which is given to a group of respondents. After administering the test, the total scores are calculated for every one. Individual items are then analysed to determine which items discriminate between persons or objects with high total scores and those with low scores.
- (iv) **Cumulative scales** are chosen on the basis of their conforming to some ranking of items with ascending and descending discriminating power. For instance, in such a scale the endorsement of an item representing an extreme position should also result in the endorsement of all items indicating a less extreme position.
- (v) **Factor scales** may be constructed on the basis of intercorrelations of items which indicate that a common factor accounts for the relationship between items. This relationship is typically measured through factor analysis method.

Important Scaling Techniques

Rating scales: The rating scale involves qualitative description of a limited number of aspects of a thing or of traits of a person. When we use rating scales (or categorical scales), we judge an object in absolute terms against some specified criteria i.e., we judge properties of objects without reference to other similar objects. These ratings may be in such forms as “like-dislike”, “above average, average, below average”, or other classifications with more categories such as “like very much—like some what—neutral—dislike somewhat—dislike very

much”; “excellent—good—average—below average—poor”, “always—often—occasionally—rarely—never”, and so on. There is no specific

A) Method of paired comparisons: Under it the respondent can express his attitude by making a choice between two objects, say between a new flavour of soft drink and an established brand of drink.

B) Method of rank order: Under this method of comparative scaling, the respondents are asked to rank their choices. This method is easier and faster than the method of paired comparisons stated above. For example, with 10 items it takes 45 pair comparisons to complete the task, whereas the method of rank order simply requires ranking of 10 items only.

Scale Construction Techniques

In social science studies, while measuring attitudes of the people we generally follow the technique of preparing the opinionnaire* (or attitude scale) in such a way that the score of the individual responses assigns him a place on a scale.

While developing such statements, the researcher must note the following two points:

- (i) That the statements must elicit responses which are psychologically related to the attitude being measured;
- (ii) That the statements need be such that they discriminate not merely between extremes of attitude but also among individuals who differ slightly.

Arbitrary Scales

Arbitrary scales are developed on ad hoc basis and are designed largely through the researcher’s own subjective selection of items. The researcher first collects few statements or items which he believes are unambiguous and appropriate to a given topic.
Differential Scales (or Thurstone-type Scales)

The name of L.L. Thurstone is associated with differential scales which have been developed using consensus scale approach. Under such an approach the selection of items is made by a panel of judges who evaluate the items in terms of whether they are relevant to the topic area and unambiguous in implication. The detailed procedure is as under:

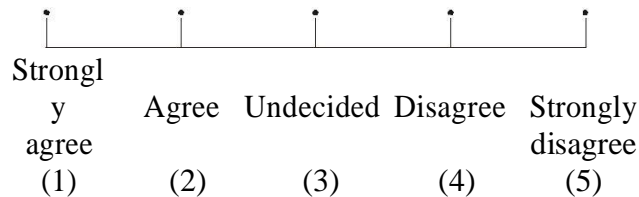
- (a) The researcher gathers a large number of statements, usually twenty or more, that express various points of view toward a group, institution, idea, or practice (i.e., statements belonging to the topic area).
- (b) These statements are then submitted to a panel of judges, each of whom arranges them in eleven groups or piles ranging from one extreme to another in position. Each of the judges is requested to place generally in the first pile the statements which he thinks are most unfavourable to the issue, in the second pile to place those statements which he thinks are next most unfavourable and he goes on doing so in this manner till in the eleventh pile he puts the statements which he considers to be the most favourable.

- (c) This sorting by each judge yields a composite position for each of the items. In case of marked disagreement between the judges in assigning a position to an item, that item is discarded.
- (d) For items that are retained, each is given its median scale value between one and eleven as established by the panel. In other words, the scale value of any one statement is computed as the 'median' position to which it is assigned by the group of judges.
- (e) A final selection of statements is then made. For this purpose a sample of statements, whose median scores are spread evenly from one extreme to the other is taken. The statements so selected, constitute the final scale to be administered to respondents. The position of each statement on the scale is the same as determined by the judges.

Summated Scales (or Likert-type Scales)

Summated scales (or Likert-type scales) are developed by utilizing 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.

We find that these five points constitute the scale. At one extreme of the scale there is strong agreement with the given statement and at the other, strong disagreement, and between them lie intermediate points. We may illustrate this as under:



Cumulative scales: Cumulative scales or Louis Guttman's scalogram analysis, like other scales, consist of series of statements to which a respondent expresses his agreement or disagreement. The special feature of this type of scale is that statements in it form a cumulative series.

Factor Scales*

Factor scales are developed through factor analysis or on the basis of intercorrelations of items which indicate that a common factor accounts for the relationships between items.

Multidimensional scaling: Multidimensional scaling (MDS) is relatively more complicated scaling device, but with this sort of scaling one can scale objects, individuals or both with a minimum of information. Multidimensional scaling (or MDS) can be characterized as a set of procedures for portraying perceptual or affective dimensions of substantive interest.

Coding operation is usually done at this stage through which the categories of data are transformed into symbols that may be tabulated and counted.

Editing is the procedure that improves the quality of the data for coding. With coding the stage is ready for tabulation. Tabulation is a part of the technical procedure wherein the classified data are put in the form of tables. The mechanical devices can be made use of

at this juncture. A great deal of data, specially in large inquiries, is tabulated by computers.

Editing: Editing of data is a process of examining the collected raw data (specially in surveys) to detect errors and omissions and to correct these when possible. As a matter of fact, editing involves a careful scrutiny of the completed questionnaires and/or schedules

Editors must keep in view several points while performing their work: (a) They should be familiar with instructions given to the interviewers and coders as well as with the editing instructions supplied to them for the purpose. (b) While crossing out an original entry for one reason or another, they should just draw a single line on it so that the same may remain legible. (c) They must make entries (if any) on the form in some distinctive colour and that too in a standardised form. (d) They should initial all answers which they change or supply. (e) Editor's initials and the date of editing should be placed on each completed form or schedule.

Coding: Coding refers to the process of assigning numerals or other symbols to answers so that responses can be put into a limited number of categories or classes. Such classes should be appropriate to the research problem under consideration.

Coding is necessary for efficient analysis and through it the several replies may be reduced to a small number of classes which contain the critical information required for analysis. Coding decisions should usually be taken at the designing stage of the questionnaire. This makes it possible to precode the questionnaire choices and which in turn is helpful for computer tabulation as one can straight forward key punch from the original questionnaires. But in case of hand coding some standard method may be used.

Classification: Most research studies result in a large volume of raw data which must be reduced into homogeneous groups if we are to get meaningful relationships. This fact necessitates classification of data which happens to be the process of arranging data in groups or classes on the basis of common characteristics.

Tabulation: When a mass of data has been assembled, it becomes necessary for the researcher to arrange the same in some kind of concise and logical order. This procedure is referred to as tabulation. Thus, tabulation is the process of summarising raw data and displaying the same in compact form (i.e., in the form of statistical tables) for further analysis. In a broader sense, tabulation is an orderly arrangement of data in columns and rows.

Tabulation is essential because of the following reasons.

1. It conserves space and reduces explanatory and descriptive statement to a minimum.
2. It facilitates the process of comparison.
3. It facilitates the summation of items and the detection of errors and omissions.
4. It provides a basis for various statistical computations.

Tabulation can be done by hand or by mechanical or electronic devices. The choice depends on the size and type of study, cost considerations, time pressures and the availability of tabulating machines or computers. In relatively large inquiries, we may use mechanical or computer tabulation if other factors are favourable and necessary

facilities are available.

UNIT III HYPOTHESIS

MEANING:

A hypothesis may be defined as a proposition or a set of propositions set forth as an explanation for the occurrence of some specified group of phenomena either asserted merely as a provisional conjecture to guide some investigation or accepted as highly probable in the light of established facts.

CHARACTERISTICS OF HYPOTHESIS:

Hypothesis must possess the following characteristics:

- (i) Hypothesis should be clear and precise.
- (ii) Hypothesis should be capable of being tested.
- (iii) Hypothesis should state relationship between variables, if it happens to be a relational hypothesis.
- (iv) Hypothesis should be limited in scope and must be specific.
- (v) Hypothesis should be stated as far as possible in most simple terms so that the same is easily understandable by all concerned. But one must remember that simplicity of hypothesis has nothing to do with its significance.
- (vi) Hypothesis should be consistent with most known facts
- (vii) Hypothesis should be amenable to testing within a reasonable time. One should not use even an excellent hypothesis, if the same cannot be tested in reasonable time for one cannot spend a life-time collecting data to test it.
- (viii) Hypothesis must explain the facts that gave rise to the need for explanation.

BASIC CONCEPTS CONCERNING TESTING OF HYPOTHESES

(a) Null hypothesis and alternative hypothesis: In the context of statistical analysis, we often talk about null hypothesis and alternative hypothesis. If we are to compare method A with method B about its superiority and if we proceed on the assumption that both methods are equally good, then this assumption is termed as the null hypothesis.

As against this, we may think that the method A is superior or the method B is inferior, we are then stating what is termed as alternative hypothesis. The null hypothesis is generally symbolized as H_0 and the alternative hypothesis as H_a .

Suppose we want to test the hypothesis that the population mean (μ) is equal to the hypothesized mean (μ_{H_0}) = 100. Then we would say that the null hypothesis is that the population mean is equal to the hypothesized mean 100 and symbolically we can express as:

$$H_0: \mu = \mu_{H_0} = 100$$

If our sample results do not support this null hypothesis, we should conclude that something else is true. What we conclude rejecting the null hypothesis is known as **Alternative hypothesis**. In other words, the set of alternatives to the null hypothesis is referred to as the alternative hypothesis. If we accept H_0 , then we are rejecting H_a and if we reject H_0 , then we are accepting H_a . For $H_0: \mu = \mu_{H_0} = 100$, we may consider three possible alternative hypothesis as follows”:

Alternative hypothesis	To be read as follows
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$H_0: \mu \neq \mu_{H_0}$	(The alternative hypothesis is that the population mean is not equal to 100 i.e., it may be more or less than 100)
$H_0: \mu > \mu_{H_0}$	The alternative hypothesis is that the population mean is greater than 100)
$H_0: \mu < \mu_{H_0}$	(The alternative hypothesis is that the population mean is Less than 100)

(1) Alternative hypothesis is usually the one which one wishes to prove and the null hypothesis is the one which one wishes to disprove. Thus, a null hypothesis represents the hypothesis we are trying to reject, and alternative hypothesis represents all other possibilities.

“If a hypothesis is of the type $\mu = \mu_{H_0}$, then we call such a hypothesis as simple (or specific) hypothesis but if it is of the type $\mu \neq \mu_{H_0}$ or $\mu > \mu_{H_0}$ or $\mu < \mu_{H_0}$, then we call it a composite (or nonspecific) hypothesis.

(2) If the rejection of a certain hypothesis when it is actually true involves great risk, it is taken as null hypothesis because then the probability of rejecting it when it is true is α (the level of significance) which is chosen very small.

(3) Null hypothesis should always be specific hypothesis i.e., it should not state about or approximately a certain value.

(b) The level of significance: This is an important concept in the context of hypothesis testing. It is always some percentage (usually 5%), which should be chosen with great care, thought reason. In case we take the significance level at 5 percent, then this implies that H_0 will be rejected when the sampling result (i.e., observed evidence) has a less than 0.05 probability of occurring if H_0 is true. In other words, the 5 per cent level of significance means that researcher is willing to take as much as a 5 per cent risk of rejecting the null hypothesis when it (H_0) happens to be true. Thus the significance level is the maximum value of the probability of rejecting H_0 when it is true and is usually determined in advance before testing the hypothesis.

(c) Decision rule or test of hypothesis: Given a hypothesis H_0 and an alternative hypothesis H_a , we make a rule which is known as decision rule according to which we accept H_0 (i.e., reject H_a) or reject H_0 (i.e., accept H_a). For instance, if H_0 is that a certain lot is good (there are very few defective items in it), against H_a that the lot is not good (there are too many defective items in it), then we must decide the number of items to be tested and the criterion for accepting or rejecting the hypothesis. We might test 10 items in the lot and plan our decision saying that if there are none or only 1 defective item among the 10, we will accept H_0 otherwise we will reject H_0 (or accept H_a). This sort of basis is known as decision rule.

(d) Type I and Type II errors: In the context of testing of hypotheses, there are basically two types of errors we can make. We may reject H_0 when H_0 is true and we may accept H_0 when in fact H_0 is not true. The former is known as Type I error and the latter as Type II error. Type I error is denoted by α (alpha) known as a error, also called the level of

significance of test; and Type II error is denoted by β (beta) known as β error. In a tabular form the said we errors can be presented as follows:

	Accept H_0	Reject H_0
H_0 (true)	Correct decision	Type I error (α error)
H_0 (false)	Type II error (β error)	Correct decision

(e) Two-tailed and One-tailed tests: A two-tailed test rejects the null hypothesis if, say, the sample mean is significantly higher or lower than the hypothesized value of the mean of the population. Such a test is appropriate when the null hypothesis is some specified value and the alternative hypothesis is a value not equal to the specified value of the null hypothesis. Symbolically, the two-tailed test is appropriate when we have $H_0: \mu = \mu_{H_0}$ and $H_a: \mu \neq \mu_{H_0}$ which may mean $\mu > \mu_{H_0}$ or $\mu < \mu_{H_0}$. Thus, in a two-tailed test, there are two rejection regions, one on each tail of the curve, which can be illustrated as under:

If the significance level is 5 per cent and the two-tailed test is to be applied the probability of the rejection area will be 0.05 (equally split on both tails of the curve as 0.025) and that of the acceptance region will be 0.95 as shown as in the above curve. If we take $\mu = 100$ and if our sample mean deviates significantly from 100 in either direction, then we shall reject the null hypothesis; but if the sample mean is not deviated significantly from μ , in that case we shall accept the null hypothesis.

But there are situations when only one-tailed test is considered appropriate. One-tailed test would be used when we are to test, say, whether the population mean is either lower than or higher than some hypothesized value.

If our $\mu = 100$ and if our sample mean deviates significantly from 100 in the lower direction, we shall reject H_0 , otherwise we shall accept H_0 at a certain level of significance. If the significance level in the given case is kept at 5% then the rejection region will be equal to 0.05 of area in the left tail as been shown in the above curve.

In case our $H_0: \mu = \mu_{H_0}$ and $H_a: \mu > \mu_{H_0}$, we are then interested what is known as one-tailed test (right tail) and the rejection region will be on the right tail of the curve as shown below.

Mathematically we can state :

Acceptance region	$A: Z < 1.645$
Rejection region	$R: Z > 1.645$

If our $\mu = 100$ and if our sample mean deviates significantly from 100 in the upward direction, we shall reject H_0 , otherwise we shall accept the same. If in the given case the significance level is kept at 5% then the rejection region will be equal to 0.05 of area in the right tail as has been shown in the above curve.

It should always be remembered that accepting H_0 , on the basis of the sample information does not constitute the proof that H_0 is true. We only mean that there

is no statistical evidence to reject it but we are certainly not saying that H_0 is proof (although be as if H_0 true)

HYPOTHESIS TESTING OF MEANS

Mean of the population can be tested presuming different situations such as the population may be normal or other than normal, it may be finite or infinite, sample size may be large or small, variance of the population may be known or unknown and the alternative hypothesis may be two-sided or one-sided. Our testing technique will differ in different situations. We may consider some of the important situations.

(1) Population normal, population infinite, sample size may be large or small but variance of the population is known, H_a may be one-sided or two-sided:

In such a situation z-test is used for testing hypothesis of mean and the test statistic z is worked out as under:

(2) Population normal, population finite, sample size may be large or small but variance of the population is known, H_a may be one-sided or two-sided:

In such a situation z-test is used and the test statistic z is worked out as under (using finite population multiplier):

(3) Population normal, population infinite, sample size small and variance of the population unknown, H_a may be one-sided or two-sided:

In such a situation t-test is used and the test statistic t is worked out as under.

(4) Population normal, population finite, sample size small and variance of the population unknown, and H_a may be one-sided or two-sided:

In such a situation t-test is used and the test statistic 't' is worked out as under (Using finite population multiplier):

(5) Population may not be normal but sample size is large, variance of the population may be known or unknown, and H_a may be one-sided or two sided:

In such a situation we use z-test and work out the test statistic z as under.

This applies in case of infinite population when variance of the population is known but when variance is not known, we use $\frac{s}{\sqrt{n}}$ in place of $\frac{\sigma}{\sqrt{n}}$ in this formula)

(OR)

(This applies in case of finite population when variance of the population is known but when variance is not known, we use $\frac{s}{\sqrt{n}}$ in place of $\frac{\sigma}{\sqrt{n}}$, in this formula.)

Illustration 1

A sample of 400 male students is found to have a mean height 67.47 inches. Can it be reasonably regarded as a sample from a large population with mean height 67.39 inches and standard deviation 1.30 inches? Test at 5% level of significance.

Illustration 2

Suppose we are interested in a population of 20 industrial units of the same size, all of which are experiencing excessive labour turnover problems. The past records show that

the mean of the distribution of annual turnover is 320 employees, with a standard deviation of 75 employees. A sample of 5 of these industrial units is taken at random which gives a mean of annual turnover as 300 employees. Is the sample mean consistent with the population mean? Test at 5% level.

T TEST

Illustration 3

The specimen of copper wires drawn from a large lot have the following breaking strength (in kg. weight):

578, 572, 570, 568, 572, 578, 570, 572, 596, 544

Test (using Student's t-statistic) whether the mean breaking strength of the lot may be taken to be 578 kg. weight (Test at 5 per cent level of significance). Verify the inference so drawn by using Sandler's A-statistic as well.

Illustration 4

Raju Restaurant near the railway station at Falna has been having average sales of 500 tea cups per day. Because of the development of bus stand nearby, it expects to increase its sales. During the first 12 days after the start of the bus stand, the daily sales were as under:

550, 570, 490, 615, 505, 580, 570, 460, 600, 580, 530, 526

On the basis of this sample information, can one conclude that Raju Restaurant's sales have increased? Use 5 per cent level of significance.

Illustration 5

Two random samples drawn from two normal populations are:

Sample 1	20	16	26	27	23	22	18	24	25	19		
Sample 2	27	33	42	35	32	34	38	28	41	43	30	37

Test using variance ratio at 5 per cent and 1 per cent level of significance whether the two populations have the same variances.

Illustration 6

Weight of 10 students is as follows:

S. No.	1	2	3	4	5	6	7	8	9	10
Weight (kg.)	38	40	45	53	47	43	55	48	52	49

Can we say that the variance of the distribution of weight of all students from which

the above sample of 10 students was drawn is equal to 20 kgs? Test this at 5 per cent and 1 per cent level of significance.

Illustration 7

A die is thrown 132 times with following results:

Number turned up	1	2	3	4	5	6
Frequency	16	20	25	14	29	28

Is the die unbiased?

Illustration 8

Find the value of χ^2 for the following information:

Class	A	B	C	D	E
Observed frequency	8	29	44	15	4
Theoretical (or expected) frequency	7	24	38	24	7

Illustration 9

Two research workers classified some people in income groups on the basis of sampling studies. Their results are as follows:

Investigators	Income groups			Total
	Poor	Middle	Rich	
A	160	30	10	200
B	140	120	40	300
Total	300	150	50	500

UNIT IV

INTERPRETATION

Interpretation refers to the task of drawing inferences from the collected facts after an analytical or experimental study.

The task of interpretation has two major aspects

- (1) The efforts to establish continuity in research through linking the results of a given study with those of another and
- (2) Establishment of some explanatory concepts

NEED FOR INTERPRETATION: -

1. It is through interpretation that the researcher can well understand the abstract that works beneath his findings
2. Interpretation leads to the establishment of explanatory concept that can serve as a guide for future research studies, it opens new avenues for intellectual adventure and stimulates the quest for more knowledge.
3. Researcher can better appreciate only through interpretation why his findings what they are and can make others to understand the real significance of his research findings.
4. The interpretation of the findings of exploratory research study often results into hypothesis for experimental research and as such interpretation is involved in the transaction from exploratory to experimental research.

TECHNIQUE OF INTERPRETATION

It involves the following steps:

1. Researcher must give reasonable explanations of the relations, which he has found and must try to find out thread of uniformity that lies under the surface layer of his findings.
2. Extraneous information must be considered while interpreting the final results of research study.
3. Consultation with frank and honest experts will enhance the utility of research results.
4. Researcher must accomplish the task of interpretation only after considering all relevant factors affecting the problem to avoid false generalization.

PRECAUTIONS IN INTERPRETATION

1. The researcher must satisfy himself that data is trustworthy and adequate for drawing inferences and proper statistical methods have been used for analysis.
2. The researcher must remain cautious about the errors that occur in the process of interpreting results.
3. The process of interpretation is very much intertwined with analysis and cannot be distinctly separated.
4. Broad generalizations should be avoided and factors hidden should be identified.
5. There should be constant interaction between initial hypothesis, empirical observation and theory

STEPS IN WRITING REPORTS:

The steps involved in report writing are:

1. Logical analysis of the subject matter
2. Preparation of the final outline
3. Preparation of the rough draft
4. Rewriting and polishing
5. Preparation of the final bibliography and
6. Writing of final draft

1. **Logical analysis of the subject matter:** It is the first step which primary concerned with the development of a subject. There are two ways in which to develop a subject
 1. Logically and
 2. Chronologically
2. **Preparation of the final outline:** It is the next step in writing report outlines is framework upon which long written works are constructed. They are an aid to the logical organization of the material and a reminder of the points to be stressed in the report.
3. **Preparation of rough draft:** This follows logical analysis of the subject and the preparation of the final outline. Such a step is of utmost importance for the researcher study. He will set down the procedure adopted by him in collecting the material for his study along with various limitations faced by him, the broad findings and generalizations and the various suggestions he wants to offer regarding the problem concerned.
4. **Rewriting and polishing:** This step happens to be most difficult part of all formal writing. Usually this step requires more time than the writing of the rough draft. The careful revision

makes the difference between a mediocre and a good piece of writing. While rewriting and polishing one should check the report for weaknesses in logical development or presentation.

5. **Preparation of the final bibliography:** The bibliography, which is generally appended to the research report, is a list of books in some way pertinent to the research, which has been done. It should contain all those works, which the researcher has been done and consulted. The bibliography should be arranged alphabetically and may be divided into two parts the first may contain the names of magazines and newspaper articles.
6. **Writing the final draft:** this constitutes the last step. The final draft should be written in a concise and objective style and in simple language, avoiding vague expressions such as “it seems” “there may be” and the like ones. While technical jargon. Illustrations and examples based on common experiences must be incorporated in the final draft, as they happen to be most effective in communicating the research findings to other.

LAYOUT OF THE RESEARCH REPORT

A comprehensive layout of the research report should comprise:

1. Preliminary Pages
2. Main text
3. End matter

A) PRELIMINARY PAGES

The preliminary pages of the report should carry a title and date, followed by acknowledgements in form of preface or foreword. It followed by table of contents, list of tables and illustrations.

B) MAIN TEXT

The main text of the report should have the following sections:

1. **Introduction:** It should contain a clear statement of the objectives of research. A brief summary of other relevant research, hypothesis of study, methodology adopted, statistical analysis adopted and limitation of study should be explicitly stated.
2. **Statement of findings and recommendations:** A summary of findings and recommendations is given in non-technical language.
3. **Results:** A detailed presentation of the findings of the study, with supporting data in the form of tables and charts together with validation of reports. All relevant results must find a place in the report.
4. **Implications of the results:** It has three important aspects
 - * A statement of the inferences drawn from the present study, which may be expected to apply in similar circumstances.
 - * The conditions of present study which limit the extent of legitimate generalizations of the inferences drawn from the study.
 - * The relevant questions that still remain unanswered or new questions raised by the study.
5. **Summary:** To conclude the research report, a brief of major findings and conclusions are given.

C) END MATTER

At the end of the report, appendices, bibliography, index are given to guide the reader.

TYPES OF REPORTS

Research reports vary in length and type, which is dictated by problems in hand. The results of research report can be presented in a number of ways:

TECHNICAL REPORT

It is used for record keeping or for public dissemination. A general outline of a technical report can be as follows:

1. Summary of results
2. Nature of the study
3. Methods employed
4. Data
5. Analysis of data and presenting of findings
6. Conclusions
7. Bibliography
8. Technical appendices
9. Index

POPULAR REPORT

It is used when research results have policy implications. A general outline of popular report:

1. The findings and their implications
2. Recommendations for action
3. Objectives of the study
4. Methods employed
5. Results
6. Technical appendices

ORAL PRESENTATION

Oral presentation of results of the study is effective in case of policy recommendations. It leads to better understanding of findings and their implications. The main demerit is that it fades away from memory before action is taken. Oral presentation may be enhanced by the use of various visual devices.

WRITTEN REPORTS

Mechanics of writing research report:

1. **Size and physical design:** The manuscript is written on unruled paper with blue or blue-black ink. The paper should be neat and legible.

2. **Procedure:** The steps involved in report writing are:

- Logical analysis of the subject matter
- Preparation of the rough draft
- Rewriting and polishing
- Preparation of the final bibliography and
- Writing of final draft

3. **Layout:** A comprehensive layout of the research report should comprise

- ❖ Preliminary Pages
- ❖ Main text
- ❖ End matter

a) Preliminary pages

The preliminary pages of the report should carry a title and date, followed by acknowledgements in form of preface or foreword. It followed by table of contents, list of tables and illustrations.

b) Main text

The main text of the report should have the following sections:

1. **Introduction:** It should contain a clear statement of the objectives of research. A brief summary of other relevant research, hypothesis of study, methodology adopted, statistical analysis adopted and limitation of study should be explicitly stated.

2. **Statement of findings and recommendations:** A summary of findings and recommendations is given in non-technical language.

3. **Results:** A detailed presentation of the findings of the study, with supporting data in the form of tables and charts together with validation of reports. All relevant results must find a place in the report.

4. **Implications of the results:** It has three important aspects

* A statement of the inferences drawn from the present study, which may be expected to apply in similar circumstances.

* The conditions of present study which limit the extent of legitimate generalizations of the inferences drawn from the study.

* The relevant questions that still remain unanswered or new questions raised by the study.

5. **Summary:** To conclude the research report, a brief of major findings and conclusions are given.

End Matter

At the end of the report, appendices, bibliography, index are given to guide the reader.

4. **Treatment of quotations:** It should be placed in quotation mark and double spaced forming an immediate part of the text.

5. **Footnotes:** It helps in identifying quotations and supplementary text. They are placed at the bottom of the page and numbered.

6. **Documentation style:** Documentary footnotes give essential facts about the edition used.

7. **Punctuation and abbreviations in footnotes:** Certain English and Latin abbreviations are used in footnotes and bibliographies to avoid repetitions.

8. **Use of statistics, charts and graphs:** They make a presentation self-explanatory, complete, neat and attractive.

9. **Final draft:** Revising and rewriting of rough draft is done before writing the final draft.

10. **Bibliography**

11. **Index:** Index may be both subject index and author index.

GRAPHICAL REPRESENTATION OF DATA

1. TABULAR PRESENTATION:

Tables are generally superior to the text for presenting statistics. Tables provide quantitative comparisons and provide a concise, efficient way to present numerical data. Tables are either general or summary in nature. General tables tend to be large, complex and detailed. They serve as the repository for the statistical findings of the study and are usually in the appendix of the research report.

Summary tables contain only a few key pieces of data closely related to specific findings. To make them inviting to the reader, the table designer should omit the unimportant details and collapse multiple classifications into composite measures that may be substituted for the original data.

2. GRAPHS:

A graph is a visual form of presentation. It shows the information that might be lost amid of tabulation and also shows tendency. Predictions are made glancing the graph. Its advantages are

1. Attractive and impressive view
2. Simplifies data
3. Easy to compare
4. No special knowledge required
5. It shows trends and direction of changes in trends.

Compared to the tables, Graphs show less information and often only approximate values. However they are often read and remembered than tables. Their advantage is that convey quantitative values and comparisons more readily than tables. The types of different graphs are as follows:

1. Line graphs:

Line graphs are used chiefly for time series and frequency distribution. There are several guidelines for designing a line graph:

- a) Put the time units or independent variables on the horizontal axis.
- b) When showing more than one line, use different line types to enable the reader to distinguish among them.
- c) Try not to put more than four lines on one chart

2. Pie charts:

Pie charts are another form of area chart. They are often used with business data. Researcher shows that reader's perceptions of the percentages represented by the pie charts. The guidelines are as follows:

1. Show 100 percent of the subject being graphed.
2. Always label the slices with "call- out" and with percentage or amount that is represented.
3. Use light colors for the large slice and darker colors for the smaller slices.

3. Bar graphs:

Bar graphs can be effective if properly constructed. Use the horizontal axis to represent time and units or growth related variables. Vertical bars are generally used for the time series and for quantitative classification. Horizontal bars are less often used.

PRECAUTIONS IN REPORT WRITING

A good research report is one which communicates the research findings effectively and efficiently.

1. The length of the report should be long enough to cover the subject.
2. It should sustain reader's interest.
3. Abstract terms and technical jargon should be avoided.
4. Charts, graph and tables may be used for quick knowledge of findings.
5. The layout of the research report should be in accordance with the objectives of the research.
6. The report should be free from grammatical mistakes.
7. The report should present logical analysis of the subject matter.
8. A research report should attempt to solve some intellectual problem.
9. It must forecast the probable future of the subject.
10. Appendices should be enlisted.
11. Bibliography is necessary for a good report.

12. Index is appended at the end of the report.
13. Report must be attractive, neat and clean.
14. Confidence limits and constraints should be mentioned.
15. Introduction to the report must contain objective of the study, nature of the problem, method employed and analysis techniques adopted.

UNIT V

PRODUCT RESEARCH:-

The term product research deals with the problems facing the product planning. These problems may include new product development modifications of the existing products, imitating competitors product, formulating and implementing product life-cycle strategies, designing and evaluating packaging and branding strategies, after sales service and guarantee policies.

Three types of product research are

- (i) New product research
- (ii) Modification of the existing product
- (i) Imitating competitor product.
- (ii) Product life cycle research
- (iii) Research in branding and packaging
- (iv) After sales service
- (v) Warranty/guarantee policies

A product may be defined as “a complex tangible and intangible attributes, including, packaging, colour, price, manufacturer’s prestige, and manufacturers and retailers services, which the buyer may accept as an offering for satisfaction of wants or needs.”

Product research encompasses various areas of product-mix such as colour and design package, price of the product: promotional aspects which build an image of the company and product in the buyers mind; distribution system and above all the attitude of the buyer towards the product with regard the satisfaction he gets from that. A firm interested in product research must take into consideration all the aspects concerned with the new product development, its modifications, product life cycle and various other product planning aspects.

Scope of product research includes following dimension

- a. Raw materials used in various proportion in the final mix.
- b. Attributes of the product.
- c. Important points of the product
- d. Product appraisal
- e. Product design
- f. Product development
- g. Product packaging
- h. Product planning
- i. Product branding or trade marks

Product research is ore concerned with the perception of the consumers about the product, than with the product as a bundle of physical and chemical attributes.

Object of product analysis

1. Product analysis
2. Product development

Importance of product research

1. It enables an advertiser to explain the features of the product in a satisfactory way.
2. Product knowledge, which is the result of product research, gives self-confidence to an organism during an advertising campaign.
3. It makes advertising more effective.
4. PR assist a prospect in getting complete knowledge of the product.
5. It leads to increased sales under markets and higher profile.

Sources of product research

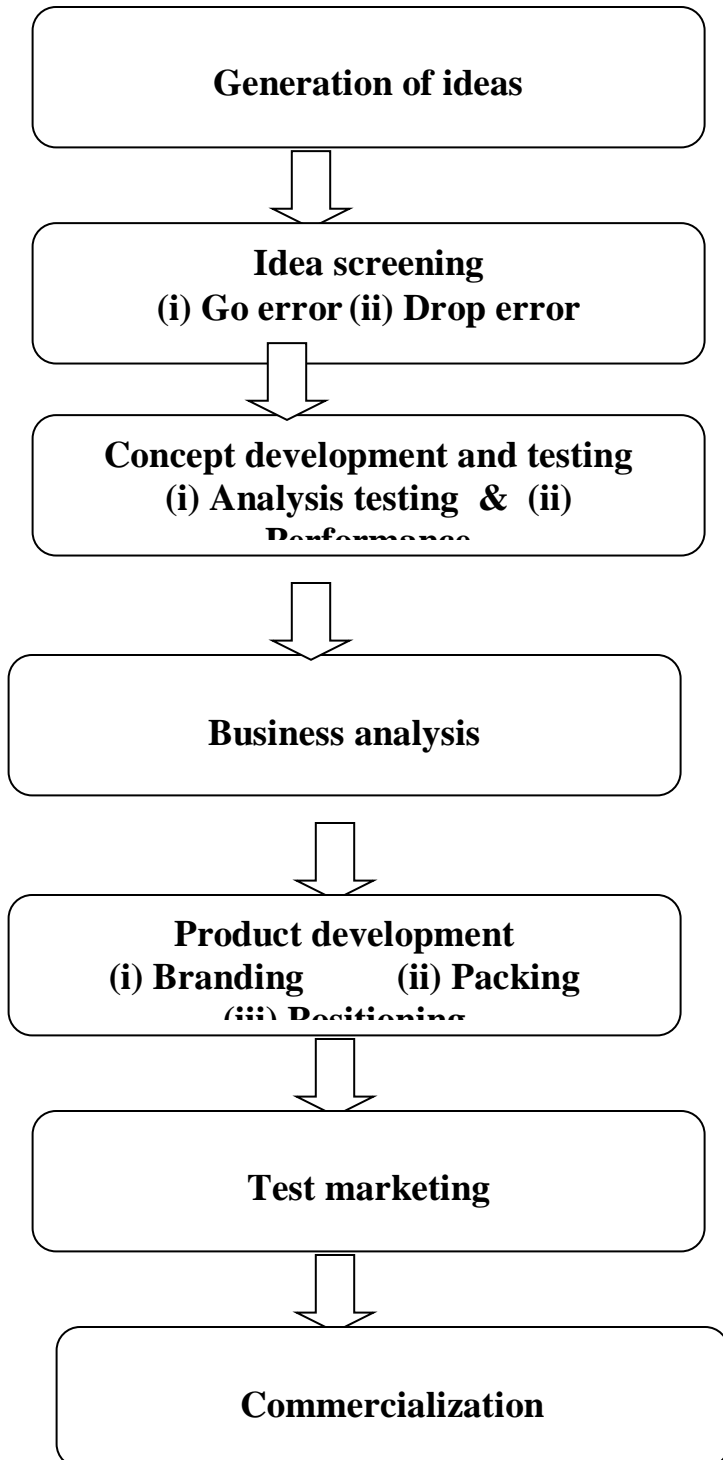
1. Colleagues in sales organization
2. Books and periodicals
3. Factory or workshop or plan
4. Competitors
5. Consumers

Methods of acquiring product knowledge

1. Observation

2. Discussion and reading

NEW PRODUCT DEVELOPMENT



1. Generation ideas

- A product idea may be worth lakhs of rupees or it may be worth zero.
- In product research, first all ideas are generated and evaluated to retain the better ones.
- The ideas can be generated by internal sources or external source Internal sources are:-
- The ideas may be generated through brain-storming session, attribute analysis.

2) Ideas screening

Screening product ideas is done to retain the ideas which are better. There can be two types of errors which a marketer may commit in screening product ideas.

(i) Go error:- Retaining a wrong or worthless idea for new product development.

(ii) Drop error:- Dropping a better ideas while screening the product ideas.

The screening can be better conducted by the product research by specifying different attributes required in an idea and collecting information by asking a sample of consumers or raters to give percentage weight out of 100 marks to each of the product attributes.

(3) Concept development and testing

After screening of ideas the remaining ideas are developed into concepts of the products. For example, Drink

- What sort of drink it will be?
- Who will be the consumers?
- Whether it will be the sold locally or nation wide?

After several other questions of this nature are to be answered and concepts are developed on these line.

The developed concept is to be tested by interviewing a sample of customers.

There should be technical testing as well as consumer testing of a new product concept.

In technical testing the manufacturer technically compares his product with competitors product.

In technical testing there are two phases

(i) Analysis testing

(ii) Performance testing

Analysis testing – Analysis composition of the product and exactly how the product.

(i) Concept testing

(ii) Pretesting the product

4. Business analysis

- The cost, sales and profits are estimated for the new product.
- The data of a similar product are considered and those are applied to estimate cost, sales and profits of new product.
- While analysing the price, volume of sales and price following should be considered.
- The market potential and share of competitor.
- Replacement or repeat sales.
- Whether repeat purchase ratio is likely to rise or fall.
- The researcher must find out the data to estimate future costs and profits.

5. Product development

A prototype of product is developed on ideas which are retained after the business analysis.

Three major product aspects are investigated and finalised in this stage.

(i) Branding

(ii) Packaging and

(iii) Positioning

Branding

- A brand name which is easy to pronounce, shorter in spelling, attractive and associated with meaning of product is selected.
- Branding can be conducted after consulting a sample of customers on company's existing product or potential customer of new product.
- Various tests which can be conducted to test the branding policy soundness are
 - (i) Association test: What images comes to respondent mind.
 - (ii) Learning test: To find ease in pronouncing the brand name.
 - (iii) Memory test: To know whether the name is easy to remember.
 - (iv) Preference test: To know which one of several names are preferred.
- The decision is to be taken on the basis of data whether the individual or family brand names would be successful.

Packaging

Regarding packaging of new product potential customers are conducted by the researcher and asked which colour, size, design and style of the package they like most from available alternative and it is selected.

Respondents are asked whether they would like to have convenience packaging or promotional packaging.

Before finalizing various tests such as engineering tests, visual tests, dealer test and consumer test are required to be conducted.

Positioning

To position the product in view of competitors product marketing mix elements of product are considered.

6. Test marketing

- Test marketing refers to testing the new product marketing plan on a miniature basis by introducing the product into a few selected markets. This is done before the product is finally launched for the purpose of commercialization. This is made in the assumption that the test marketing results will be project able to the entire market for commercializing the product.
- The test help in discovering the product fault, which escaped attention in the product development stage.
- Marketing testing provides answers to various questions such as
- How large a plant is needed for national sales?
- Which cities should be selected to run the test?
- What should be optimum expenditure on production, etc.?

7. Commercialization

First step in test marketing is to develop a test market plan.

The major decisions in test market may include (1) the number of cities to be selected for testing the product, (2) the length of time for which test should run, (3) the type of information to be gathered, and (4) the action to be taken on the basis market result.

The test should run for an average repurchase period that is when the customers start purchasing the product second time after they consume the first free sample, product purchased in special deals or after an impulse purchase.

The firm should keep in mind that the test does not become so long so that the competitors by that time grasp the market share.

At the final launching stage, the company should finalize all the attributes and package design for the new product. Promotional tools are used for promotion.

Product life cycle research

Four distinct stages of the product life cycle. They are:

- (i) Introduction stage, (ii) Growth stage, (iii) Maturity stage and (iv) Decline stage.

Introduction stage

- During the introduction stage, the information on product acceptance, production image and distribution system are needed.
- Expenditure on promotion is required to be more so price can be fixed in such a manner that other expenses get compensated.
- Profits are low at this stage.
- Research is conducted to yield more at the introduction stage;

Growth stage

At this stage the product starts yielding very good profit but there is a threat from the competitors that try to enter the market and snatch the market share.

To know about the competition strategies during the growth stage a research effort is needed to be made to gather information on the competitor's product attribute, market share, price structure, discount and allowance in pricing policies, distribution policies promotional programs, etc.

The emphasis of the company is on increasing the product acceptance, product image and market share of the product. This is carried by improving the product quality and adding new features in the product, searching vigorously for the new market segments, opening new distribution channels for providing more exposure to the product, shifting from informative advertising to persuasive advertising, lowering price at the right time to attract new price sensitive layer of customers.

Maturity stage

The products sale reaches the highest point but the profit starts declining slowly.

At this stage the number of competitors increases further and they become very tactical and more and more research is needed to note and counter their activities.

The maturity stage may exhibit these phases

- (i) Growth maturity Where sales grow slowly
 (ii) Saturation maturity Where sales maintain a constant level
 (iii) Decaying maturity Where sales start declining

Product can be saved from dropping out through (I) Market modification by entering into new market segment and searching new markets, increasing usage rate of the product and repositioning of product achieves large brand sales, (ii) Product modification to relaunch the product, it can be carried out through quality improvement, feature improvement and style improvement, (iii) Marketing – Mix modification can be carried out by adjusting all the four P's of marketing.

To make these modification huge amount of information is required to gather and these information marketing research plays important role.

This exhibits a sharp decline in sales of the product. The firm has to decide whether to drop the product or continue with it. The MR has to gather lot of information. These may be used to

- first identify the weak product
- after identifying the research makes available the information whether the continuation strategy, concentration strategy will be useful for the firm with regard to the product.
- The strategies to be carried out depends upon competition more so information on their strategies pertaining to the product in question are needed to be collected, analysed and interpreted.
- At the final stage the product may be modified so that new re-cycle may begin otherwise the product may be dropped.

Product mix research

A continuous evaluation of package designs, branding policies and after sales service is the essential component of produce research.

1. Package designs must be in conformity with those of the competitors or better than competitors.
2. Both pretesting and post testing are conducted in packaging research
3. Paired comparison test are the mostly used type of packaging test.
4. The researcher tests designs, colours, shapes, size and symbols.
5. Resistance of package for the product handling is also required to be tested individually and in comparison to the competitors product. Resistance is an essential feature of packaging aspects which facilitates the product handling apart from acting as promotional tool to the product.
6. The researcher may investigate the complaints of the dealers and consumers in this connection and after analysis of available data, suggest some measures to improve the packing aspects of the product.

Branding policies

- If the brand is appealing it can increase the market share.
- Brand names should be easy to pronounce, explain some small attribute of the product and should be shorter containing only single word.
- The researcher task is to investigate whether present branding policy is serving the organizational purpose. If not the reasons are found out and corrective measures are taken.

After sales services

- After sales service becomes increasing important because of increased competition.
- Buyers expect that the manufacturer should remain in continuous contact with them according to the guarantee of warranty given in connection with the product purchased. If the marketer fails to meet this condition of buyer and does not pay much attention to their complaints he is sure to loose the market.
- The researcher must investigate where company's efforts are lacking pertaining to after sales service.
- With regard to consumer product house wives must be contacted and problems as product performance must be identified, analyzed and solution worked out.

The dealers or distributors must be contacted and problems on product performance must be identified, analysed and solution worked out.

PRICE RESEARCH

Research on pricing of product can be done on the following areas.

1. New product pricing
2. Pricing for product life
3. Competitor pricing
4. Price sensitivity research
5. Price spread analysis

Data required for pricing research

1. COST DATA : Raw material, labour & overhead cost.
2. Govt. regulation on price
3. Economic data : Demand and supply of product.
4. Competitor production and pricing strategies,
5. Price spread analysis : Price variation between producer and consumer.
6. Consumer behaviour and price change.

METHODOLOGY

Data required : Secondary data/primary data

Tools used : Data sheets, Questionnaire, schedule method.
 Data analysis : Statistical tools like simple percentage.
 Averages, standard deviation, correlation,
 Chi-square, ANOVA, T-test, F-test.

Major research techniques.

1. New product pricing
2. Price sensitivity research

NEW PRODUCT PRICING RESEARCH:

There are mainly two product-pricing strategies

1. Profit oriented pricing
2. Share oriented pricing

Profit oriented pricing

1. Delphi method:
The formalize way to obtain the expressed judgment of a number of persons involved in the pricing process. If it consist of a series of round prediction made by participants, each prediction made by the participant each prediction being made anonymously and given to an administrator. The process is repeated till the final judgement is arrived.
2. Statistical analysis:
Past data at various price charges are used to find the quantity that can be sold at a given price. Past data are used to predict the pricing trends and future pricing trends and future pricing behaviour.
3. Surveying:
Opinion surveys can be conducted with sales representatives, distributors, and customers. This will help in findings the quality that can be sold at a given charge in price.
4. Conjoint analysis:
Price is determined, taking in to account various factors like quality of material used, manufacturing process, technology used, company image etc., The influence of all these on price charges are shifted jointly.
5. Value analysis:
Total price is determined on the basis of competitive difference
6. Laboratory experiments:
It involves a simulated store in which prices are changed experimentally and the levels of purchase by the responders are measured. It is a quick method to estimate demand for the products at various price.
7. Panel research:
Data on the purchase over a given price are collected from a panel of customers appointed by the company. The data will be analysed to find attitude on a price charge.
8. Retail audit;
The rate of purchase of products for a given change in price can be studied by the retail audit method. This method involves counting of opening stock and adding new arrivals, altering the price and closing stock. The difference between total stock and closing will reveal the sale.
9. Field experiments:
Data can be collected in natural purchase environment such as supermarket buying behaviour of people as a result of price-changes can be accurately measured.

PRICE SENSITIVITY RESEARCH:

Objectives;

- To study consumer reaction to a given change in price.
- To study the volume of purchase for a given change in Price.
- To measure the degree of change in the purchase behaviour for a given change in price.

Research techniques:

1. Company sales records
2. Panel sales data
3. Field experiment
4. Retail audit
5. Laboratory experiment

MOTIVATION RESEARCH

Motivational research by its nature is different from traditional or ‘nose counting’ research.

By nose counting research we mean the research is directed at finding the answer to a specific question or even the number that answers a specific question. Information can't be obtained by direct message. The researcher cannot simply go up to a consumer and ask him why he prefers one product brand to another and expect to get a correct answer. Generally direct questioning does not give correct answers for one of the two reasons: either the consumer does not know his true reasons or he knows but is unwilling to tell them to the researchers or gives illogical reasons.

These illogical reasons are because of

1. The consumer does not know the “why” of purchase
 - * Consumers are generally unaware of their own “true” reasons for specific brand and product selections.

- The consumer may answer due to the influence of the advertisement. The consumers can also get confused about the brand they actually bought.

This happens because of the influence of heavy product identification with a single brand.

Eg. Cold cream ponds

Photocopier – Xerox

The heavy product identification is a total disaster in the view of marketing research. In response to direct questioning concerning purchase behaviour, all the researcher gets is the major brand name even if the consumer is buying “off-brand”.

2. The consumer will not tell about their purchase:

Reason for incorrect answers lies in the choice made by consumers not to tell the correct answer even if they know it. This deliberate misrepresentation will occur at any time due to moral sensitivity or status-related.

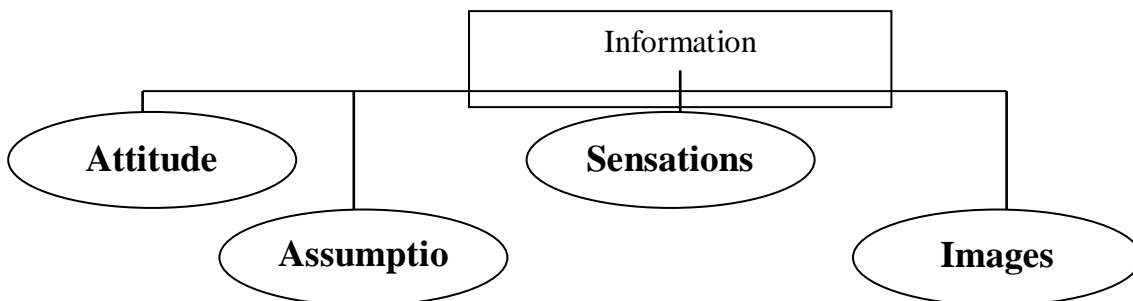
Over estimate their income, their charitable giving and their purchases of branded item and they under estimate their smoking, drinking habits.

Respondents will also modify their answer in attempt to appear logical and intelligent.

3. The consumer may put forward illogical reasons for their purchase

The reasons for consumer preferences are seldom logical. The researcher who approaches the respondent in a direct, illogical, and straightforward manner will often obtain very misleading answers. Where as some motivation research can be conducted in a relatively direct fashion in other areas valid results can be obtained only from very indirect and seemingly roundabout methods. Further since the nature of investigation is subjective, the conclusions produced are often highly speculative and will vary greatly with person performing the research.

Kinds of information sought in motivation research:-



Attitude

Consumers are believed to have stable sets of attitudes. These sets are different for different individual consumers. The stable set of attitude towards a product brand may be favourable or unfavourable. If the customer have positive attitude towards the product. The set of attitude can be changed forming advertising appeals carefully aiming at a particular market segment.

Assumptions

Consumer before buying the product create a opinion about the product Consumer have “frames of references” formed out of the information gathered from their experience. They try to “fit” things in the frame of reference. If they do not fit they reject things.

It is important to have knowledge of assumption and beliefs held by consumers. Some consumers may use price as an index of quality.

Consumers make a number of assumptions regarding products and companioes-often without fact.

Assumption and beliefs are closely related to attitudes but it is harder to change than attitudes.

Sensations

Sensation may be defined as the reaction of the mind to either a mental or physical stimulus. Sensation is commonly produced by stimuli, which affect a person's sight, smell, hearing, taste, and touch.

Images

Image is defined as mental pictures that are formed as a result of stimuli. Consumers develop some images about products. These images are built on the basis of salient features of product, which are considered really salient by a particular consumer. These images lead a consumer to buy or not to buy a brand of the product. The images can be changed with the help of improved advertising.

Motive

Motive is one of the more impelling determinants of a person's action. Motivation arises out of tension-systems in consumers mind and thus creates a need for brand of the product directs the individual to a goal.

Motive is a need, want, drive or usage in the mind of an individual. Marketer's task is to develop a tension system in the consumer's mind and thus create a need for brand of the product.

Motivation Research technique

1. Non-disguised-structured techniques
2. Non-disguised non-structured techniques
3. Disguised-non-structured techniques and
4. Disguised-structured techniques.

(i) Non-disguised structured techniques

- This approach employs a standardized questionnaire to collect data on beliefs, feelings and attitudes from the respondent.
- The purpose of the study is clearly explained to respondent.
- Three types of methods might be employed to collect data as explained below:

(a) Single question method

This is the simplest method used to collect data on attitudes. A single question is asked with a variety of given response-choices. The respondent is required to give one answer selected from various choices given to them.

For example, to find out consumer's attitude towards a given product the following question might be asked. Which one of the following responses best describe your feelings about X brand of product?

1. I think it is an excellent product.
2. I think it is a very good product.
3. I think it is a good product.
4. I think it is a fair product.
5. I think it is a poor product.
6. I think it is a very poor product

Merits

The single-question technique has the advantage of being easy to administer and analyse.

Demerits

- The subject matter being specific, it is difficult to construct meaningful categories
- Specified alternative answers may force the respondent to express an attitude, which he does not hold.

(ii) Multiple question method

In this method number of questions are asked about the attitudes and total score from all the questions responses give the score or total attitude of the respondent.

(iii) Physiological tests

Laboratory tests such as galvano skin response, eye moment and pupil dilation are used to measure attitude of people towards product.

(2) Non-disguised-non-structured techniques

- These techniques use an unstandardised questionnaire.
- The purpose of the study is revealed fully to respondent.
- Neither the questions asked nor the answers given are predetermined is the most common thing in various variations of this approach.
- The techniques are also called depth interviews, qualitative interviews, unstructured interviews, non-directive interview, focused-interview and camera action interviews.

Non-directive approach

In this approach the respondent is motivated to reveal more and more details on the initial question like, "Tell us how you feel about product? What more? Etc.

The main disadvantage of the depth interview-non-directive approach is that the data obtained is highly qualitative and ambiguous.

To remove this disadvantage a more structured approach is required to be used.

3. Disguised-non-structured technique
 - In this technique the purpose of the study is not revealed
 - A list of unstructured question is used to collect data on consumer's attitudes.
 - The purpose of the research is disguised, this is done because many consumers either do not know or they are unwilling to reveal or express the reasons of their product purchase.
 - In order to get the true information on the subject under study indirect questions are asked to the respondents.
 - This act of using disguised and unstructured method is referred to as projective techniques.
 - The projective techniques include several tests given to the respondents. They may be asked to give their comments on cartoons, pictures, stories, etc. This method compels a respondent to project himself on 'why' part of his behaviour.

7. Disguised structural techniques

When the researcher is to measure that attitude which respondent might not readily and accurately express, then researcher can use disguised structured techniques. Respondents are given questions, which they are not likely to be able to answer accurately. In such circumstances they are compelled to "guess at" the answers. It is felt that at this circumstance attitude on the subject are assumed to be revealed.

8. Brand maps

Blank sheet of paper is given to consumers. They are asked to map out brands of a particular product category. Certain brands form a cluster and certain brands are distanced. This makes the researcher to know about the brand perception of consumers. Competitive threats to research brand.

9. Unique trait sorting/neuro linguistic programming

List of attributes associated with the product is prepared. The respondent is asked to rank the attributes in respect with a given brand. Large share of unique attributes possessed by a brand makes it a strong brand or equity. Absence of unique trait indicates the contrary.

10. Bank accounts

Identify all values related to a brand. Ask consumers to invest, save or spend these values, as they like.

Value put in fixed deposit	-	Previous values protect these
Values put in S.B. account	-	Save them and consolidated them
Values in current account	-	Can be transacted with changed, modified or revised
Loose cash	-	Incidental to the brand

Limitation in motivation research

 - (i) Cautions are required to be exercised not only in the application of these techniques but also the resultant data should be analysed and interpreted according to psychological theory.
 - (ii) The designing and administering of these techniques need qualified and Experienced researchers.
 - (iii) Generally small samples are taken for conducting motivation research generalizations if drawn on this basis are misleading.

PROMOTION RESEARCH

Promotion research consists of

- a) Evaluating promotion effectiveness
- b) Analysing promotion and selling practices
- c) Selecting promotion media
- d) Motivational studies
- e) Establishing sales territories
- f) Evaluating present and proposed sales methods
- g) Studying competitive pricing.
- h) Analysing salesmen's effectiveness
- i) Establishing sales quotas.

DISTRIBUTION RESEARCH

Decision making areas.

1. Channel choice-Direct & indirect
2. Channel performance measurement
3. Warehouse location
4. Retail outlet location
5. Number of sales representation

Channel choices:

Comparison of channel cost for distribution-The changes include dealer margin-commission-storage cost freight and forwarding charges. Total cost of distribution of each channel. Will be computed and compared with each other. Cost effective channel will be computed and compared with each other. Cost effective channel is one which involves the least expenses and least time for distribution.

Distribution research consists of

- a) Location and design of distribution centers.
- b) Handling and packing merchandise.
- c) Cost analysis of transportation methods.
- d) Dealer supply and storage requirements.

PROMOTION RESEARCH

Promotion research consists of

- j) Evaluating promotion effectiveness
- k) Analyzing promotion and selling practices.
- l) Selecting promotion media
- m) Motivational studies
- n) Establishing sales territories
- o) Evaluating present and proposed sales methods.
- p) Studying competitive pricing.
- q) Analysing salesmen's effectiveness.
- r) Establishing sales quotas.

SALES CONTROL RESEARCH

Sales control research is described as the identification and measurement of all those variables which individually and in combination have effect on sales.

Sales control research comprises sales forecasting, market potential, market share analysis, determination of market characteristics and sales analysis.

1. SALES FORECASTING

Steps in forecasting process:

STEP I : Objective of the forecast

The Marketing Research should know as to what will be the use of the forecast that is being conducted.

STEP II : The time period

The time period for which forecast is to be made should be selected. Is the forecast for Short-term, Medium-term or long-term? Why should be a particular period of forecast be selected?

STEP III : The Method or Technique of forecasting should be selected

One should be clear as to why particular techniques must be selected out of several techniques.

STEP IV. The data necessary should be collected

The need for specific data will depend on forecasting technique to be used.

STEP V : The forecast is to be made.

This will involve the use of computation procedure.

In order to make forecast to be useful to the company, there should be good understanding between Management and Researcher. The management should clearly explain the researcher about the purpose of forecast of how it is going to help the company.

The researcher should have proper understanding of the operations of the company, its environment, past performance in terms of key indicator of their relevance of future trend. These information help the researcher to take more realistic information.

Sales forecasting means the predication of sales of a particular product, company, branch office, or other unit for a given period of times.

METHOD OF FORECASTING:

Methods of forecasting can be divided into broad categories viz.

- Subjective or Qualitative
- Objective or Quantitative Methods

Subjective Methods:

1. Field Sales force:

The companies ask their salesman to indicate the most likely sales for a specific period in the future. Usually the salesman is asked to indicate anticipated sales for each account in his territory. District manager checks these forecasts who forward these to company's head office different territory forecasts are then combined into a composite forecast at the head office. This method is more suitable when short-term forecast is to be made, as there would be no major changes in this short period affecting the forecast. Advantage of this method is that it involves the entire sales force, which realises its responsibility to achieve the target it has set for itself.

2. Jury of Executives:

Jury of executive opinion method and sales force estimate method are subjective methods of sales forecasting. Each of the number of executives make an independent forecast of sales for the next period usually a year. These forecasts are more than just opinion. Each executive has considerable factual data available to him and presumably possesses mature judgment.

Once the various executives have made their estimates, some method of reconciling the difference or averaging them must be determined. The chief executive of the company may consider the various estimates and make a final decision. A round table discussion with a brainstorming session may lead to reconciliation of estimate.

Advantage

It is simple and based on different viewpoints as opinions of different executive or sought.

Limitation

The executive's opinions are likely to be influenced in one direction on basis of general business condition.

Users Expectations:

Forecast can be based on users expectations or intentions to purchase goods of service. It is different to use this method when number of users is large. It is most suitable when the number of buyers is small such as in case of industries products.

The Delphi Method:

- This Method is based on the experts Opinions
- Here each expert has access to the sales information that is available.
- A feedback system generally keeps them informed of each others forecast but no majority opinion is disclosed to them the experts are not brought together.
- This is to avoid domination of one or more vocal expert on others.
- The experts are given an opportunity to compare their own previous forecast with those of other and revise them. After this three or four experts arrive at final forecast.
- The method may involve large number of experts from 10 to 40 so this may delay the forecast.

Quantitative or Statistical Method

Time-Series:

In time-series forecasting the past sales data are extrapolated as a linear or curvilinear trend.

- Time-series forecasting is most suitable to stable situation where the future trends will largely be an extension of past.
- Moving average method.

Time series decomposition :

- i) Trend – long term effect on sales that are caused by such factors as income, population industrialization & technology
- ii) Cycle-cyclical component indicate sort of a periodicity in general.
- iii) Seasonal component reflect: change in sales level due to factors such as weather, festival holidays etc.,
- iv) Erratic movements in data arise on account of events such as strikes, lockouts, price wars etc.,

Causal or Explanatory Method:

This method yield realistic forecasts provided relevant data are available on the Major variable influencing changes in sales.

- i) Leading indicator or
- ii) Regression models

- (i) **Leading indicator:** The change in sales of a particular product or service are preceded by changes in one or more leading indicators. In such cases the leading indicators are identified and closely observed for changes.

Example: Birth data --- Baby food + goods necessary for infants

- (ii) **Regression Models**

In involves estimating or predicting the value of one variable given the value of another.

For example: Advertising expenditure and sales are related in such a way that the former increases sales Regression analysis is used to find likely sales against a advertising expenditure or vice versa.

Factors to be considered while selecting particular forecasting method are:-

- 1) Time horizon
- 2) Cost
 - Development cost
 - Data storage cost
 - Cost of repeated application
- 3) Data availability
- 4) Variability or consistency of data
- 5) Amount of detail necessary
- 6) Accuracy
- 7) Turning points

The task of forecasting should not be exclusively entrusted to a person. It should be co-coordinated by single person preferably the marketing research manager, sales manager and production manager must be actively involved in it.

Economic Model:

- It is combination of statistical & Mathematical technique to verify hypotheses existing in economic theory.
- An econometric model incorporates functional relationship estimated by these techniques into an internally consistent and logically self-contained framework Econometric model used both external and internal variables.

3. **Sales Analysis:**

- Sales analysis is analyzing actual sales result.
- Sales analysis enables a company to identify the areas where its sales performance has been good customers who have bought in bulk, product with higher and low sales volume.
- A systematic comprehensive and periodical analysis will be helpful to a company to reinforce its sales effort where it is most needed.
- Sales analysis is on the basis of four major types viz.
 - By territory
 - By product
 - By customer
 - By size of order
- The purpose of conducting the sales analysis is to determine the company areas of strength and weakness.
- This try to find out those products which are producing the greatest volume of sales also the product with least sales volume.

(a) **Sales analysis by territory:**

- The invoice is considered as primary sales record for the purpose of analysis
- First geographical control units to be used is decided
- District are the typical choice for analysis
- Sales are tabulated by territorial units.
- The results may be compared with sales potentials previously developed.
- The reasons are identified such as
 - (i) Is competition usually high?
 - (ii) Has less selling effort been put there?
 - (iii) Is sales force weak?

(b) **Sales analysis by products:**

- The analysis by product will enable a company to identify its strong or weak products.
- The sales analysis by product results are more effective when the analysis is carried out on details break-up of products such as product variation by size, colour etc.,

- When a company finds that a particular product is doing poorly, two opinions are open to it.
 - i) It may concentrate on that product to improve sales
 - Or
 - ii) It may gradually withdraw the product and eventually drop it all together.
 - If the product is complementary with other items sold by the company the decision to abandon the product must be with care and caution.
 - Combining sales analysis by products with that by territory will further help in providing information on which products are doing better in which area.
- (c) Sales analysis by customers:
This analysis would indicate that a relatively small number of customers accounts for large proportion of sales.
One may compare the data with the proportion time spent on the customers i.e., the value of sale calls.
An analysis of this type will enable the company to devote relatively more time to those customers who collectively account for proportionally large sales.
Sales analysis by customer can also be combined with analysis both by area & product.
It may indicate that in some areas sales are not increasing with particular type of customers though they have grown fast of other areas. Information of this type will be extremely useful to the company as it identifies the weak spot where greater effort can be called for.
- b) Sales analysis by size or order:
Sales analysis by the size of the order may show that a large volume of sales is accompanied by low profit and vice versa.
If cost accounting data are available which will indicate the cost of securing and handling an order, it is possible to determine sales, which are made at loss.
This analysis may be pushed to find areas product and customers where small orders are prevalent.
This leads to the action of setting a minimum order size in order to train salesman to develop large orders or to drop certain products or areas of customers.

3. Sales Potential

- Sales potential analysis is also termed as market analysis.
- A set of geographical sales potential can be defined as “ relative reassures of total possible sales of a commodity or a group of commodities under specific marketing condition at a stated time in a specified geographical area relative to the total area under consideration. The measure is concerned with the relative level of possible sales. Possible sales enter into the consideration of geographical sales potential merely as a concept and no value need to be attached to it.

Uses of sales potential :

1. Defining the sales territories
 2. Allocating funds for advertising & promotional efforts
 3. Setting the sales quotas
 4. Designing the distribution channels
 5. Deciding the location & size of the plants new sales office and warehouses
 6. Determining the strategy for market entry
- 1) Designing and assigning sales territories:
- the estimates of potentials form the basic for defining and designing of sales territories.
 - For each sales territory an optimum sales potential is sought by a particular firm. If the potential is below the optimum level the salesman is unable to use his time to his advantage.
 - If territory has too much of potential it is difficult for management to manage it call and sales may be cost.
 - Sales territory must be carefully defined and assigned to the salesman so that one salesman gets almost equal potential territory compared to other.
- Various factors influencing the optimum sales potential are.
- 1) Travels distance
 - 2) Average size of order or geography
 - 3) Number of customers
 - 4) The product line and its return and
 - 5) Nature of competition
- The elimination of weak areas and concentration of stronger ones can increase sales and at the same time reduce the costs.

- 2) Allocation of sales efforts:
 - Funds for all selling efforts viz. Sales force, advertising & sales promotion & publicity should be allocated only after consideration of potentials
 - In case of national advertising, this can be done by comparing circulation data for media with market potential.
 - Advertising can be allocated to each market in proportion to potential
 - Potential is not the only criteria for allocating sales efforts. The primary usefulness of market potential is to focus attention on relative worth of individual markets.
- 3) Setting sales quotas:
 - Sales quotas must be set for each sales territory.
 - While setting sales quotas sales potential of concerned territory should be kept in mind.
 - Before setting quotas the estimate of sales potential, sales performance change to be made in amount of supporting sales effort during coming year and anticipated activities of competitors must be considered.
 - Sales quota is set for each territory and salesman.
 - Quotas may not be same or of relative size of sales potential for that territory. A territory might have a very large potential but owing to local competitors the firm in question may not get the desired share of market. Hence the firm must set its sales quotas in view of internal competition.
- 4) Designing the distribution channel:
 - Depending upon the sales potential existing in each sales territory, we can design the sales channels for different territories.
 - More middlemen may be needed in large potential territories where as we can resort to direct selling in small territories with less potential or keep a very limited number of middlemen as compared to large potential territories.
- 5) Deciding the new plant location and size:

With knowledge of sales potential exact location of plant and its optimum size can be worked out. From sales potential figures the information about the potential exist for product and keeping in view competitors sales and potential figures the geographical location & plant size can be decided.

 - Whether to locate near particular market or at extra place covering all markets.
- 6) Strategy for Market entry :

By knowing the market potential one can decide about market entry time and positioning or product in comparison to competitors.

The basic reason for any company's being in business is to satisfy his needs by offering him suitable products and services.

 - All companies' activities such as production, finance, personnel, purchase, selling etc., must be devoted to the satisfaction of consumers, while still making a profit over the long run.
 - Basic marketing research thus revolves around the motivations of consumer buying.

Buying behaviour of consumers are studied in terms of its components like life-style, personality, social class, family-life cycle, reference groups attitude etc.,

MEDIA RESEARCH:-

The main importance of media research is

- a) How to choose among media types?
- b) How to decide on a specific insert within a particular type of media, say television?

In order to decide on these two issues it is necessary to have some data. The advertising research foundation suggested the following types of data for this purpose:

- 1) Media vehicle distribution
- 2) Media vehicle audience
- 3) Advertising exposure
- 4) Advertising perception
- 5) Advertising communication
- 6) Sales response