

UNIT – I

Topics Covered

- ❖ **Definition / Meaning of Research**
- ❖ **Objectives of Research**
- ❖ **Types / Classification of Research**
- ❖ **Steps in Research Process / Research Proposal**
- ❖ **Errors in Research**
- ❖ **Significance of HR Research**
- ❖ **Concept-mapping for HR Research**
- ❖ **Model Building in HR Research**

1.1 Definition / Meaning of Research

Research is defined as an *organized, systematic, data-based, critical, objective, scientific inquiry or investigation into a specific problem*, undertaken with the purpose of finding answers or solutions to it. In essence, research provides the needed information that guides managers to make *informed* decisions to successfully deal with problems. The information provided could be the result of a careful analysis of data gathered firsthand or of data that are already available (in the company, industry, archives, etc.). Data can be quantitative (as generally gathered through structured questions) or qualitative (as generated from the broad answers to specific questions in interviews, or from responses to open-ended questions in a questionnaire, or through observation, or from already available information gathered from various sources).

According to Rusk

“Research is a point of view, an attitude of inquiry or a frame of mind. It asks questions which have hitherto not been asked, and it seeks to answer them by following a fairly definite procedure. It is not a mere theorizing, but rather an attempt to elicit facts and to face them once they have been assembled. Research is likewise not an attempt to bolster up pre-conceived opinions, and it implies a readiness to accept the conclusions to which an inquiry leads, no matter how unwelcome they may prove. When successful, research adds to the scientific knowledge of the subject.

According to George J. Mouly

He defines research as, “The systematic and scholarly application of the scientific method interpreted in its broader sense, to the solution of social studies problems; conversely, any systematic study designed to promote the development of social studies as a science can be considered research.”

According to Francis G. Cornell

“To be sure the best research is that which is reliable verifiable and exhaustive, so that it provides information in which we have confidence. The main point here is that research is, literally speaking, a kind of human behavior, an activity in which people engage. By this definition all intelligent human behavior involves some research.”

“In social studies, teachers, administrators, or others engage in ‘Research’ when they systematically and purposefully assemble information about schools, school children, the social matrix in which a school or school system is determined, the characteristic of the learner or the interaction between the school and pupil.”

According to Clifford Woody of the University of Michigan

He writes that in an article in the *Journal of Social Studies Research* (1927), research is a carefully inquiry or examination in seeking facts or principles; a diligent investigation to ascertain something, according to Webster’s *New International Dictionary*. This definition makes clear the fact that research is not merely a search for truth, but a prolonged, intensive, purposeful search. In the last analysis, research constitutes a method for the discovery of truth which is really a method of critical thinking. It comprises defining and redefining problems; formulating hypotheses or suggested solutions; collecting, organizing and evaluating data; making deductions and reaching conclusions; and at last, carefully testing the conclusions to determine whether they fit the formulating hypotheses.

According to C.C. Crawford

He writes that “Research is simply a systematic and refined technique of thinking, employing specialized tools, instruments, and procedures in order to obtain a more adequate solution of a problem than would be possible under ordinary means. It starts with a problem, collects data or facts, analysis these critically and reaches decisions based on the actual evidence. It evolves original work instead of mere exercise of

personal. It evolves from a genuine desire to know rather than a desire to prove something. It is quantitative, seeking to know not only what but how much, and measurement is therefore, a central feature of it.”

John W. Best thinks, “Research is considered to be the more formal, systematic, intensive process of carrying on the scientific methods of analysis. It involves a more systematic structure of investigation, usually resulting in some sort of formal record of procedures and a report of results or conclusions.”

“Research is but diligent search which enjoys the high flavor or primitive hunting.”

– James Harvey Robinson

“Research is the manipulation of things concepts or symbols for the purpose of generalizing to extend, correct or verify knowledge, whether that knowledge aids in the practice of an art.”

– Encyclopedia of Social Science

“Research is a systematized effort to gain new knowledge.”

– V. Redman and A.V.H. Mory

According to C. Francies Rummel

“Research is an endeavor to discover, develop and verify knowledge. It is an intellectual process that has developed over hundreds of years, ever changing in purpose and form and always searching for truth.”

P.M. Cook has given a very comprehensive and functional definition of the term research “Research is an honest exhaustive, intelligent searching for facts and their meanings or implications with reference to a given problem. The product or findings of a given piece of research should be an authentic, verifiable and contribution to knowledge in the field studied.”

He has emphasized the following characteristics of research in his definition:

1. It is an honest and exhaustive process.
2. The facts are studied with understanding.
3. The facts are discovered in the light of problem. Research is problem-centred.
4. The findings are valid and verifiable.
5. Research work should contribute new knowledge in that field.

According to W.S. Monroe

Monroe, University of Illinois states, “Research may be defined as a method of studying problems whose solutions are to be derived partly or wholly from facts. The facts dealt with in research may be statements of opinion, historical facts, those contained in records and reports, the results of tests, answers to questionnaires, experimental data of any sort, and so forth. The final purpose of research is to ascertain principles and develop procedures for use in the field of social studies; therefore, it should conclude by formulating principles or procedures. The mere collection and tabulation of facts is not research, though it may be preliminary to it on eve a part thereof.”

According to R.M. Hutchins

R.M. Hutchins, Chancellor of the University of Chicago, in “The Higher Learning in America” says, “Research in the sense of the development, elaboration, and refinement of principles, together with the collection and use of empirical materials to aid in these processes, is one of the highest activities of a university and one in which all its professors should be engaged.”

J.H. McGrath and D.E. Watson have defined the term ‘Research’ more comprehensively. “Research is a process which has utility to the extent that class of inquiry employed as the research activity vehicle is capable of adding knowledge, of stimulating progress and helping society and man relate more efficiently and effectively to the problems that society and man perpetuate and create.”

1.2 Objectives of Research

The objective of research is to discover answers to questions by applying scientific procedures.

In the other words, the main aim of research is to find out truth which is hidden and has not yet been discovered. Although every research study has its own specific objectives, research objectives may be broadly grouped as follows, (Based upon the Research viewpoint):

- To gain familiarity with or new insights into a phenomenon, that is, formulative research studies);
- To accurately portray the characteristics of a particular individual, group or a situation, that is, descriptive research studies);
- To analyze the frequency with which something occurs, that is, diagnostic research studies); and
- To examine a hypothesis of a causal relationship between two variables, that is, hypothesis-testing research studies).

(Based upon the Researcher viewpoint):

- The knowledge of research methodology provides training to new researchers and enables them to do research properly;
- It helps them to develop disciplined thinking or a 'bent of mind' to objectively observe the field, the knowledge of doing research would inculcate the ability to evaluate and utilize the research findings with confidence;
- The knowledge of research methodology equips the researcher with tools that help him/her to observe things objectively; and
- The knowledge of methodology helps the research consumer to evaluate

Furthermore the research objectives can be classified as follows:

1. Theoretical objective
2. Factual objective and
3. Application objective.

1. Theoretical Objective

Those researches whose objectives are theoretical formulate the new theories, principles or laws. Such type of research is explanatory because it explains the relationships of certain variables. These researches contribute some basic knowledge to the human knowledge. The researches in different disciplines, that is, Physics, Chemistry, Mathematics, etc. have the theoretical objective.

2. Factual Objective

Those researches whose objective is factual find out new facts. This objective is by nature descriptive. These researches describe facts or events which happened previously. Such type of research is done in history.

3. Application Objective

The research having application objective does not contribute a new knowledge in the fund of human knowledge but suggests new applications. By application we mean improvement and modification in practice. For example if anyone gives a new application of electricity then such type of research has application objective.

1.3 Research Methods versus Methodology

- **Research methods** include all those techniques/methods that are adopted for conducting research. Thus, research techniques or methods are the methods the researchers adopt for conducting the research operations.
- **Research methodology** is the way of systematically solving the research problem. It is a science of studying how research is conducted scientifically. Under it, the researcher acquaints himself/herself with the various steps generally adopted to study a research problem, along with the underlying

logic behind them. Hence, it is not only important for the researcher to know the research techniques/methods, but also the scientific approach called methodology.

1.4 Research Approaches

There are two main approaches to research, namely, Quantitative Approach and Qualitative Approach.

- **Quantitative Approach** involves the collection of quantitative data, which are put to rigorous quantitative analysis in a formal and rigid manner. This approach further includes experimental, inferential and simulation approaches to research.
- **Qualitative Approach** uses the method of subjective assessment of opinions, behavior and attitudes. Research in such a situation is a function of the researcher's impressions and insights. The results generated by this type of research is either in non-quantitative form or in the form which can not be put to rigorous quantitative analysis. Usually, this approach uses techniques like depth interviews, focus group interviews and projective techniques.

1.5 Classification of Research*

1. On the basis of Level

In actual practice, research is conducted at different levels and for different immediate purposes. The level at which a person operates in the field depends on the objectives he intends to accomplish. Generally research has two levels:

(i) Basic Level

Trevers has defined basic level as basic research. It is designed to add an organized body of scientific knowledge and does not necessarily produce results of immediate practical value.

(ii) Applied Level

Applied research is undertaken to solve an immediate practical problem and the goal of adding to scientific knowledge is secondary. A common mistake is to assume that levels differ according to complexity and that basic research tends to be complex and applied research. Some applied research is quite complex and some basic research is rather simple.

2. On the Basis of Objectives of Research

On the basis of objectives of research they are of two types:

- (i) Fundamental research
- (ii) Action research.

3. On the Basis of Approach of Research

On the basis of approach of Research they are of two types:

(i) **Longitudinal research:** Historical research, case study, genetic comes under longitudinal approach of research.

(ii) **Cross sectional research:** Experimental research, survey are the examples of cross sectional research.

4. On the Basis of Precision in Research Findings

On the basis of precision (accuracy) the researches are:

- (i) Experimental research and
- (ii) Non-experimental research.

Experimental research is precise while non-experimental is not.

5. On the Basis of Nature of Findings

On the basis of findings Researches are of two types:

(i) **Explanatory research:** Such researches explain more concerned theories, laws and principles.

(ii) **Descriptive research:** These are more concerned with facts.

6. According to National Science Foundation

These National Science Foundation formulated a three-fold classification of research.

- (i) **Basic research:** Those researches which embrace origin or unique investigation for the advancement of knowledge.
- (ii) **Applied research:** Which may be characterized as the utilization in practice.
- (iii) **Development research:** It is the use of scientific knowledge for the production of useful materials, devices, systems, methods for processes excluding design and production engineering.

7. Another Classification

- (i) **Adhoc research:** Adhoc research is the class of inquiry used for a purpose alone and special.
- (ii) **Empirical research:** Empirical research is that which depends upon the experience or observation of phenomena and events.
- (iii) **Explained research:** Explained research is that which is based on a theory.
- (iv) **Boarder line research:** Boarder line research is that which involves those main two branches or are as of science. For example study of public school finance.

* Detailed explanation of the mentioned classification is left out for the students .

1.6 Significance of Research

- According to a famous Hudson Maxim, "All progress is born of inquiry. Doubt is often better than overconfidence, for it leads to inquiry, and inquiry leads to invention" (Wilkinson and Bhandarkar 1979). It brings out the significance of research, increased amounts of which makes progress possible.
- Research encourages scientific and inductive thinking, besides promoting the development of logical habits of thinking and organization.
- The role of research in applied economics in the context of an economy or business is greatly increasing in modern times.
- The increasingly complex nature of government and business has raised the use of research in solving operational problems.
- Research assumes significant role in the formulation of economic policy, for both the government and business.
- It provides the basis for almost all government policies of an economic system.
- Government budget formulation, for example, depends particularly on the analysis of needs and desires of people, and the availability of revenues, which requires research.
- Research helps to formulate alternative policies, in addition to examining the consequences of these alternatives. Thus, research also facilitates the decision-making of the policy- makers, although in itself it is not a part of research. In the process, research also helps in the proper allocation of a country's scarce resources.
- Research is also necessary for collecting information on the social and economic structure of an economy to understand the process of change occurring in the country. Collection of statistical information, though not a routine task, involves various research problems. Therefore, large staff of research technicians or experts is engaged by the government these days to undertake this work.
- Research as a tool of government economic policy formulation involves three distinct stages of operation, viz., (i) investigation of economic structure through continual compilation of facts; (ii) diagnosis of events that are taking place and the analysis of the forces underlying them; and (iii) the prognosis, i.e., the prediction of future developments (Wilkinson and Bhandarkar 1979).

- Research also assumes a significant role in solving various operational and planning problems associated with business and industry. In several ways, operations research, market research, and motivational research are vital and their results assist in taking business decisions.
- Research in terms of marketing refers to the investigation of the structure and development of a market for the formulation of efficient policies relating to purchases, production and sales.
- Operational research relates to the application of logical, mathematical, and analytical techniques to find solution to business problems, such as, cost minimization or profit maximization, or the optimization problems.
- Motivational research helps to determine why people behave in the manner they do with respect to market characteristics. More specifically, it is concerned with the analyzing the motivations underlying consumer behavior. All these researches are very useful for business and industry, who are responsible for business decision-making.
- Research is equally important to social scientists for analyzing social relationships and seeking explanations to various social problems.
- Research gives intellectual satisfaction of knowing things for the sake of knowledge. It also possess practical utility for the social scientist to gain knowledge so as to be able to do something better or in a more efficient manner.
- Research in social sciences is concerned with both knowledge for its own sake, and knowledge for what it can contribute to solve practical problems.
- It gathers new knowledge or data from primary or first-hand sources.
- It places emphasis upon the discovery of general principles.
- It is an exact systematic and accurate investigation.
- It uses certain valid data gathering devices.
- It is logical and objective.
- The researcher resists the temptation to seek only the data that support his hypotheses.
- The researcher eliminates personal feelings and preferences.
- It endeavors to organize data in quantitative terms.
- Research is patient and unhurried activity.
- The researcher is willing to follow his procedures to the conclusions that may be unpopular and bring social disapproval.
- Research is carefully recorded and reported.
- Conclusions and generalizations are arrived at carefully and cautiously.

1.7 Research Process / Research Proposal / Steps in Research Process

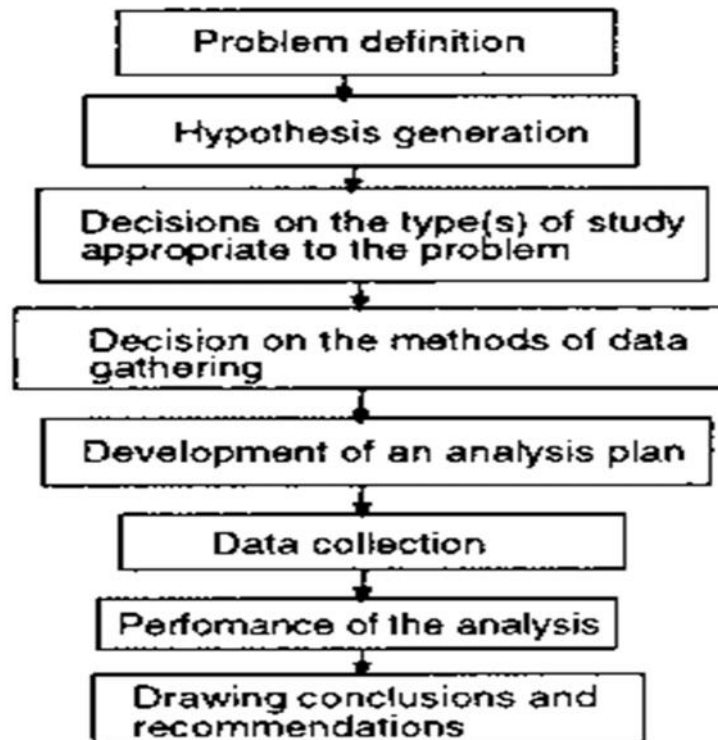
Research process comprises a series of steps or actions required for effectively conducting research and for the sequencing of these steps.

Some authors have defined Research Process as a series of eight steps while some define the process as composed of eleven steps.

The steps involved as regards to eleven steps include the following:

Formulating the research problem; Extensive literature survey; Developing hypothesis; Preparing the research design; Determining sample design; Collecting data; Execution of the project; Analysis of data; Hypothesis testing; Generalization and interpretation; and Preparation of the report or presentation of the results.

The diagrammatic flowchart of eight step research process is as shown below:



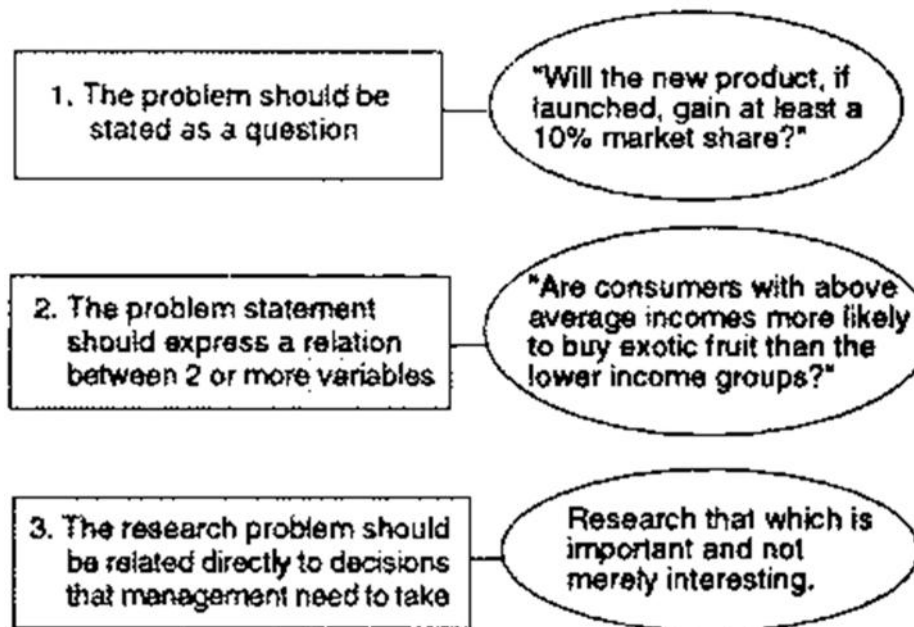
The detailed explanation for the eight step research process shall form the basis of discussion in this study material, as follows:

Step-1: Problem Definition

It is obvious that the decision-maker should clearly communicate the purpose of the research to the researcher but it is often the case that the objectives are not fully explained to the individual carrying out the study. Decision-makers seldom work out their objectives fully or, if they have, they are not willing to fully disclose them. In theory, responsibility for ensuring that the research proceeds along clearly defined lines rests with the decision-maker. In many instances the researcher has to take the initiative.

In situations, in which the researcher senses that the decision-maker is either unwilling or unable to fully articulate the objectives then he / she will have to pursue an indirect line of questioning. One approach is to take the problem statement supplied by the decision-maker and to break this down into key components and / or terms and to explore these with the decision-maker. For example, the decision-maker could be asked what he has in mind when he uses the term market potential. This is a legitimate question since the researcher is charged with the responsibility to develop a research design which will provide the right kind of information. Another approach is to focus the discussions with the person commissioning the research on the decisions which would be made given alternative findings which the study might come up with. This process frequently proves of great value to the decision-maker in that it helps him think through the objectives and perhaps select the most important of the objectives.

Whilst seeking to clarify the objectives of the research it is usually worthwhile having discussions with other levels of management who have some understanding of the marketing problem and/or the surrounding issues. Other helpful procedures include brainstorming, reviews of research on related problems and researching secondary sources of information as well as studying competitive products. Kerlinger suggests that a well-defined marketing research problem tends to have three common characteristics as shown in figure below.



Step-2: Hypothesis Generation

Whilst it is true that the purpose of research is to address some question, nonetheless one does not test research questions directly. For example, there may be interest in answering the question: "Does a person's level of education have any bearing upon whether or not he/she adopts new products?" Or, "Does a person's age bear any relation to brand loyalty behavior?". Research questions are too broad to be directly testable. Instead, the question is reduced to one or more hypotheses implied by these questions.

A hypothesis is a conjectural statement regarding the relation between two or more variables. There are two key characteristics which all hypotheses must have: they must be statements of the relationship between variables and they must carry clear implications for testing the stated relations. These characteristics imply that it is relationships, rather than variables, which are tested; the hypotheses specify how the variables are related and that these are measurable or potentially measurable. Statements lacking any or all of these characteristics are not research hypotheses. For example, consider the following hypothesis:

"Red meat consumption increases as real disposable incomes increase."

This is a relation stated between one variable, "red meat consumption", and another variable, "disposable incomes". Moreover, both variables are potentially measurable. The criteria have been met. However for the purposes of statistical testing it is more usual to find hypotheses stated in the so-called null form, for example,

"There is no relationship between red meat consumption and the level of disposable incomes."

Consider a second hypothesis:

"There is no relationship between a farmer's educational level and his degree of innovativeness with respect to new farming technologies."

Again there is a clear statement of the relationship being investigated but there are question marks over the measurability with respect to at least one of the variables, that is, "...a farmer's degree of innovativeness."

We may also encounter difficulties in agreeing an appropriate measure of the other variable, that is, "level of education". If these problems can be resolved then we may indeed have a hypothesis.

Hypotheses are central to progress in research. They will direct the researcher's efforts by forcing him/her to concentrate on gathering the facts which will enable the hypotheses to be tested. The point has been made that it is all too easy when conducting research to collect "interesting data" as opposed to "important data".

Data and questions which enable researchers to test explicit hypotheses are important. The rest are merely interesting.

There is a second advantage of stating hypotheses, namely that implicit notions or explanations for events become explicit and this often leads to modifications of these explanations, even before data is collected.

On occasion a given hypotheses may be too broad to be tested. However, other testable hypotheses may be deduced from it. A problem really cannot be solved unless it is reduced to hypothesis form, because a problem is a question, usually of a broad nature, and is not directly testable.

Step-3: Decision on the Type of Study

Research can be carried out on one of three levels: Exploratory, Descriptive or Causal.

Exploratory research: The chief purpose of exploratory research is to reach a better understanding of the research problem. This includes helping to identify the variables which should be measured within the study. When there is little understanding of the topic it is impossible to formulate hypotheses without some exploratory studies. For example, crop residues such a straw are high in lignin (a wood-like substance) and low in nutrients. This makes them a poor animal feed since the lignin acts against digestibility and the low nutrient content means poor food value. However, if treated in a strong alkali, plus a little heat, the lignin breaks down and the nutrient content increases. A company was established to exploit this technology and did so successfully for 4 seasons. After this period sales began to slow down. Three other manufacturers had entered the market by this time. The company, Animal Feed Systems, did not know whether the whole industry had slowed down or if only their product was suffering. Nor did they know if the problem was temporary in that perhaps the market comprised of "early adopters" had been saturated but it was only a matter of time before other farmers began to buy their systems when they saw how well they worked. It was also possible that if a problem did exist it could lie in any one of a number of areas: animal populations might be declining, distributors may not be promoting the product aggressively, customers may be experiencing difficulties in getting the chemicals, and so on and on.

This is a good example of a situation where insufficient knowledge prevented the development of clear objectives, since the problem could not be articulated with any precision and therefore research of an exploratory nature was required. Such research can take the form of literature searches, informal personal interviews with distributors and users/non-users of the product and/or focus group interviews with farmers and/or distributors.

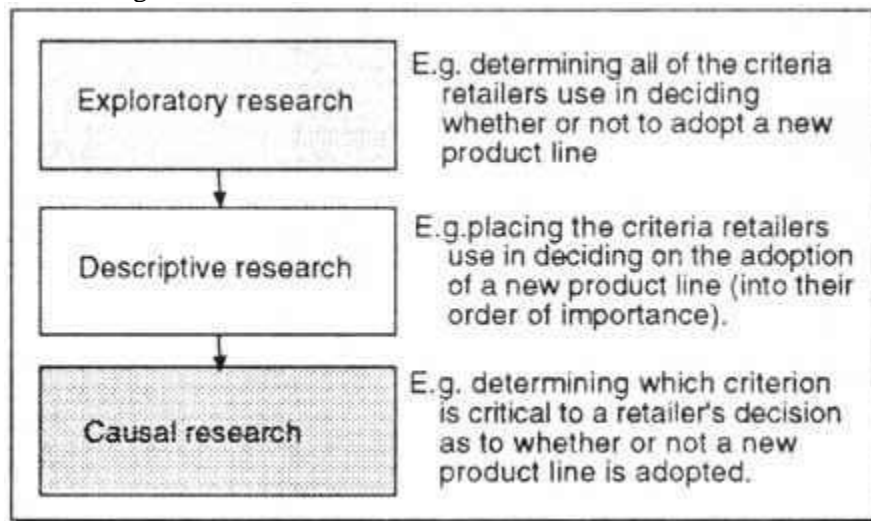
Exploratory research is intended to help researchers formulate a problem in such a way that it can be researched and suggest testable hypotheses.

Descriptive research: As the name suggests, descriptive research is concerned with describing market characteristics and/or marketing mix characteristics. Typically, a descriptive study specifies the number and size of market segments, the alternative ways in which products are currently distributed, listing and comparison of the attributes and features of competitive products, etc.

This type of study can involve the description of the extent of association between variables. For example, the researcher may observe that there is an association between the geographical location of consumers and their tendency to consume red meat. Note that the researcher is able to describe the relationship rather than explain it. Nonetheless if the relationship between the two is fairly stable this descriptive information may be sufficient for the purposes of prediction. The researcher may, for example, be able to predict how fast the per capita consumption of red meat is likely to rise over a given time period.

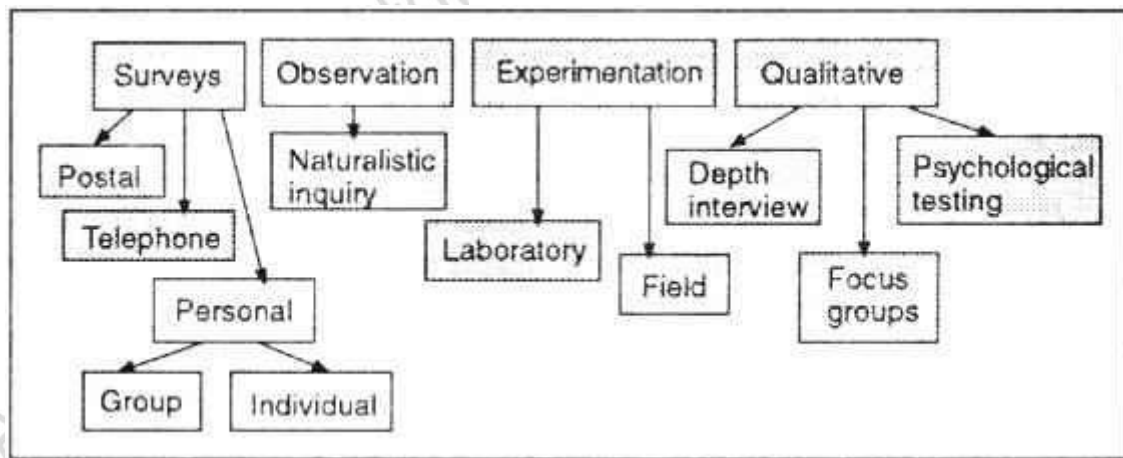
The principal difference between exploratory and descriptive research is that, in the case of the latter, specific research questions have been formulated before the research is undertaken. When descriptive research is conducted the researcher must already know a great deal about the research problem, perhaps because of a prior exploratory study, and is in a position to clearly define what he/she wants to measure and how to do it.

Causal research: Causal research deals with the "why" questions. That is, there are occasions when the researcher will want to know why a change in one variable brings about a change in another. If he/she can understand the causes of the effects observed then our ability to predict and control such events is increased. In summary then there are three distinct types of marketing research study: exploratory, descriptive and causal. The purpose of each is summarized in figure below. In some cases, a research programme will be of one kind or another, but in other instances these three typologies will represent phases within a single marketing research investigation.



Step-4: Decision on Data Collection Method

The next set of decisions concerns the method(s) of data gathering to be employed. The main methods of data collection are secondary data searches, observation, the survey, experimentation and consumer panels. Each of these topics is dealt with in Unit-III , so they are simply noted in the figure below.



Step-5: Development of and Analysis Plan

Those new to research often intuitively believe that decisions about the techniques of analysis to be used can be left until after the data has been collected. Such an approach is ill-advised. Before interviews are conducted the following checklist should be applied:

Is it known how each and every question is to be analysed? (e.g. which univariate or bivariate descriptive statistics, tests of association, parametric or nonparametric hypotheses tests, or multivariate methods are to be used?)

Does the researcher have a sufficiently sound grasp of these techniques to apply them with confidence and to explain them to the decision-maker who commissioned the study?

Does the researcher have the means to perform these calculations? (e.g. access to a computer which has an analysis program which he/she is familiar with? Or, if the calculations have to be performed manually, is there sufficient time to complete them and then to check them?)

If a computer program is to be used at the data analysis stage, have the questions been properly coded?

Have the questions been scaled correctly for the chosen statistical technique? (e.g. a t-test cannot be used on data which is only ranked)

There is little point in spending time and money on collecting data which subsequently is not or cannot be analyzed. Therefore consideration has to be given to issues such as these before the fieldwork is undertaken.

Step-6: Data Collection

At this stage the researcher is ready to go into the field and collect data. The various issues relating to data collection shall be dealt with in Unit-III.

Step-7: Analysis of Data

The word 'analysis' has two component parts, the prefix 'ana' meaning 'above' and the Greek root 'lysis' meaning 'to break up or dissolve'. Thus data analysis can be described as:

"...a process of resolving data into its constituent components, to reveal its characteristic elements and structure."

Where the data is quantitative there are three determinants of the appropriate statistical tools for the purposes of analysis. These are the number of samples to be compared, whether the samples being compared are independent of one another and the level of data measurement.

Suppose a fruit juice processor wishes to test the acceptability of a new drink based on a novel combination of tropical fruit juices. There are several alternative research designs which might be employed, each involving different numbers of samples.

Test A	Comparing sales in a test market and the market share of the product it is targeted to replace.	Number of samples = 1
Test B	Comparing the responses of a sample of regular drinkers of fruit juices to those of a sample of non-fruit juice drinkers to a trial formulation.	Number of samples = 2
Test C	Comparing the responses of samples of heavy, moderate and infrequent fruit juice drinkers to a trial formulation.	Number of samples = 3

The next consideration is whether the samples being compared are dependent (i.e. related) or independent of one another (i.e. unrelated). Samples are said to be dependent, or related, when the measurement taken from one sample in no way affects the measurement taken from another sample. Take for example the outline of test B above. The measurement of the responses of fruit juice drinkers to the trial formulation in no way affects or influences the responses of the sample of non-fruit juice drinkers. Therefore, the samples are independent of one another. Suppose however a sample were given two formulations of fruit juice to taste. That is, the same individuals are asked first to taste formulation X and then to taste formulation Y. The researcher would have two sets of sample results, i.e. responses to product X and responses to product Y. In this case, the samples would be considered dependent or related to one another. This is because the individual will make a comparison of the two products and his/her response to one formulation is likely to affect his/her reaction or evaluation of the other product.

The third factor to be considered is the levels of measurement of the data being used. Data can be nominal, ordinal, interval or ratio scaled. Table below summarizes the mathematical properties of each of these levels of measurement.

Once the marketing researcher knows how many samples are to be compared, whether these samples are related or unrelated to one another and the level of measurement then the selection of the appropriate statistical test is easily made. To illustrate the importance of understanding these connections consider the following simple, but common, question in marketing research. In many instances the age of respondents will be of interest. This question might be asked in either of the two following ways:

Please indicate to which of the following age categories you belong

(a)

15-21 years ___

22 - 30 years ___

Over 30 years ___

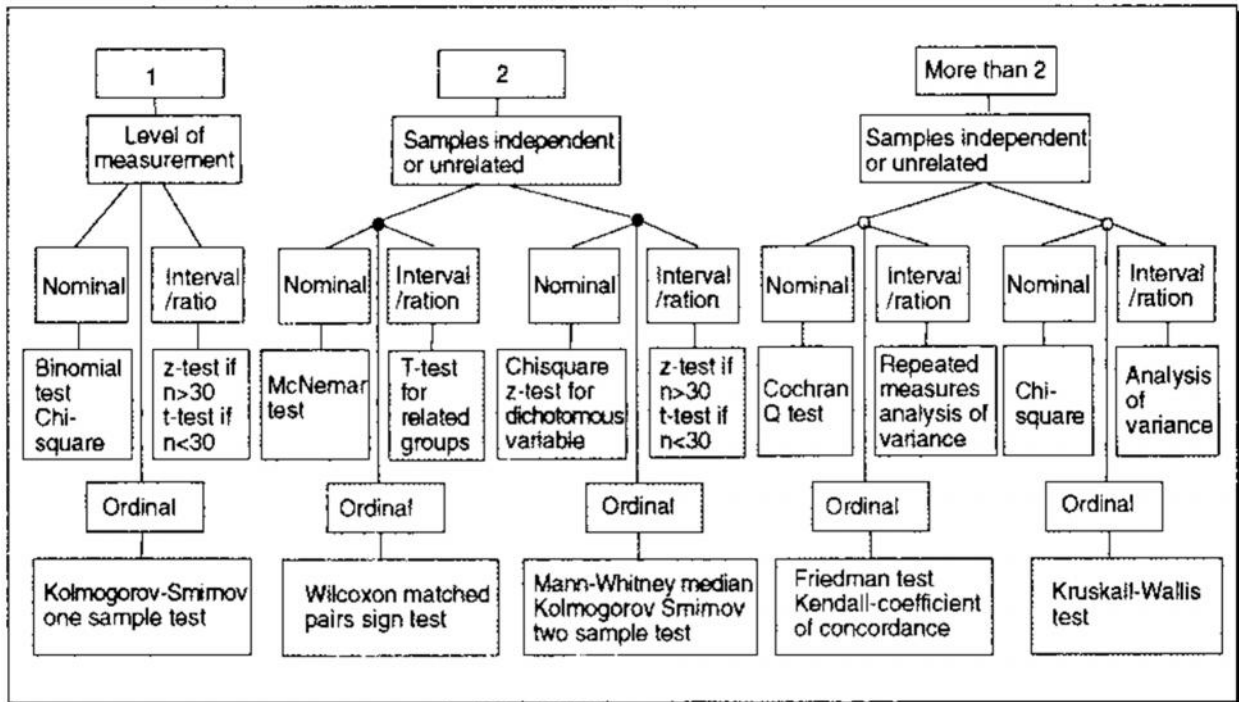
(b)

How old are you? ___ Years

Table: Levels of measurement

Measurement scale	Measurement Level	Examples	Mathematical properties
Nominal	Frequency counts	Producing grading categories	Confined to a small number of tests using the mode and frequency
Ordinal	Ranking of items	Placing brands of cooking oil in order of preference	Wide range of nonparametric tests which test for order
Interval	Relative differences of magnitude between items	Scoring products on a 10 point scale of like/dislike	Wide range of parametric tests
Ratio	Absolute differences of magnitude	Stating how much better one product is than another in absolute terms.	All arithmetic operations

Choosing format (a) would give rise to nominal (or categorical) data and format (b) would yield ratio scaled data. These are at opposite ends of the hierarchy of levels of measurement. If by accident or design format (a) were chosen then the analyst would have only a very small set of statistical tests that could be applied and these are not very powerful in the sense that they are limited to showing association between variables and could not be used to establish cause-and-effect. Format (b), on the other hand, since it gives the analyst ratio data, allows all statistical tests to be used including the more powerful parametric tests whereby cause-and-effect can be established, where it exists. Thus a simple change in the wording of a question can have a fundamental effect upon the nature of the data generated. Figure below provides a useful guide to making that final selection.



The individual responsible for commissioning the research may be unfamiliar with the technicalities of statistical tests but he/she should at least be aware that the number of samples, their dependence or independence and the levels of measurement does affect how the data can be analyzed. Those who submit marketing research proposals involving quantitative data should demonstrate an awareness of the factors that determine the mode of analysis and a capability to undertake such analysis.

Marketing researchers have to plan ahead for the analysis stage. It often happens that data processing begins whilst the data gathering is still underway. Whether the data is to be analyzed manually or through the use of a computer program, data can be coded, cleaned (i.e. errors removed) and the proposed analytical tests tried out to ensure that they are effective before all of the data has been collected.

Another important aspect relates to logistics planning. This includes ensuring that once the task of preparing the data for analysis has begun there is a steady and uninterrupted flow of completed data forms or questionnaires back from the field interviewers to the data processors. Otherwise the whole exercise becomes increasingly inefficient. A second logistical issue concerns any plan to build up a picture of the pattern of responses as the data comes flowing in. This may require careful planning of the sequencing of fieldwork. For instance, suppose that research was being undertaken within a particular agricultural region with a view to establishing the size, number and type of milling enterprises which had established themselves in rural areas following market liberalization. It may be that the West of the district under study mainly wheat is grown whilst in the East it is maize which is the major crop. It would make sense to coordinate the fieldwork with data analysis so that the interim picture was of either wheat or maize milling since the two are likely to differ in terms of the type of mill used (e.g. hammer versus plate mills) as well as screen sizes and end use (e.g. the proportions prepared for animal versus human food).

Step-8: Drawing Conclusions and Making Recommendations

It is perhaps worth noting that the end products of research are conclusions and recommendations. With respect to the human resource or marketing planning function, human resource or marketing research helps to identify potential threats and opportunities, generates alternative courses of action, provides information

to enable human resource / marketing managers to evaluate those alternatives and advise on the implementation of the alternatives.

Too often research reports chiefly comprise a lengthy series of tables of statistics accompanied by a few brief comments which verbally describe what is already self-evident from the tables. Without interpretation, data remains of potential, as opposed to actual use. When conclusions are drawn from raw data and when recommendations are made then data is converted into information. It is information which management needs to reduce the inherent risks and uncertainties in management decision making.

Customer oriented researchers will have noted from the outset of the research which topics and issues are of particular importance to the person(s) who initiated the research and will weight the content of their reports accordingly. That is, the researcher should determine what the respective manager's priorities are with respect to the research study. In particular he / she should distinguish between what the managers: must know, should know and could know. This means that there will be information that is essential in order for the marketing manager to make the particular decision with which he/she is faced (must know), information that would be useful to have if time and resources within the budget allocation permit (should know) and there will be information that it would be nice to have but is not at all directly related to the decision at hand (could know). In writing a research proposal, experienced researchers would be careful to limit the information which they firmly promise to obtain, in the course of the study, to that which is considered 'must know' information. Moreover, within their final report, experienced researchers will ensure that the greater part of the report focuses upon 'must know' type information.

1.8 Errors in Research

Logically, there are two types of errors when drawing conclusions in research:

Type-I error is when we accept the research hypothesis when the null hypothesis is in fact correct.

Type-II error is when we reject the research hypothesis even if the null hypothesis is wrong.

Type-I Error:

A Type I error is often referred to as a 'false positive', and is the process of incorrectly rejecting the null hypothesis in favor of the alternative. In the case above, the null hypothesis refers to the natural state of things, stating that the patient is not HIV positive. The alternative hypothesis states that the patient does carry the virus. A Type I error would indicate that the patient has the virus when they do not, a false rejection of the null.

Type-II Error:

A Type II error is the opposite of a Type I error and is the false acceptance of the null hypothesis. A Type II error, also known as a false negative, would imply that the patient is free of HIV when they are not, a dangerous diagnosis. In most fields of science, Type II errors are not seen to be as problematic as a Type I error. With the Type II error, a chance to reject the null hypothesis was lost, and no conclusion is inferred from a non-rejected null. The Type I error is more serious, because you have wrongly rejected the null hypothesis. Medicine, however, is one exception; telling a patient that they are free of disease, when they are not, is potentially dangerous.

1.9 Concept-mapping for HR Research

Refer to Images circulated on the Google Group.

1.10 Model Building in HP Research

Refer to Images circulated on the Google Group.