Dr. Madhurima Verma
Chairperson
University School of Open Learning

Subject Coordinator: Prof. R.K. Gupta
Course Leader: Prof. R.K. Gupta

Research Methodology in Commerce

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INTRODUCTION TO RESEARCH AND SCIENTIFIC METHOD

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1.1 Objectives

- Understanding meaning of research and scientific approach.
- Highlighting different qualities of a research worker.
- Outlining various stages of research.
- Differentiating between inductive and deductive approach.

1.2 Introduction

The term "research" is often loosely defined and thus used in a similar way. This unfortunate development results from a misconception about what is research. To properly understand what

research is, it is good to start with common misconceptions about research. First, fact transfer is not research. Consider a typical high school research project. The teacher assigns a "research project" on some topic. The students went to the library, checked out several books, and might have copied several pertinent pages from the book. The typical student organized collected information and wrote up the "research report". What these students did is information gathering and organization; it is nothing more or nothing less. No doubt the student went through some motions associated with research.

But finding fact and fact transfer alone is not research. Transfer of information from one source, namely books and pertinent pages, to another source, namely the so-called research report, is nothing more than fact transfer, but not research. To the distress we find many college students repeat this same mistake by submitting a ‘research report’ which is nothing but fact transfer from one source to their report. A second misconception about research is that research is related to laboratory research (for example, in chemistry or biology in the natural sciences). When people hear term the "research", they often conjure up this image. But research is not limited to certain fields of study; it is characterized by the methods used.

1.3 Meaning of the Research

Research in common context refers to a search for knowledge. It can also be defined as a scientific and systematic search for gaining information and knowledge on a specific topic or phenomena. In management research is extensively used in various areas. For example, we all know that, Marketing is the process of Planning & Executing the concepts; pricing, promotion & distribution of ideas, goods, and services to create exchange that satisfy individual & organizational objectives. Thus, we can say that, the Marketing Concept requires Customer Satisfaction rather than Profit Maximization to be the goal of an organization. The organization should be Consumer oriented and should try to understand consumer’s requirements & satisfy them quickly and efficiently, in ways that are beneficial to both the consumer & the organization.

This means that any organization should try to obtain information on consumer needs and gather market intelligence to help satisfy these needs efficiently. This can only be done only by

research. In this lecture we will be discussing the role of research in management and its key ingredients. But first let us understand the meaning of research. It will be clear after going through some important definitions of research.

Research has been defined in a number of different ways

A broad definition of research has been given by Martyn Shuttleworth - "In the broadest sense of the word, the definition of research includes any gathering of data, information and facts for the advancement of knowledge."

Another definition of research is given by Creswell who states - "Research is a process of steps used to collect and analyze information to increase our understanding of a topic or issue". It consists of three steps: Pose a question, collect data to answer the question, and present an answer to the question.

The Merriam-Webster Online Dictionary defines research in more detail as "a studious inquiry or examination; especially: investigation or experimentation aimed at the discovery and interpretation of facts, revision of accepted theories or laws in the light of new facts, or practical application of such new or revised theories or laws".

A more academic approach to the question of ‘what is research’ results in a more complex answer. Fundamentally, research is undertaken in order to enhance our knowledge of what we already know; to extend our knowledge about aspects of the world of which we know either very little or nothing at all, and to enable us to better understand the world we live in.

When research is used for decision-making, it means we are using the methods of science to art of management. Every organization operates under some degree of uncertainty. This uncertainty cannot be eliminated completely, although it can be minimized with the help of research methodology. Research in particularly important in the decision making process of various business organizations. To choose the best line of action (in the light of growing competition and increasing uncertainty).

1.4 Qualities of a Good Research Worker

Being 'good', according to the Oxford English Dictionary can be aligned with high quality, competent and skilful to name a few. It takes real commitment and a lot of personal development to do research well. People commonly assume that research is research—and doing any kind of research is better than doing none at all. Unfortunately, this isn't always the case. Not all research is created equal. To be effective, there are certain personal characteristics a researcher should have. This section will help you to understand the personal characteristics that really make a difference to a researcher's success. A detailed description of some important characteristics is available as follow.

(i) Diligence

In gathering the data for a research work is not an easy task. The researchers should work hard. You must be industrious and care your work in a meticulous way.

(ii) Futuristic

Think in advance. It is necessary that you have already in your mind the answers of the primary questions in conducting a research, namely: what to do, how to do, and where to conduct the research.

(iii)Consistency

You must concentrate. Do not deviate on the topic or issue that you have raised in the start of your study. Do not raise another topic or issue in the text of your work. It might cause some trouble and confusions. The things, acts, or statements that you use at the beginning should be compatible or in harmony with what has been previously done, expressed or agreed upon. They must have logical connections. You must have to be firmed.

(iv)Prudence

You must have to be habitually careful to avoid errors. Be cautious, and exercise sound judgment at all times. Do not allow your carelessness ruin or destroy your intense desire to finish your research work.

(v) Broad - mindedness and Perseverance

There might be unexpected things, acts or statements that you may encounter along the way in the making of your research paper. Try to have the wide range or unusual width of mind to understand the situations that may occur. Be liberal in beliefs and opinion of other people. This will strengthen the content of your study.

(vi)Determined

To have our name printed on a research paper is a great reward to our hard work. Start doing your study with great intention of finishing it. Settle your mind and decide that you must have to reach the completion of your study.

(vii) Willingness

Have and keep the flame of your interest burning. Direct yourself to the right path. Never let some unexpected circumstances to change the course of your desire which is to finish you research work.

(viii) Resourcefulness

Have the ability to search useful facts that will substantiate the study. Search for fertile resources and have the pool of theories that is relevant to the study.

(ix)Patience

Loosen your belt. Hold your temper because you, your teacher or your adviser are unique individuals. You have different view point in a certain situations but as a team you will have to work the research study hand in hand till finish. Be calm. The forbearance on the faults or infirmities of others is virtue. Endure without complaint.

(x) Passion and Endurance

Think that research work is easy. Be ready to handle difficult, unexpected situations along the way in the life time of the research study.

(xi) Responsible

Do the writing having the capacity of perceiving what is right or wrong.

(xii) Honest

This is important aspect in doing a research. Unreliable results are a product of dishonesty.

(xiii) Time Consciousness

Stick and strictly observe your schedule.

1.5 Scientific Method

The Scientific Method is a logical and rational order of steps by which scientists come to conclusions about the world around them. The Scientific Method helps to organize thoughts and procedures so that scientists can be confident in the answers they find. Scientists use observations, hypotheses, and deductions to make these conclusions. According to Frank Wolfs from the University of Rochester:

"The scientific method is the process by which scientists, collectively and over time, endeavor to construct an accurate (that is, reliable, consistent and non-arbitrary) representation of the world."

The scientific method is the means by which researchers are able to make conclusive statements about their studies with a minimum of bias. The interpretation of data, for example the result of a new drug study, can be laden with bias. Research using the scientific method is a process that moves an idea from hypothesis to theory. This process can take years - even decades. Studies are only considered scientifically valid if this method is followed. The researcher often has a personal stakes in the results of his work. As any skilled debater knows, just about any opinion can be justified and presented as fact. In order to minimize the influence of personal stakes and biased opinions, a standard method of testing a hypothesis is expected to be used by all members of the scientific community.

1.5.1 Assumptions of Scientific Method

There are five major assumptions underlying scientific method which are as follows.

(i) Order

The first major assumption is the belief that there is some kind of order in the universe, and that it is possible for us to gain some understanding of this order. This is linked with the idea of determinism, the assumption that events have causes, and that the links between events and causes can be revealed. This regularity enables some predictions to be made about future events (e.g. if gravity causes apples to fall today, it will also cause them to fall tomorrow). Scientists do admit, however, that owing to imperfect knowledge, predictions of varying levels of probability often result.

(ii) External Reality

The second assumption is that, in order to enable us to gain this understanding of the world, there must be an agreement between people that external reality exists, and that people recognize the same reality, a public or shared reality. It is hardly necessary to point out that much philosophic debate has been devoted to the nature of reality. Nevertheless, scientific enquiry relies on the acceptance of the reliability of knowledge gained by experience to provide empirical evidence (evidence which is verifiable by observation) to support or refute its theories.

(iii)Reliability

The third assumption is the reliability of human perception and intellect. Despite the many ways in which our senses can be tricked, researchers depend on their senses to record and measure their work reliably. Reasoning is an important method of organizing data and ideas, and is regarded, if used correctly, as a dependable tool of research. Human memory also plays a major role in research. To avoid questioning at every single stage, some credence must be given to the power of memory to provide reliable knowledge.

(iv)Parsimony

The fourth assumption is the principle of parsimony. Phenomena should be explained in as economic a manner as possible. Needless complexity is abhorred, and scientists aim to achieve the most elegant and simple theories.

(v) Generality

The fifth assumption is that of generality. This is the assumption that there can be valid relationships between the particular cases investigated by the researcher and the general situation in the world at large. It is accepted that these relationships can be relatively un-problematical in some sciences (e.g. chemistry and physics) but that in others, with a larger number of unknown factors (e.g. sociology), there is a weaker chance of generality.

1.5.2 Characteristics of research which uses scientific method

Accepting these assumptions, research using the scientific method displays six characteristics which distinguish it from other methods of enquiry:

1. It is generated by a question we are surrounded by unanswered questions, unresolved problems, with conjecture and unproven beliefs. A questioning mind is the precondition for research. Why, how, when do things happen? What do events mean? What caused them? All these are questions which can generate research activity. Such a question is often referred to as the research problem.

2. It necessitates clarification of a goal. Without a clear statement of the objectives and what is intended to be done, the research cannot be successful.

3. It entails a specific program of work Research needs to be carefully planned in order to achieve its objectives and reach conclusions.

4. It is aimed at increasing understanding by interpreting facts or ideas and reaching some conclusions about their meaning The significance of facts or ideas depends on the way in which the intellect can extract meaning from them.

5. It requires reasoned argument to support conclusions In order to communicate an ordered sequence of ideas; a clear logical argument is required.

6. It is reiterative in its activities Advances in knowledge and interpretations of facts are based on previous knowledge, which, in turn, is expanded by the advances. Then resolution of research problems often gives rise to further problems which need resolving.

In addition, research often:

- It divides the principal question or problem into more practicable sub-questions or problems. Problems are often too large or abstract to examine as a whole. Dividing them into component parts (sub-problems) enables them to be practically investigated.

- It is tentatively guided by assertions called hypotheses (informed guesses or tentative assertions). Testing these hypotheses provides a direction for exploration.

- It requires measurable data in attempting to answer the question which initiated the research.

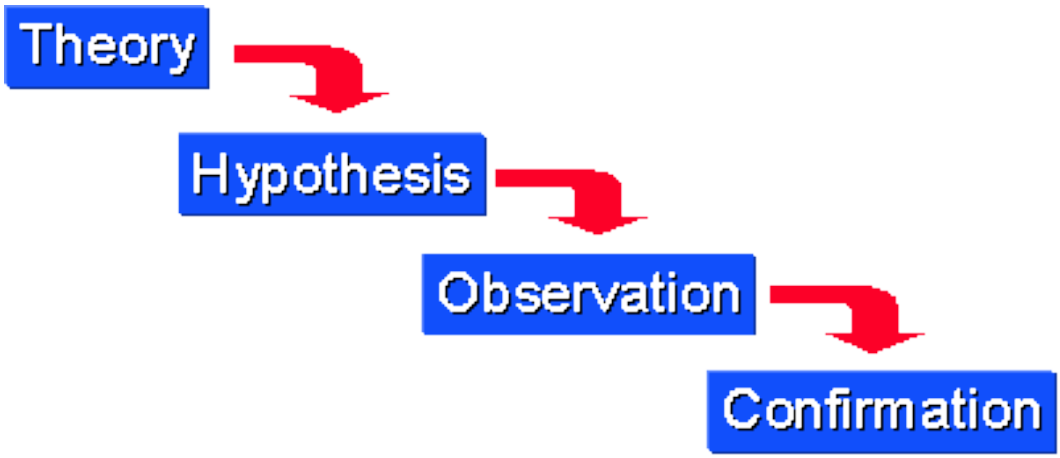
1.6 Logical Method

Logical method is the process which uses arguments, statements, premises and axioms to define weather a statement is true or false, resulting in a logical or illogical reasoning. In today's logical reasoning two different types of research can be distinguished, known as deductive research, and inductive research.

1.6.1 Deductive Research

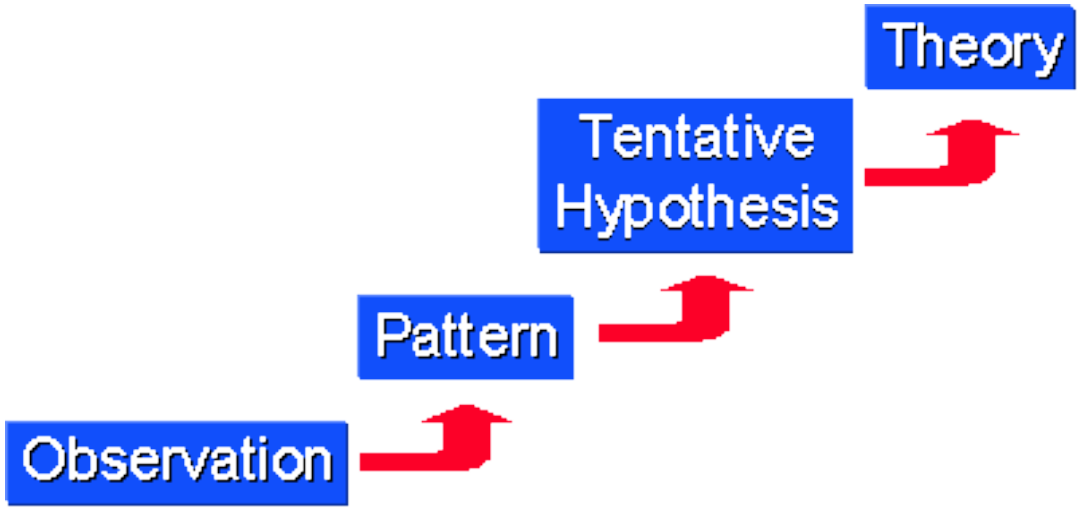
Deductive research is a study in which a conceptual and theoretical structure is developed and then tested by empirical observation; thus, particular instances are deduced from general inferences. Deductive research works from the more general to the more specific. Sometimes this is informally called a "top-down" approach. We might begin with thinking up a *theory* about our topic of interest. We then narrow that down into more specific *hypotheses* that we can test. We narrow down even further when we collect *observations* to address the hypotheses. This ultimately leads us to be able to test the hypotheses with specific data -- a *confirmation* (or not) of our original theories. For example, you may have read about theories of motivation and wish

to test them in your own workplace. This will involve collecting specific data of the variables that the theories have identified as being important.



1.6.2 Inductive Research

Inductive research works the other way, moving from specific observations to broader generalizations and theories. Inductive research is a study in which theory is developed from the observation of empirical reality; thus, general inferences are induced from particular instances, which is the reverse of the deductive method. Informally, we sometimes call this a "bottom up" approach (please note that it's "bottom up" and *not* "bottom**s** up" which is the kind of thing the bartender says to customers when he's trying to close for the night!). In inductive research, we begin with specific observations and measures, begin to detect patterns and regularities, formulate some tentative hypotheses that we can explore, and finally end up developing some general conclusions or theories.



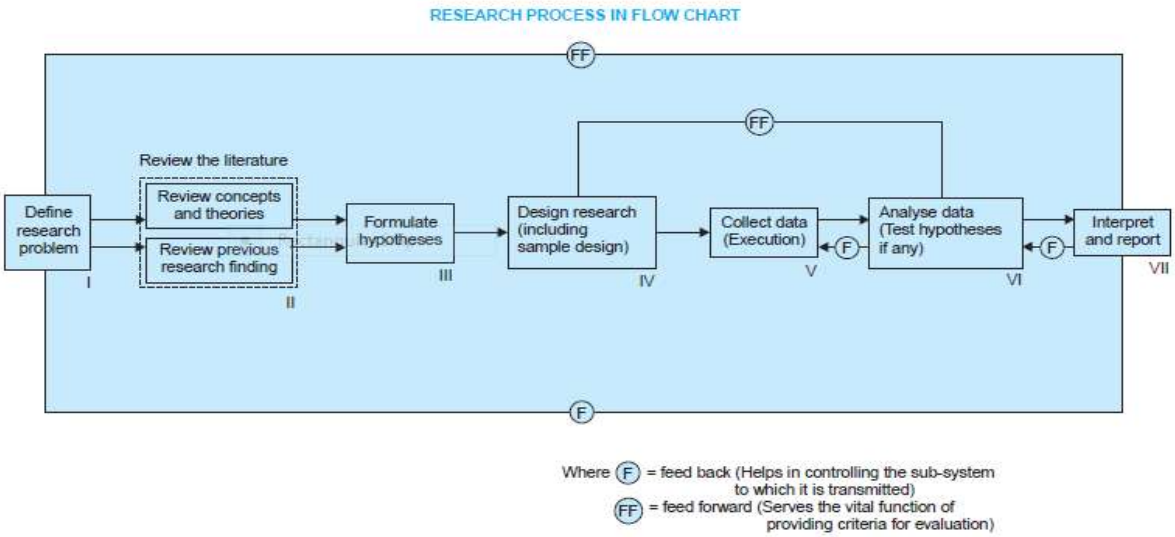
These two

methods of research have a very different "feel" to them when you're conducting research. Inductive research, by its very nature, is more open-ended and exploratory, especially at the beginning. Deductive research is narrower in nature and is concerned with testing or confirming hypotheses. Even though a particular study may look like it's purely deductive (e.g., an experiment designed to test the hypothesized effects of some treatment on some outcome), most social research involves both inductive and deductive research processes at some time in the project. In fact, it doesn't take a rocket scientist to see that we could assemble the two graphs above into a single circular one that continually cycles from theories down to observations and back up again to theories. Even in the most constrained experiment, the researchers may observe patterns in the data that lead them to develop new theories.

1.7 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 shown well illustrates a research process.

Chart-1.1: Research Process in Flow Chart



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 are they 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) generalizations 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. Then, the feasibility of a particular solution has to be considered before a working formulation of the problem can be set up. The formulation of a general topic into a specific research problem, thus, constitutes the first step in a scientific enquiry. Essentially two steps are involved in formulating the research problem, viz., understanding the problem thoroughly, and rephrasing the same into meaningful terms from an analytical point of view.

The best way of understanding the problem is to discuss it with one's own colleagues or with those having some expertise in the matter. In an academic institution the researcher can seek the

help from a guide who is usually an experienced man and has several research problems in mind. Often, the guide puts forth the problem in general terms and it is up to the researcher to narrow it down and phrase the problem in operational terms. In private business units or in governmental organizations, the problem is usually earmarked by the administrative agencies with which the researcher can discuss as to how the problem originally came about and what considerations are involved in its possible solutions.

The researcher must at the same time examine all available literature to get himself acquainted with the selected problem. He may review two types of literature—the conceptual literature concerning the concepts and theories, and the empirical literature consisting of studies made earlier which are similar to the one proposed. The basic outcome of this review will be the knowledge as to what data and other materials are available for operational purposes which will enable the researcher to specify his own research problem in a meaningful context. After this the researcher rephrases the problem into analytical or operational terms i.e., to put the problem in as specific terms as possible. This task of formulating, or defining, a research problem is a step of greatest importance in the entire research process. The problem to be investigated must be defined unambiguously for that will help discriminating relevant data from irrelevant ones. Care must; however, be taken to verify the objectivity and validity of the background facts concerning the problem. Professor W.A. Neiswanger correctly states that the statement of the objective is of basic importance because it determines the data which are to be collected, the characteristics of the data which are relevant, relations which are to be explored, the choice of techniques to be used in these explorations and the form of the final report. If there are certain pertinent terms, the same should be clearly defined along with the task of formulating the problem. In fact, formulation of the problem often follows a sequential pattern where a number of formulations are set up, each formulation more specific than the preceeding one, each one phrased in more analytical terms, and each more realistic in terms of the available data and resources.

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. For this

purpose, the abstracting and indexing journals and published or unpublished bibliographies are the first place to go to. Academic journals, conference proceedings, government reports, books etc., must be tapped depending on the nature of the problem. In this process, it should be remembered that one source will lead to another. The earlier studies, if any, which are similar to the study in hand, should be carefully studied. A good library will be a great help to the researcher at this stage.

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. They also affect the manner in which tests must be conducted in the analysis of data and indirectly the quality of data which is required for the analysis. In most types of research, the development of working hypothesis plays an important role. Hypothesis should be very specific and limited to the piece of research in hand because it has to be tested. The role of the hypothesis is to guide the researcher by delimiting the area of research and to keep him on the right track. It sharpens his thinking and focuses attention on the more important facets of the problem. 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. It may as well be remembered that occasionally we may encounter a problem where we do not need working hypotheses, especially in the case of exploratory or formulative researches which do not aim at testing the hypothesis. But as a general rule, specification of working hypotheses in another basic step of the research process in most research problems.

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 minimizes bias and maximizes the reliability of the data collected and analyzed.

There are several research designs, such as, experimental and non-experimental hypothesis testing. Experimental designs can be either informal designs (such as before-and-after without control, after-only with control, before-and-after with control) or formal designs (such as completely randomized design, randomized block design, Latin square design, simple and complex factorial designs), out of which the researcher must select one for his own project. The preparation of the research design, appropriate for a particular research problem, involves usually the consideration of the following:

(i) the means of obtaining the information;

(ii) the availability and skills of the researcher and his staff (if any);

(iii) explanation of the way in which selected means of obtaining information will be organized and the reasoning leading to the selection;

(iv) the time available for research; and

(v) The cost factor relating to research, i.e., the finance available for the purpose.

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. Even the slightest element of bias in such an inquiry will get larger and larger as the number of observations increases. Moreover, there is no way of checking the element of bias or its extent except through a resurvey or use of sample checks. Besides, this type of inquiry involves a great deal of time, money and energy. Not only this, census inquiry is not possible in practice under many circumstances. For instance, blood testing is done only on sample basis. Hence, quite often we select only a few items from the universe for our study purposes. The items so selected constitute what is technically called a sample.

The researcher must decide the way of selecting a sample or what is popularly known as the sample design. In other words, a sample design is a definite plan determined before any data are actually collected for obtaining a sample from a given population. Thus, the plan to select 12 of a city's 200 drugstores in a certain way constitutes a sample design. Samples can be either probability samples or non-probability samples. With probability samples each element has a known probability of being included in the sample but the non-probability samples do not allow the researcher to determine this probability. Probability samples are those based on simple random sampling, systematic sampling, stratified sampling, cluster/area sampling whereas non-probability samples are those based on convenience sampling, judgment sampling and quota sampling techniques.

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:

a. By observation: This method implies the collection of information by way of investigators' 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.

b. 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.

c. 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.

d. 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 conduced 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.

e. 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.

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 analyzing 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, especially 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, generalizations established on the basis of data may be stated as hypotheses to be tested by subsequent researches in times to come.

10. Generalizations and interpretation

If a hypothesis is tested and upheld several times, it may be possible for the researcher to arrive at generalization, i.e., to build a theory. As a matter of fact the real value of research lies in its ability to arrive at certain generalizations. 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:

The layout of the report should be as follows:

(i) The preliminary pages;

(ii) The main text, and

(iii) The end matter.

(i) 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.

(ii) The main text of the report should have the following parts:

- 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.

- 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 summarized.
- Main report: The main body of the report should be presented in logical sequence and broken-down into readily identifiable sections.
- 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.

(iii) 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.

1.8 Misapplications of the Scientific Method

A common error encountered by people who claim to use the scientific method is a lack of testing. A hypothesis brought about by common observations or common sense does not have scientific validity. As stated above, even though a good debater may be quite convincing as he conveys the merits of his theory, logical arguments are not an acceptable replacement for experimental testing.

Although the purpose of the scientific method is to eliminate researcher bias, an investigation of the raw data from an experiment is always a good idea. Researchers sometimes toss out data that does not support their hypothesis. This isn't necessarily done with the intent of deception, it is sometimes done because the researcher so passionately believes in his hypothesis that he assumes unsupportive data must have been obtained in error. Other times, outside forces (such as the corporation sponsoring and conducting the research) may put extreme pressure on the researcher to get specific results.

The best way for the scientific community, and the general public, to deal with these errors is to promote multiple, independent experiments. We are all familiar with "breaking news" (that seems to break nearly every day!) about a new miracle drug or herbal remedy. In most cases, this "breaking news" was released by a single source--usually a source with financial stakes in the new miracle. Look for multiple sources to confirm a hypothesis before you hand your money over for a new product. If possible, also try to discover where the funding came from in these

experiments. You may have three different lab reports, all confirming that Drug A is the most effective cure, but if all three laboratories are funded by the same drug company-you may want to raise an eyebrow.

1.9 Limitations of the Scientific Method

Science has some well-known limitations. Science works by studying problems in isolation. This is very effective at getting good, approximate solutions. Problems outside these artificial boundaries are generally not addressed. The consistent, formal systems of symbols and mathematics used in science cannot prove all statements, and furthermore, they cannot prove all TRUE statements. Kurt Gödel showed this in 1931. The limitations of formal logical systems make it necessary for scientists to discard their old systems of thought and introduce new ones occasionally. Newton's gravitational model works fairly well for everyday physical descriptions, but it is not able to account for many important observations. For this reason, it has been replaced by Einstein's general theory of relativity for most celestial phenomena. Instead of talking about gravity, we now are supposed to talk about the curvature of the four-dimensional time-space continuum. Scientific observations are also subject to physical limits that may prevent us from finding the ultimate truth. The Heisenberg Uncertainty Principle states that it is impossible to determine simultaneously the position and momentum of an elementary particle. So, if we know the location of a particle we cannot determine its velocity, and if we know its velocity we cannot determine its location. Jacob Bronowski wrote that nature is not a gigantic formalizable system because to formalize it we would have to make some assumptions that cut some of its parts from consideration, and having done that, we cannot have a system that embraces the whole of nature.

The application of the scientific method is limited to independently observable, measurable events that can be reproduced. The scientific method is also applicable to random events that have statistical distributions. In atomic chemistry, for example, it is impossible to predict when one specific atom will decay and emit radiation, but it is possible to devise theories and formulas to predict when half of the atoms of a large sample will decay. Irreproducible results cannot be studied by the scientific method. There was one day when many car owners reported that the alarm systems of their cars were set off at about the same time without any apparent cause.

Automotive engineers were not able to discover the reason because the problem could not be reproduced. They hypothesized that it could have been radio interference from a passing airplane, but they could not prove it one way or another. Mental conceptual experiences cannot be studied by the scientific method either. At this time there is no instrumentation that enables someone to monitor what anybody else conceives in their mind, although it is possible to determine which part of the brain is active during any given task. It is not possible to define experiments to determine objectively which works of art are "great", or whether Picasso was better than Matisse. So-called miracles are also beyond the scientific method. A person has tumors and faces certain death, and then, the tumors start shrinking and the person becomes healthy. What brought about the remission? A change in diet? A change in mental attitude? It is impossible to go back in time to monitor all variables that could have caused the cure, and it would be unethical to plant new tumors into the person to try to reproduce the results for a more careful study.

1.10 Summary

Research is scientific enquiry and follows a systematic method to implement it. A researcher should possess some basic qualities like patience, diligence, consistency and so on. Scientific approach to research follows some standardized preset stages like defining problem, consulting literature and framing hypotheses, data collection and interpretation. Scientific method is logical in nature. It can though follow inductive or deductive path of doing it.

1.11 Glossary

Basic research: Research undertaken purely to understand processes and their outcomes, predominantly in universities as a result of an academic agenda, for which the key consumer is the academic community.

Deductive approach: Research approach involving the testing of a theoretical proposition by the employment of a research strategy specifically designed for the purpose of its testing.

Inductive approach: Research approach involving the development of a theory as a result of the observation of empirical data.

Scientific research: Research that involves the systematic observation of, and experiment with phenomena.

1.12 Suggested Readings

Research Methodology – Methods & Techniques, 2nd edition, Kothari C. R. –New Age Publications – New Delhi 2004.

Research Methodology-A Beginners,(2nd.ed.), Kumar, Ranjit, Singapore, Pearson Education. 2005.

Business Research Methods, Donald R. Cooper, Pamela S. Schindler, 8/e, Tata McGraw-Hill Co. Ltd., 2006.

1.13 Terminal and Model Questions

1. Write short note on the following.

   a) Research
   b) Deductive Research
   c) Inductive Research
   d) Logical Method
   e) Scientific Method

2. Briefly describe the different steps involved in a research process.
3. What do you mean by research? Explain its significance in modern times.
4. Differentiate between inductive and deductive approach of reasoning.
5. Write down various qualities of a researcher.

PLANNING / APPROACH TO A RESEARCH PROJECT

Structure

2.1 Learning Objectives
2.2 Introduction
2.3 Purpose of Research
2.4 Business Research Functions
2.5 Research Program
2.6 Problem Solving through Research
2.7 Typology of Problem-Solving Research
2.8 Financial Aspects of Research
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2.12 Terminal and Model Questions

Learning Objectives

- Understanding the purpose of research
- Differentiating between problem-solving and basic research
- Understanding research program
- Gaining knowledge of financial aspects of research.

Introduction

The purpose of the research plan is to take the initial research problem and decide how it will be researched. A clearly defined and expressed research problem is one important prerequisite for evolving a research plan. Important facts to be considered when designing the project are available time, financial resources, facilities, and the availability of data, possible methods of analysis, and your own developing skills as a researcher.

Remember that you do not have a team of researchers to support you, and that you have only a few weeks to complete a dissertation, about one year to complete a M. Phil or about three years to complete a PhD. All other research projects are similarly limited in their time frame. There will be some hard choices to make; however fascinating your subject and however important the

expected outcomes, it is essential to limit the area of your investigation and keep it within manageable proportions. Keep in mind that working towards a research degree is also a training exercise to develop research skills, and your thesis will finally demonstrate that you have acquired them sufficiently.

Purpose of Research

What sort of research will you pursue? It is worth remembering the different overall aims that could be at the centre of your project. Phillips and Pugh (1994, pp. 49–52) identified three basic aims of research, as follows.

1. **Exploration**

This kind of research delves into the unknown, tackling new problem issues or topics. As little or no previous research has been done on those topics, it will be impossible to delineate precisely the scope of the research or to predict its outcomes. Because it will be in a relatively unexplored domain, a necessary part of the research is to explore what existing theories, concepts and methodologies might be used or adapted, or failing those, to devise new ones. It pushes out the boundaries of knowledge in the anticipation that the outcomes will be of value.

2. **Testing out**

A common feature of such research is that it makes generalizations from specific instances. But how far are the generalizations valid? Testing out research explores the validity of the generalizations in other circumstances, and tries to define their limits. This basic scientific activity leads to the refinement of theories. There are a host of opportunities in this approach – testing the generalizations in different locations, under different social or physical conditions, in different contexts etc.

3. **Problem solving**

This type of research identifies a ‘real-life problem’. Its aim is to find possible solutions to the problem by using techniques of systematic appraisal and analysis. As ‘real-life problems’ tend to be complex, the study might involve several disciplines and a variety of methods, requiring a great deal of background knowledge. Although it is possible to pursue this kind of research on a

theoretical level, commonly practical benefits flow from it. However, solutions are unlikely to be obvious and clear-cut.

Which type of research lends itself best to gaining a research degree? Phillips and Pugh (1994) pragmatically suggest that the safest option, with the least unknown factors, is to be recommended. Testing out research, based on known theories and established methods of testing, avoids the unpredictability (though it might miss out on the excitement) of the other two research approaches. It is probably better to keep your feet on the bottom until you are able to swim! You will still have to introduce some new insights or methods into the subject to make the research worthwhile (rather than just replication), and it can be argued that this mainstream type of research will usefully produce more readily publishable and quotable results than the other two types.

There are greater risks and unknowns in the exploratory and problem solving approaches. They undoubtedly require more expertise and experience on the part of the researcher and demand the enthusiastic support of the supervisor. In such innovative and original research, it is more difficult to achieve the authority in the subject required for it to be publishable, which might, in turn, impede a career in research.

Business Research Functions

The function of business research is often to measure various elements important for business decisions. These elements are often call metrics and can include advertising results, product usage and customer feedback, according to Dobney, an international marketing research consulting firm. The business research functions will usually be contingent upon a company's overall research objectives. For example, some companies conduct research to determine the potential success of a new product. Other companies need solutions to problems.

1. **Measuring Brand Awareness**

One business research function is determining a company's brand awareness. Brand awareness is the percentage of consumers who are aware of a company's brand in the marketplace. For example, 95 percent of all consumers nationally may be aware of a large consumer products

company. However, only 10 percent of all customers in a local market may be aware of a small cleaning company. There are two main types of brand awareness: Aided and unaided. Aided brand awareness is usually measured by asking consumers "Have you ever heard of 'Joe's Hardware' store?" The person conducting the survey will usually provide the company's name to measure aided brand awareness. Contrarily, a company will not provide a company's name to measure unaided awareness. Instead, the company may include the survey question: "Which hardware stores are you familiar with in the local area?" Companies with strong unaided awareness among consumers may be one of the preferred brands in the market.

2. **Measuring Customer Satisfaction**

Business research is often used to measure satisfaction among consumer or business customers. For example, a company may want to determine how satisfied customers are with its customer service department. Market researchers may ask consumers to evaluate their experiences with a company's phone, email and technical support, three possible levels of customer service. Companies may also ask customers how satisfied they are with product features or prices. A publisher may ask business clients how satisfied they are with the content of its newsletter. Customer satisfaction is an important element for companies to track in business research. Satisfied customers are usually more likely to keep buying a company's products.

3. **Tracking Ad Effectiveness**

Business research functions also include tracking advertising effectiveness. Companies like to know how many people saw their ads and who responded to an offer as a result of an ad. Companies use business research to track ad results from print, radio, direct, television and other types of advertising. Sometimes, a company will even track the number of people who recall its advertising slogan or message. For example, a pizza restaurant company may ask consumers what details they remember from a television ad campaign.

4. **Solving Problems**

Companies also use business research to solve problems. For example, a consumer products company may want to evaluate why consumers are switching to a competitive brand of peanut

butter. In the course of surveys, the consumer products company may find that consumers prefer the taste and texture of competitive brands. Consequently, the consumer products company may need to develop a better tasting peanut butter.

5. **Total Quality Management**

Business research is an essential aspect of total quality management. Total quality management is a business philosophy, which has much in common with the idea that the consumer is king. It embodies the belief that the management process must focus on integrating the idea of customer-driven quality throughout the organization. Total quality management stresses continuous improvement of product quality and service. Managers improve durability and enhance products with additional features as the product ages. They strive to improve delivery and other services to keep their brands competitive.

Companies that have adopted the total quality philosophy view employees as internal customers. Implementing a total quality management program requires considerable measurement. It involves routinely asking customers to rate a company against its competitors. It involves measuring employee attitudes. It involves monitoring company performance against benchmark standards. In short, it uses business research. Thus, business research with external customers and with employees in the organization (internal customers)is important under a total quality management program

Research Program

A research program coordinates several projects that share a common research goal. Such programs are commonly directed and funded by large organizations, such as universities, corporations, NGOs, and governments. Depending on an organization's needs and interests, research programs vary widely in terms of both their structures and objectives. Research program managers primarily work to coordinate and supervise all of the projects involved and make sure they remain on task. Sponsored projects will typically also have their own immediate managers. This person is usually responsible for designing and carrying out the particular project.

In many cases, the relationship between a research program and a research project might be likened to that between a franchiser and a franchisee. The franchiser provides an established set

of guidelines and a support system while the franchisee works hands-on to develop his or her own particular business. As within a franchise system, a research program´s overall success depends on that of its smaller constituents. Project leaders might interact with one another when the successful operation of any one project is contingent on another, or they might conduct their activities more independently. In either case, all projects are accountable to the overseeing program and its objectives.

Different kinds of organizations have different aims when developing new research programs. A for-profit company might launch a research program in order to learn more about its market, its competition, and opportunities for product or service development. These research programs are designed to discover market demands, to find ways of better meeting those demands, and to generally become more competitive. Corporate research programs are also frequently set up to examine spending and costs, to incorporate new technologies and organizational tools, and to prepare for a large operation such as an engineering project. A company might also develop research programs aimed at supporting social objectives — these might focus on helping the surrounding community or the company's own employees.

Socially-oriented research programs are also commonly initiated on the part of NGOs and governments. They might be aimed at economic or political development, improving services such as education or health care, fostering entrepreneurship in citizens, protecting the environment, integrating newcomers into a society, or any number of goals that the organization has set for itself. Governments also frequently fund research programs that promote growth in certain industries. A university can sometimes focus on research for its own sake — that is, for the sake of developing human knowledge. Cross-organizational funding and cooperation on research projects also can occur where interests overlap.

Problem Solving through Research

The most common intellectual activity that occupies people in everyday contexts (both work and personal lives) is problem solving. While many of us prefer not to admit that we have problems, the reality is that we solve problems constantly. What shall I wear to work? Which is the best route to avoid this traffic jam? How do I prevent my boss from criticizing me? How can I get that new contract? What shall we make for supper this evening? How much should I add to

inventory? How shall we market this new product to maximize cash flow? What do I have to do in order to attract recognition in this agency? We are deluged with problems every day. Unfortunately, we have rarely been taught how to solve problems, especially the kinds of problems that plague us in our everyday lives.

Problem solving has three critical attributes. One, a problem is an unknown value, process, method, position, or belief that is worth finding an answer to. Two, in order to find the unknown, problem solving requires the mental representation of the problem. That is, human problem solvers individually construct or socially co-construct a representation of the problem, known as the problem space (Newell & Simon, 1972). Three, problem solving engages cognitive and social activities that manipulate the problem space, such as model building, hypothesis generation, speculation, solution testing, information gathering, etc.

- **How do people solve problems?**

Historically, problem solving has been conceived as a uniform process. In traditional models of problem solving, all problems are solved essentially the same way. A typical model includes these processes:

- Identifying potential problems
- Defining and representing the problem
- Exploring possible strategies
- Acting on those strategies
- Looking back and evaluating the effects of those activities (Bransford& Stein. 1983)

Gick (1986) synthesized problem solving models into a simplified model of the problem-solving process, including the processes of

- Constructing a problem representation
- Searching for solutions
- Implementing solutions
- Monitoring solutions.

However, more contemporary research and theory asserts that problem solving is context-specific or domain-specific, that is, solving problems in one situation or discipline is different than solving problems in another situation or discipline.

- **How do problems vary?**

It has been argued that problems and problem solving vary in several ways. Several authors (Jonassen, 1997; Simon, 1973, Voss & Post, 1988) have distinguished well-structured from ill-structured problems and recommended different learning approaches for each. Most problems encountered in schools and universities are well-structured problems. Well-structured problems typically present all elements of the problem; engage a limited number of rules and principles that are organized in a predictive and prescriptive arrangement; possess correct, convergent answers; and have a preferred, prescribed solution process.

Ill-structured problems, on the other hand, are the kinds of problems that are encountered in everyday practice. Ill-structured problems have many alternative solutions to problems; vaguely defined or unclear goals and constraints; multiple solution paths; and multiple criteria for evaluating solutions; so they are more difficult to solve.

Problems also vary in complexity. The complexity of a problem is a function of the number of issues, functions, or variables involved in the problem; the number of interactions among those issues, functions, or variables; and the predictability of the behavior of those issues, functions, or variables. Ill-structured problems tend to be more complex, however, there are a number of highly complex well-structured problems, such as chess.

Dynamicity is another dimension of complexity. In dynamic problems, the relationships among variables or factors change over time. Changes in one factor may cause variable changes in other factors. The more intricate these interactions, the more difficult it is any solution. Ill-structured problems tend to be more dynamic.

A final dimension of problems and problem solving is domain specificity. In contemporary psychology, there is a common belief that problems within a domain rely on cognitive strategies that are specific to that domain (Mayer, 1992; Smith, 1991; Sternberg &Frensch, 1991). These are often referred to as strong methods, as opposed to domain-general strategies (weak methods).

For example, Lehman, Lempert, and Nisbett (1988) concluded that different forms of reasoning are learned in different graduate disciplines. Graduate students in the probabilistic sciences of psychology and medicine perform better on statistical, methodological, and conditional reasoning problems than students in law and chemistry, which do not learn such forms of reasoning. The cognitive operations are learned through the development of pragmatic reasoning schemas rather than exercises in formal logic. Graduates in different domains develop reasoning skills through solving situated, ill-structured problems that require forms of logic that are domain-specific.

Typology of Problem-Solving Research

Jonassen (2000) described a typology of problems that vary primarily along a continuum from well-structured to ill-structured, including the following kinds of problems.

1. **Logic Problems**
   - Outcome: efficient solution
   - Problem: logical manipulation
   - Solution: single, clear criteria
   - Examples of Logic Problems
     - Tower of Hanoi
     - Cannibals & Missionaries
     - How can I divide the water in the first jug and second jug using only three jugs
     - Rubic's Cube
     - Draw four straight lines on 3X3 array of dots without removing pen from paper
     - Divide triangular cake into four equal pieces

2. **Algorithms**
   - Outcome: correct solution
   - Problem: procedural, algorithmic
   - Solution: single, clear criteria
   - Context: abstract, formulaic
   - Examples of Algorithms

- Factor quadratic equation
- Convert Farenheit to Celsius temperatures
- Bisect any given angle
- Calculate speed given distance and time

3. Story (Word) Problems

- Outcome: correct solution
- Problem: identify variables, insert & solve, practice
- Solution: single, clear criteria
- Context: constrained to predefined elements, shallow context; textbook problems
- Examples of Story Problems
    - How long for car A to overtake car B traveling at different speeds
    - apply Boyle's law to problem statement
    - calculate reagents needed to form a specific precipitate in a chemical reaction
    - how many flight hours are required to pay off a 777
    - calculate engine size needed to move a particular boat 22 knots per hour
    - determine wattage needed to produce 80 dB sounds at the back of the concert hall

4. Rule Using (Induction) Problems

- Outcome: information
- Problem: procedural
- Solution: productivity, relevance, correctness
- Context: purposeful academic, real world, constrained
- Examples of Rule Using Problems
    - Search an online catalog for best resources
    - Prove angles of isosoles triangle are equal
    - Calculating materials needed for addition
    - Rewrite story in first person
    - Complete application to enhance admission chances

- Calculate benefits under plans from different companies; program an input routine in C++
- Evaluate loan application
- Set up a press run for a newspaper
- Determine chemicals present in qualitative analysis

5. Decision Making Problems

- Outcome: decision about alternatives and justification
- Problem: advantages, disadvantages, weighing options
- Solution: selection of alternatives
- Context: life decisions, information needs, tactical decisions
- Examples of Decision Making Problems
    - Should I move in order to take another job
    - Which school should my daughter attend
    - Which benefits package should I select
    - Which strategy is appropriate for a chess board configuration
    - How am I going to pay this bill
    - What's the best way to get to the interstate during rush hour
    - Determine numbers and proportions of banties, guineas, and turkins for a poultry operation
    - Which automobile should I purchase to meet my needs

6. Troubleshooting Problems

- Outcome: fault isolation
- Problem: search & replace, serial elimination, space splitting
- Solution: correct fault & replace, efficiency
- Context: closed system, real world
- Examples of Troubleshooting Problems
    - Troubleshoot inoperative modem
    - Why won't car start
    - Determine why newspaper article is poorly written;

- Identify communication breakdowns in a committee
- Determine why local economy is inflationary despite national trends
- Isolate cause of inadequate elasticity in polymer process
- Why are trusses showing premature stressing
- Why is milk production down on dairy far

7. Diagnosis-Solution Problems

- Outcome: fault identification and treatment
- Problem: serial elimination, problem schemas, management
- Solution: optional, must be defended
- Context: real world, technical, mostly closed system
- Examples of Diagnosis-Solution Problems
    - Virtually any kind of medical diagnosis and treatment
    - How should I study for the final exam
    - Identifying and treating turfgrass problems on a golf course
    - Develop individual plan of instruction for special education students
    - Decide how to make an uncontrollable horse ridable

8. Strategic Performance Problems

- Applying tactics to meet strategy in real-time, complex environment
- Maintaining situational awareness
- Achieving mission objective
- Examples of Strategic Performance Problems
    - Flying an airplane on a combat mission
    - Driving a car in different conditions
    - Managing investment portfolio; how can I avoid interacting with person X
    - Moving to next level in Pokemon game
    - Teaching in live class
    - Arguing points of law before court
    - Air traffic controllers at a busy airport

- A corporate CEO negotiating with labor unions
- Being a translator in high-level negotiations
- Military commander in a combat situation

9. Policy Analysis Problems

- Outcome: decision, action, argumentation
- Problem: solution identification. Alternative actions, argue position
- Solution: multiple, unclear
- Context: real world, constrained
- Examples of Policy Analysis Problems
    - Harvard business cases
    - Plan a menu for foreign dignitaries
    - Render judgment in any tort case
    - Develop policy for condominium association
    - Evaluate performance of a stock portfolio
    - How should Microsoft be split up
    - Decide which mutual fund to invest in

10. Design Problems

- Outcome: problem articulation, options, design, justification
- Problem: original, principle-based
- Solution: multiple, undefined criteria
- Context: complex, real world
- Examples of Design Problems
    - Design instructional intervention given situation
    - Write a short story; compose a fugue; design a bridge
    - Make a paper airplane; design a dog house; design a vehicle that flies
    - Developing curriculum for school; plan marketing campaign for new Internet company
    - Develop investment strategy for money market fund

- Design a crib that will alert parents when babies stop breathing

11. Dilemmas

- Outcome: complex, non-predictive: personal, social, & ethical dilemmas
- Problem: vexing decision, no solutions, perspective irreconcilable
- Solution: articulated preference, preferred decisions
- Context: topical, complex, interdisciplinary
- Examples of Dilemmas
    - Should abortions be banned
    - Resolve Kosovo crisis
    - Negotiate peace between Hutus and Tutsis in Rwanda
    - Redistribute wealth through tax policies
    - Develop bipartisan bill for U.S. congress that will pass with 2/3 majority

Financial Aspects of Research

Financial aspects of research are mainly related to getting research funded or sponsored by any external agency and the process of availing it. It also covers some basic items of research budget which is generally presented at the research proposal stage for approval.

Research Funding

Research funding is a term generally covering any funding for scientific research, in the areas of both "hard" science and technology and social science. The term often connotes funding obtained through a competitive process, in which potential research projects are evaluated and only the most promising receive funding. Such processes, which are run by government, corporations or foundations, allocate scarce funds.

Most research funding comes from two major sources, corporations (through research and development departments) and government (primarily carried out through universities and specialized government agencies). Some small amounts of scientific research are carried out (or funded) by charitable foundations, especially in relation to developing cures for diseases such as

cancer, malaria and AIDS. According to OECD, around two-thirds of research and development in scientific and technical fields is carried out by industries, and 20% and 10% respectively by universities and government.

Government-funded research

Government-funded research can either be carried out by the government itself, or through grants to academic and other researchers outside the government. An additional advantage to government sponsored research is that the results are publicly shared, whereas with privately funded research the ideas are controlled by a single group. Consequently, government sponsored research can result in mass collaborative projects that are beyond the scope of isolated private researchers.

Privately funded research

Funding of research by private companies is mainly motivated by profit, and is much less likely than governments to fund research projects solely for the sake of knowledge. The profit incentive causes researchers to concentrate their energies on projects which are perceived as likely to generate profits.

Proposals for Funded Research

In addition to the information required in a research proposal for an academic degree, a proposal to do funded research requires further information covering costs, personnel, timetabling, outputs and other issues. It is important, when preparing such a proposal, that you argue a case for awarding the money and demonstrate that the researchers are likely to make good use of the funds.

You should take care to apply only to funders who are likely to be interested in your work, or to organizations whose terms of reference specifically cover your research topic. Nearly all research funders provide clear information on their specific areas of interest. It is a waste of your

time to attempt to gain their backing for research into subjects that they are unable or unwilling to support.

- **Costs**

When seeking funding, a clear and comprehensive account of all the costs which will be incurred is obviously of vital importance. There are many categories of costs; these are often listed in the application forms issued by funding bodies. The main categories are: personnel remuneration, travel and subsistence, capital equipment (e.g. computers, printers, measuring instruments and experimental equipment), overheads (e.g. universities charge for the use of their facilities), consumables (e.g. stationery, telephone). Your own university or organization will probably have clear budgeting guidelines and will be able to provide help in setting up a spreadsheet if necessary.

- **Personnel**

The funders are interested in the competence of those proposing to do the research, and of those whom they wish to employ to help them in order to be assured that the team will be capable of carrying out what they propose. CVs of the main members of the research team will usually be required. It is important to get the right balance of managers and workers, and the requisite skills and capabilities. Some funders insist on a partnership between academic and industrial/commercial organizations. In this case the roles of the various members of the partnership must be spelt out. Successful project management and organization are becoming increasingly important issues in the selection process. Indicate the intended management structure, the relevant experience of the responsible managers, research quality assurance procedures and other relevant budgetary and monitoring devices.

- **Timetabling**

This shows when the various operations will be carried out and in which sequence, and how long the project will take overall. A bar chart showing the various tasks and their timing is a useful way to summarize the program, together with a written description of what is involved in each task. A sequence of milestones with a description of what will be produced at each will give a

reliable monitoring guide. Take into account any risk factors and build in some fallback solutions, particularly if the risks are overt and an inherent part of the project.

- **Outputs**

There is little point in carrying out funded (or, for that matter, any other) research if the outcomes are not disseminated to those who might benefit from them. The proposed outputs could be in the form of articles, reports, papers, books, pamphlets, guides, conferences, computer programs etc. How the outputs will be made available to potential readers/users will also be of interest. Your intellectual property rights should also be considered here. Your aim should be to retain as many rights as possible. However, in more commercial work this can become a complicated issue and you will probably need to gain expert advice and be involved in discussions with the other participants and the promoter.

There is increasing competition in the research and consultancy environment. The process has become more subject to the time limited, programmatic priorities of funding bodies, and to increasing emphasis on the relevance to industry and the economy. The ways in which applicants convey their interest and expertise, register and enter the competition are important criteria used by promoters in the selection of participants and allocation of funds. It is essential that researchers are aware of how the research agendas are set. To be best informed, get yourself on relevant circulation lists which will supply you with information, calls for expressions of interests, research conferences and other dissemination events. Consult with the sponsoring or commissioning bodies for details and opinions. For inside information, find out if any of the staff in your organization are members of an advisory or steering research group of the commissioning body: they should know more details about the research relevant agenda. Consult also with research directors in your organization, they will have had plenty of experience in making applications. And do not hesitate to show the drafts of your proposal to colleagues in order to get opinions about the clarity and strength of your argument. Strict submission deadlines are usually enforced, so do give yourself enough time to develop the proposal and to get support and approval from all parties involved in order to avoid last minute panics: it inevitably takes longer than you think at first! Submitted proposals are generally reviewed and evaluated blind (that is, without knowing who the submitter is) by a selected panel or committee, often with the

help of specialist advisers drawn in to ensure that this type of peer review is thorough. These specialists may be competitors or colleagues in your field of interest. They will be looking for the bids of the highest quality, based on solid and dependable research approaches that break new ground in areas of current concern, and that are feasible within the projected framework, using the personnel proposed.

Judith Margolin (1983, pp. 233–4) noted that a large proportion of applications for funded research are rejected. She devised a list of ten reasons why proposals are turned down, which provides a useful tool for a critical appraisal of your own proposal. The list has been adjusted to show which items apply to academic as well as to funded research proposals, and those which apply only to proposals for funded research. The reasons relevant to all research proposals are:

1. There is an inadequately presented statement of need. It is perceived by the assessor either as not significant or as one of such magnitude that it is clearly impossible for the lone researcher to come to any useful conclusions in view of his/her limited resources (or, in the case of funded research, a few grant dollars would barely make a dent in the problem).

2. The objectives are ill-defined and are put forward as vague goals or personal aims.
3. The procedures are confused with the objectives.
4. There is a lack of integration within the text among components of the proposal (e.g. aims and objectives do not match).
5. The individual has adopted a poor approach and appealed on an emotional or a political rather than a factual or a theoretical basis.
6. Not enough information is provided about the details of the project.

The remaining reasons which apply only to applications for funded research are:

7. The funder does not accept proposals from unaffiliated individuals.
8. The funder knows that the proposed idea has already been tried and failed.

9. The funder approves of the concept but believes that the applicant is not the proper individual to conduct the project or that the institution with which the applicant is affiliated in not suitable.
10. The idea costs too much.

Research Funding Process

Often research funding is applied for by scientists and approved by a granting agency to financially support research. These grants require a lengthy process as the granting agency can inquire about the researcher(s)'s background, the facilities used, the equipment needed, the time involved, and the overall potential of the scientific outcome. The process of grant writing and grant proposing is a somewhat delicate process for both the granter and the grantee: the granter wants to choose the research that best fits their scientific principles, and the grantee wants to apply for research in which he has the best chances but also in which he can build a body of work towards future scientific endeavors. This interplay can be a frustrating and lengthy process.

Research Budget

The budget should be presented in the form the sponsor requests. For example, some organizations require secretarial assistance to be individually budgeted, whereas others insist it be included in the research director's fees or the overhead of the operation. In addition, limitations on travel, per diem rates, and capital equipment purchases can change the way in which you prepare a budget.

Typically, the budget should be no more than one to two pages. Diagram below shows a format that can be used for small contract research projects. Additional information, backup details, quotes from vendors, and hourly time and payment calculations should be put into an appendix if required or kept in the researcher's file for future reference. The budget statement in an internal research proposal is based on employee and overhead costs. The budget presented by an external research organization is not just the wages or salaries of their employees but the person-hour price that the contracting firm charges.

The detail presented may vary depending on both the sponsors' requirements and the contracting research company's policy.

Budget Example: Research Program Budget

Budget Items	**Rate**	**Total Days**	**Charge**
A. Salaries			
1. Research director,	Rs 200/hr	20 hours	Rs. 4,000
2. Associate	Rs100/hr	10 hours	Rs. 1,000
3. Research assistants (2)	Rs20/hr	300 hours	Rs. 6,000
4. Secretarial (1)	Rs12/hr	100 hours	Rs 1,200
Subtotal			**Rs 12,200**
B. Other costs			
5. Employee services and benefits			
6. Travel			Rs 2,500
7. Office supplies			Rs 100
8. Telephone			Rs 800
9. Rent			
10. Other equipment			
11. Publication and storage costs			Rs 100
Subtotal			**Rs. 3,500**
C. Total of direct costs			**Rs. 15,700**
D. Overhead support			**Rs. 5,480**
E. Total funding requested			**Rs. 21,180**

One reason why external research agencies avoid giving detailed budgets is the possibility that disclosures of their costing practices will make their calculations public knowledge, reducing their negotiating flexibility. Since budget statements embody a financial work strategy that could be used by the recipient of the bid to develop an independent work plan, vendors are often doubly careful.

The budget section of an external agency's proposal states the total fee payable for the assignment. When it is accompanied by a proposed schedule of payment, this is frequently detailed in a purchase order. Unlike most product sale environments, research payments can be divided and paid at stages of completion. Sometimes a retainer is scheduled for the beginning of the contract, then a percentage at an intermediate stage, and the balance on completion of the project.

It is extremely important that you retain all information you use to generate your budget. If you use quotes from external contractors, get the quotation in writing for your file. If you estimate time for interviews, keep explicit notes on how you made the estimate. When the time comes to do the work, you should know exactly how much money is budgeted for each particular task. Some costs are more elusive than others. Do not forget to build the cost of proposal writing into your fee. Publication and delivery of final reports can be a last minute expense that can easily be overlooked in preliminary budgets.

Summary

It is clear from this chapter that the purpose of research may be to test the validity of existing studies in different settings. It may also be to explore new dimensions. Research can be fully academic and fundamental in nature or it can be based on problem-solving. Research can be sponsored whereby some external party can bear the expenses related to research. In such cases, a detailed research budget is made and presented.

Glossary

Basic research: Research undertaken purely to understand processes and their outcomes, predominantly in universities as a result of an academic agenda, for which the key consumer is the academic community.

Research objectives: Clear, specific statements that identify what the researcher wishes to accomplish as a result of doing the research.

Research question: One of a number of key questions that the research process will address. These are often the precursor of research objectives.

Theory: Formulation regarding the cause and effect relationships between two or more variables, which may or may not have been tested.

Suggested Readings

Research Methods for Business Students, 4th edition, Mark Saunders, Philip Lewis and Adrian Thornhill – Pearson Education – New Delhi- 2007.

An Introduction to Research Procedure in Social Sciences – Gopal, M. A. – Asia Publishing House – Bombay, 2000.

Research Methods, William Zikmund, 5th Edition, Cengage Learning, 2006.

Terminal and Model Questions

1. Write short note on the following.

    f) Research Program
    g) Research Budget
    h) Fundamental Research
    i) Problem-Solving Research
    j) Dilemmas

2. Make a detailed explanation of financial aspects of research.
3. What do you mean by research program? Explain its significance in modern times.
4. How is problem solving research different from basic research? Explain types of problem solving research.

DRAFTING A RESEARCH PROPOSAL

Structure

3.1 Learning Objectives
3.2 Research Proposal / Synopsis
3.3 Types of Research Proposal
3.4 The Recipe for a Successful Research Proposal
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3.6 Selecting Topic
3.7 Problem area
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3.10 Coverage and Delimitations
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3.12 Research Objectives
3.13 Research Design
3.14 Sources of Information
3.15 Definition of Terms
3.16 Techniques of Data Analysis
3.17 Test of Hypotheses
3.18 Nature and Form of Results
3.19 Summary
3.20 Glossary
3.21 Suggested Readings
3.22 Terminal and Model Questions

Learning Objectives

- To understand synopsis as a document of research proposal.
- To learn about various contents of research proposal.
- To know about hypotheses and their formulation.
- To understand financial aspects of any research project.

Research Proposal / Synopsis

This section will culminate in the writing of your research proposal which will provide a foundation for your thesis or research project. You will need to use all the understanding which you have acquired and skills you have developed in the previous chapters in order to accomplish this task. You will you have to not only clarify in your own mind exactly what your specific area of study will be, but also be able to explain it in a compact and logical form so that anyone who reads your proposal will be able to understand the character and value of your intended work. Because submitting your proposal is a part of the formal process of attaining a research degree or applying for project funding, you will have to abide by the relevant university or funding body's regulations with regard to the suitability of your proposed research and the form of the research proposal. This chapter will help you to achieve this.

You will notice that the exercises in this chapter aim to help you to examine aspects of your own work in preparation for writing your proposal. There are obviously no right or wrong answers to these questions, so the answers at the back tend either to provide a list of points for you to check against what you have written, or to urge you to consult with your tutor or supervisor to discuss the outcome of the exercise. Of course, gaining approval for your intended work as described in your proposal is only the beginning of the process of research. The main effort will be in carrying out the research. Although this book is not intended to be a practical guide to help you to do this, it does conclude with some useful hints as how to approach the problem of writing and presenting your thesis or report. You will no doubt be faced with many new situations during your subsequent work, but the preparatory work which you have done during reading of this book should help you to beat a path through the complex and often frustrating process of completing your research project.

In order to be fully aware of what is required of you, if you are doing a research degree it is essential that you carefully read your university research degree regulations, a copy of which you should have received when you first registered. If you are doing a major assignment or a project, follow the detailed guidelines in your assignment or project instructions. If you are preparing a proposal for a funding application, then read the detailed instructions prepared by the funding body given to you with the application forms.

Types of Research Proposal

In general, business proposals can be divided between those generated internally and externally. An internal proposal is done for the corporation by staff specialists or by the research department of the firm. External proposals are either solicited or unsolicited. Sponsors can be university grant committees, government agencies, government contractors, corporations, and so forth. With few exceptions, the larger the project, the more complex is the proposal. In public sector work, the complexity is generally greater than in a comparable private sector proposal. There are three general levels of complexity. The exploratory study is the first, most simple business proposal. More complex and common in business is the small-scale study-either an internal study or an external contract research project

Now let us discuss difference between Internal proposal & External proposal.

Internal Proposals

Internal proposals are a memo from the researcher to management outlining the problem statement, study objectives, research design, and schedule is enough to start an exploratory study. Privately and publicly held firms are concerned with how to solve a particular problem, make a decision, or improve an aspect of their business. Seldom do businesses begin research studies for other reasons.

In the small-scale proposal, the literature review and bibliography are consequently not stressed and can often be stated briefly in the research design. Since management insists on brevity, an executive summary is mandatory for all but the most simple of proposals (projects that can be proposed in a two-page memo do not need an executive summary). Schedules and budgets are necessary for funds to be committed. For the smaller-scale projects, descriptions are not required for facilities and special resources, nor is there a need for a glossary. Since small projects are sponsored by managers familiar with the problem, the associated jargon, requirements, and definitions should be included directly in the text. Also, the measuring instrument and project management modules are not required. Managers will typically leave this detail for others.

External Proposals

An external proposal is either solicited or unsolicited. A solicited proposal is often in response to a request for proposal (RFP). The proposal is likely competing against several others for a

contract or grant. An unsolicited proposal has the advantage of not competing against others but the disadvantage of having to speculate on the ramifications of a problem facing the firm's management.

Even more difficult, the writer of an unsolicited proposal must decide to whom the document should be sent. The most important sections of the external proposal are the objectives, design, qualifications, schedule, and budget. The executive summary of an external proposal may be included within the letter of transmittal. As the complexity of the project increases, more information is required about project management and the facilities and special resources. In contract research, the results and objectives sections are the standards against which the completed project is measured. As we move toward government-sponsored research, particular attention must be paid to each specification in the RFP.

Usefulness

- Sponsor uses proposal to evaluate research idea
- Ensures the sponsor and investigator agree to research question
- For newcomer, research proposal helps learning from others
- Completed proposal provides a logical guidance

The Recipe for a Successful Research Proposal

Proposals for research tend to follow a defined pattern. They all have these features in common: an explanation, in a compact and precise fashion, of the nature of the research; why it is needed; how it will be done; the likely outcomes; and, in most cases, exactly what resources are required to carry it out. The three main functions of a proposal, according to Locke et al. (1993, pp. 3–5), are:

- A means of communication from the researcher to those who will assess, approve and possibly fund the work
- A plan for action to describe the scope, aims, step-by-step procedures and expected outcomes of the work

- A contract that will form the basis of agreement between the parties involved, e.g. the researcher, supervisors, funders, institutions (e.g. university or college); the signed agreement cannot be substantially altered without the agreement of all the parties.

There are, of course, differences in the nature of research projects and this will affect the exact nature of the proposal. However, keep in mind that any proposal is a type of promise, so it is advisable not to 'promise mountains and deliver molehills'!

The Main Ingredients and Sequence

Academic research proposals are usually composed of the elements like the topic/title, aims of the research, the background, the research problem, possible outcomes, outline of methods and selected bibliography. This sequence is usual, but small variations are possible. It is a good idea, at the first attempt, to write a preliminary draft of the proposal while concentrating your attention exclusively on the orderly.

Selecting Topic

One of the first tasks, therefore, on the way to deciding on the detailed topic of research is to find a question, an unresolved controversy, a gap in knowledge or an unrequited need within the chosen subject. This search requires an awareness of current issues in the subject and an inquisitive and questioning mind. Although you will find that the world is teeming with questions and unresolved problems, not every one of these is a suitable subject for research. So what features should you look for which could lead you to a suitable research problem? Here is a list of the most important:

1. It should be of great interest to you. You will have to spend many months investigating the problem. A lively interest in the subject will be an invaluable incentive to persevere.
2. The problem should be significant It is not worth time and effort investigating a trivial problem or repeating work which has already been done elsewhere.
3. It should be delineated. Consider the time you have to complete the work, and the depth to which the problem will be addressed. You can cover a wide field only superficially, and the more you restrict the field, the more detailed the study can be. You should also consider the cost of necessary travel and other expenses.

4. You should be able to obtain the information required. You cannot carry out research if you fail to collect the relevant information needed to tackle your problem, either because you lack access to documents or other sources, and/or because you have not obtained the co-operation of individuals or organizations essential to your research.
5. You should be able to draw conclusions related to the problem. The point of asking a question is to find an answer. The problem should be one to which the research can offer some solution, or at least the elimination of some false 'solutions'.
6. You should be able to state the problem clearly and concisely. A precise, well thought out and fully articulated sentence, understandable by anyone, should normally clearly be able to explain just what the problem is.

It is not easy to decide on and define a research problem, and you will not be expected to do so immediately. The important thing, at this stage, is to know what you are looking for, and to explore your subject for suitable possibilities. The problem can be generated either by an initiating idea, or by a perceived problem area. For example, investigation of 'rhythmic patterns in settlement planning' is the product of an idea that there are such things as rhythmic patterns in settlement plans, even if no-one had detected them before.

This kind of idea will then need to be formulated more precisely in order to develop it into a researchable problem. We are surrounded by problems connected with society, the built environment, education etc., many of which can readily be perceived. Take for example social problems such as poverty, crime, unsuitable housing and uncomfortable workplaces, technical problems such as design deficiencies, organizational problems such as business failures and bureaucratic bungles, and many subjects where there may be a lack of knowledge which prevents improvements being made, for example, the influence of parents on a child's progress at school, the relationship between designers and clients. Obviously, it is not difficult to find problem areas. The difficulty lies in choosing an area which contains possible specific research problems suitable for the subject of a research project or degree.

Some Common Mistakes in Selecting Topic

It is worth warning you at this stage of some common mistakes made when a research problem is chosen. These mistakes arise mainly from the failure to grasp the necessity for the interpretation of data in the research project.

Here are four common mistakes:

1. *Making the choice of a problem an excuse to fill in gaps in your own knowledge.* We all welcome the chance to learn more for ourselves, but the point of research is not just personal enlightenment, but making a contribution to public knowledge. Anyone can find a problem which involves the gathering and duplication of information, but it requires an additional effort to find one which requires data to be analyzed and conclusions to be drawn which are of wider interest.
2. *Formulating a problem which involves merely a comparison of two or more sets of data.* A comparison of sets of data or records might fill up many pages (e.g. the average age of marriage through the centuries), but without any effort to reveal something new from the information, there is no research activity. The problem should clearly state the objectives behind making the comparison.
3. *Setting a problem in terms of finding the degree of correlation between two sets of data.* Comparing two sets of data to reveal an apparent link between them (e.g. the average age of marriage and the size of families) might be interesting, but the result is only a number, and does not reveal a causal connection. This number, or coefficient of correlation, reveals nothing about the nature of the link, and invites the question – so what?
4. *Devising a problem to which the answer can be only yes or no.* In order to improve on our knowledge of the world we need to know why things are as they are and how they work. A yes–no solution to a problem skirts the issues by avoiding the search for the reasons why yes or no is the answer, and the implications which the answer has.

Booth et al. (1995, p. 36) suggest that the process for focusing on the formulation of your research problem looks like this:

1 Find an interest in a broad subject area (problem area).

2 Narrow the interest to a plausible topic.

3 Question the topic from several points of view.

4 Define a rationale for your project.

Problem area

Initially, it is useful to define no more than a problem area, rather than a specific research problem, within the general body of knowledge which interests you, e.g. housing and homelessness, parks in cities, building regulations and historic conservation. Your aim should be to subsequently narrow down the scope of the idea or problem until it becomes a highly specific research problem. This narrowing process will require a lot of background reading in order to discover what has been written about the subject already, what research has been carried out, where further work needs to be done and where controversial issues still remain.

You should keep in mind three questions when engaged in the preliminary exploratory work. The first is, what is your motivation for doing the research? A major motivation should be a curiosity about the research results. Another will undoubtedly be the fulfilment of the requirements of a research degree. Learning about the process of research – practical knowledge which can be used in the future – is also likely to be a motivation. The choice of problem is likely to be influenced by these motivational factors.

The second question is, what relevant interest, experience or expertise do you bring to bear on the subject? Obviously, interest in a subject is essential if you are to concentrate happily on it for a year or more. Although experience or expertise in a subject is not a prerequisite to doing research in that field, it does have an effect on the preliminary and information gathering stage of the work, as you will be familiar with the literature and the potential problem areas. However, a 'new light' may be cast on a subject by someone looking at it with 'fresh eyes'.

The third question is, what are you going to produce? As a researcher, your priority will be to produce a defendable thesis or useful research report within your time limit. If you are a research student, you should check the requirements of your university or college in the regulations issued about the nature of suitable research topics. (It might be a good idea to do that now. You will find the information in the latest university research degree regulations kept in the library. You should also be issued with your own copy.) If you are doing a dissertation as part of a course, check the course notes for guidance. If you are doing a funded research project, then you will need to know the requirements of the likely funders or of the policy of the organization for which you work.

Initial literature review and defining the problem area

The objective of the initial review of the literature is to discover relevant material published in the chosen field of study and to search for a suitable problem area. Fox (1969) mentions two kinds of literature which should be reviewed. The first is 'conceptual literature'. This is written by authorities on the subject you have in mind, giving opinions, ideas, theories or experiences, and published in the form of books, articles and papers. The second is 'research literature' which gives accounts and results of research which has been undertaken in the subject, often presented in the form of papers and reports.

As every piece of research contributes only a small part to a greater body of knowledge or understanding, researchers must be aware of the context within which their research work is to be carried out. At this stage it is important to get an overview of the subject, rather than knowledge in depth. This will provide you with an understanding of the principal issues and problems or controversies, and the opportunity to select a problem area within a frame of reference.

Within this problem area, it is important that you familiarize yourself with those aspects which have already been well established by previous research, and are generally accepted as true. These 'truths' can then be assumed to need no further proof, and the research problem simply uses them. It is not possible for a researcher to question absolutely everything in his/her investigations. Alternatively the research problem can be in the form of a challenge to veracity of one or more of these 'truths'. Advances in wisdom are only made by building on the solid foundations of previous knowledge. Obviously, someone who is already familiar with the subject investigated will tend to be quicker to advance through this stage.

At this early stage in your research programme you are exploring your subject field only to identify a problem area, and do not need to try to define your research problem in any detail. All the same, I think it is useful to know what the next steps will be so that you can see the direction in which you will be moving. This might well help you to choose a problem area. The knowledge and techniques which you will require for defining your specific research problem in detail are explained in Chapters 2–7 of this book.

Research problem Definition

From the interest in the wider issues of the chosen subject, and after the selection of a problem area, the next step is to define the research problem more closely so that it becomes a specific research problem, with all the characteristics already discussed. This stage requires an enquiring mind, an eye for inconsistencies and inadequacies in current theory and a measure of imagination. It is often useful in identifying a specific problem to pose a simple question, for example, 'Does the presence of indoor plants affect people's frame of mind?' or 'How can prevention measures reduce vandalism?' or 'Can planning and building regulations prevent the destruction of indigenous architecture?'

Such a question can provide a starting point for the formulation of a specific research problem, whose conclusion should aim to answer the question. At this stage, the nature of the question will give some indication of the type of research approach (or approaches) which could be appropriate. Will it be a historical study, or a descriptive inquiry, an analysis of correlations or an experimental exercise, or a combination of more than one of them?

Seemingly simple questions are riddled with ambiguities, which must be cleared up by careful definition: for example, in the above questions, what does 'frame of mind' mean, what sort of 'prevention measures' are envisaged, and does the question embrace all types of 'indigenous architecture' everywhere? It is likely that the problem is too broad if you can state it in less than half a dozen words. A few additional questions posed against each word can help to delineate the problem – where, who, what, which, when? Break the problem down into short sentences, not worrying at this stage about the overall length of the problem statement. It is a useful trick to put each sentence on a separate slip of paper, so that they can be put into order in different sequences. When the best logical progression from sentence to sentence is achieved, the statement can be edited into a more elegant form.

While developing a specific research problem, keep in mind the skills which you will require to carry out the research posed by the problem. Fox (1969 p. 39) defined five types of skills which are essential: research design, instrument development, data collection, data analysis and research writing.

Designing research can be learned, in consultation with your tutor or supervisor. Instrument development is, however, a highly specialized skill, so it is advisable to formulate the problem so that you can use standardized or previously developed instruments. The skills required by data collection techniques are generally readily acquired, though consideration must be given to the extent of data needed. Data analysis does require specialist skills, which can be of a highly sophisticated nature (specialist help is on hand when you get that far). It will definitely be worth your while to consult your tutor or supervisor on the implications for data analysis that the research problem might have. Skills in research writing will be developed by consultation with your tutors or supervisors over the next months (or years). Careful consideration of these points will ensure that the planned research is practicable and has a good chance of success.

The sub-problems

Most research problems are difficult, or even impossible, to solve without breaking them down into smaller problems. The short sentences devised Sub-problems during the problem formulation period can give a clue to presence of sub- problems. Does one aspect have to be researched before another aspect can be begun? For example, in one of the research questions asked above, the kinds of prevention measures that can be used against vandalism, how they can be employed and for what types of vandalism they are suitable, will have to be examined. The sub-problems should delineate the scope of the work and, taken together, should define the entire problem to be tackled as summarized in the main problem.

According to Booth et al. (1995, p. 40) you can organize your questions to define the sub-problems by looking at your topic from these four perspectives:

1. What are the parts of your topic and what larger whole is it a part of?
2. What is its history and what larger history is it a part of?
3. What kind of categories can you find in it, and to what larger categories of things does it belong?
4. What good is it? What can you use it for?

Second review of literature

A more focused review of literature follows the formulation of the research problem. The purpose of this review is to learn about research already carried out into one or more of the aspects of the research problem, in order to:

1. Summarize the results of previous research to form a foundation on which to build your own research
2. Collect ideas on how to gather data
3. Investigate methods of data analysis
4. Study instrumentation which has been used
5. Assess the success of the various research designs of the studies already undertaken.

Coverage and Delimitations

It is important to narrow down your thesis topic and limit the scope of your study. The researcher should inform the reader about limits or coverage of the study. The scope identifies the boundaries of the study in term of subjects, objectives, facilities, area, time frame, and the issues to which the research is focused.

Sample phrases that help express the scope/coverage of the study:

- The coverage of this study…….
- The study consists of ……..
- The study covers the …….
- This study is focus on……..

The delimitation of the study is delimiting a study by geographic location, age, sex, population traits, population size, or other similar considerations. Delimitation is used to make study better and more feasible and not just for the interest of the researcher. It also identifies the constraints or weaknesses of your study which are not within the control of the researcher.

Sample phrases that expressed the delimitations of the study:

- The study does not cover the……
- The researcher limited this research to……

- This study is limited to……

Formulating Hypotheses

Hypothesis may be defined as a tentative proposition suggested as a solution to problems or as an explanation of some phenomena. Hypothesis can also be defined as a testable, tentative, probable explanation of the relationship between 2 or more variables that create a state of affairs or phenomenon.

The formulation of an appropriate hypothesis goes hand-in-hand with the selection of research problem. After stating the research problem and reviewing the literature, the ground is prepared for structuring hypothesis. A hypothesis is an expectation of what the researcher beliefs that he/she might find in the data. It provides a directly testable relational statement and facilities extension of knowledge. Hypothesis should always be in declarative sentence form, and should relate either generally or specifically variables to variables. Hypotheses are formulated usually either from are search problem statement, an existing theory or the findings of previous studies.

Importance of Hypotheses

The following are some of the importance of hypothesis.

(i) Hypotheses provide direction to research and prevent the review of irrelevant literature and the collection of useless or excessive data.

(ii) Hypotheses provide link between a research problem and the location of the empirical evidence that may provide solution to the problem.

(iii) Hypotheses are not ends in themselves, but rather are means by which the researcher can understand with greater clarity his problem and its ramifications, as well as, the data that bear on it.

(iv) Hypotheses not only suggest what to look for in an investigation, but also how to obtain the data, thus determining the research design.

(v) Hypotheses act as a framework for conclusions. They permit the collection of relevant data and they make possible the interpretation of these data in the light of the potential solution. They provide the framework for stating conclusions in a meaningful way, that is, as a direct answer to the hypotheses being tested.

(vi) Hypotheses stimulate further research.

Sources of Meaningful Hypotheses

There are 3 sources from which hypotheses may be developed. These are;

(i) Intuition or a hunch (insight, sense, feeling, instinct, perception or idea)

(ii) The findings of other studies

(iii) An existing theory

A hypothesis developed from intuition or hunch might make some important contributions to knowledge, but if the testing is limited to one study, then there will be no assurance that the relationship between variables found in a particular study will be found in other studies. Another point is that hypothesis developed from a hunch might likely not be related to other knowledge or theory and will, therefore, have no clear connection with the larger body of knowledge about the field in question.

Similarly, a hypothesis developed from the findings of other studies will help to confirm relationship as occurring regularly if the present findings support the hypothesis, and the possibility that the relationship discovered in the study is due to some special condition in a given situation is greatly reduced but not altogether eliminated. A hypothesis developed from a theory has no limitations of the other sources stated above especially that of isolation from a larger body of knowledge of the field concern. If the findings of the study confirm the hypothesis, then they confirm the general theory by showing that the relationship discovered in the study not only holds in particular situation studied but also in any other situation where the theory has been applied. These findings therefore help to strengthen the explanatory and predictive powers of the general theory.

Types of Hypotheses

There are two major types of hypotheses, namely the null (H_0) and the alternate (H_1 or H_A). A null hypothesis is the hypothesis stated in a negative ascertain form by the use of the words 'No" or "Not". The null hypothesis is the hypothesis that is tested because in a research, a researcher does not attempt to prove that something is so, rather he/she tires to prove that something is not so. If it then shows to be not 'not so' (null hypothesis), then it would be assumed to be so. The statistical tests of the null hypothesis, H_0, may suggest the rejection of the H_0 at a particular level of significance and degree of freedom, as the case may be.

The rejection of the null hypothesis signals an automatic acceptance of the alternative hypothesis, H_1. This is because both hypotheses are complementary. The alternative hypothesis on the other hand is the hypothesis that is proposed to be accepted if the statistical null hypothesis turns out not to be tenable. Thus, the alternative hypothesis describes the result that the researcher expects. A hypothesis may be directional or non-directional. A directional hypothesis is one sided and non-directional hypothesis is two sided. A non-direction hypothesis test that there is no difference between the means of two populations e.g. there is no difference between financial performances in company "A" and "B" (H_0). A directional hypothesis on the other hand tests whether one population mean is greater or less than the other population mean. E.g. financial performance in company "A" is greater than company "B" (H_0).

Research Objectives

This section addresses the purpose of the investigation. It is here that you layout exactly what is being planned by the proposed research. In a descriptive study, the objectives can be stated as the research question. Recall that the research question can be further broken down into investigative questions. If the proposal is for a causal study, then the objectives can be restated as a hypothesis. The objectives module flows naturally from the problem statement, giving the sponsor specific, concrete, and achievable goals. It is best to list the objectives either in order of importance or in general terms first, moving to specific terms (i.e., research question followed by underlying investigative questions). The research questions (or hypotheses, if appropriate) should be set off from the flow of the text so they can be found easily.

The research objectives section is the basis for judging the remainder of the proposal and, ultimately, the final report. Verify the consistency of the proposal by checking to see that each objective is discussed in the research design, data analysis, and results sections.

Importance/ Benefits of the Study

This section allows you to describe explicit benefits that will accrue from your study. The importance of "doing the study now" should be emphasized. Usually, this section is not more than a few paragraphs. If you find it difficult to write, then you have probably not understood the problem adequately. Return to the analysis of the problem and ensure, through additional

discussions with your sponsor or your research team, or by a reexamination of the literature, that you have captured the essence of the problem.

This section also requires you to understand what is most troubling to your sponsor. If it is a potential union activity, you cannot promise that an employee survey will prevent unionization. You can, however, show the importance of this information and its implications. This benefit may allow management to respond to employee concerns and forge a linkage between those concerns and unionization.

The importance/benefits section is particularly important to the unsolicited external proposal. You must convince the sponsoring organization that your plan will meet its needs.

The background

It is necessary to explain to the reader of your proposal, the context from which the research problem emerges. You should be able to demonstrate that you are aware of the major factors which surround your problem, and of any significant literature which relates to it. It is also the function of this introduction to capture the interest of the reader. Some of the factors which make up the context might be of a physical nature, such as building types (e.g. schools, prisons), materials (e.g. historical artifacts, household products), situations (e.g. the playground, the street, the countryside) or organizations (e.g. local government, secret society, local community), while others might be more conceptual, such as the economy, legislation, development policy etc.

More abstract are theoretical concepts such as power, poverty and Marxism. In order to keep the description as short as possible, use references to relevant literature which, if known or followed up by the reader, give a full account of the concept or situation mentioned? It is quite difficult to pitch the level of your text so that any intelligent reader understands the factors from which your problem emerges, while at the same time persuading the expert that you are conversant with details of the principal issues. Do not assume that the reader knows anything about your subject.

Research Design

Research Design is a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically. In it we study the various steps that are generally adopted by a researcher in studying his research problem along with the logic behind

them. It is necessary for the researcher to know not only the research methods/techniques but also the methodology. Researchers not only need to know how to develop certain indices or tests, how to calculate the mean, the mode, the median or the standard deviation or chi-square, how to apply particular research techniques, but they also need to know which of these methods or techniques, are relevant and which are not, and what would they mean and indicate and why. Researchers also need to understand the assumptions underlying various techniques and they need to know the criteria by which they can decide that certain techniques and procedures will be applicable to certain problems and others will not.

The design module describes what you are going to do in technical terms. This section should include as many subsections as needed to show the phases of the project. Provide information on your proposed design for tasks such as sample selection and size, data collection method, instrumentation, procedures, and ethical requirements. When more than one way exists to approach the design, discuss the methods you rejected and why your selected approach is superior.

Sources of Information

Information can come from virtually anywhere — media, blogs, personal experiences, books, journal and magazine articles, expert opinions, encyclopedias, and web pages — and the type of information you need will change depending on the question you are trying to answer.

Primary sources

Primary sources are original materials. They are from the time period involved and have not been filtered through interpretation or evaluation. Primary sources are original materials on which other research is based. They are usually the first formal appearance of results in physical, print or electronic format. They present original thinking, report a discovery, or share new information.

Examples include:

- Artifacts (e.g. coins, plant specimens, fossils, furniture, tools, clothing, all from the time under study);
- Audio recordings (e.g. radio programs)
- Diaries;
- Internet communications on email, listservs;
- Interviews (e.g., oral histories, telephone, e-mail, questionnaire);
- Journal articles published in peer-reviewed publications;
- Letters;
- Newspaper articles written at the time;
- Original Documents (i.e. birth certificate, will, marriage license, trial transcript);
- Patents;
- Photographs
- Proceedings of Meetings, conferences and symposia;
- Records of organizations, government agencies (e.g. annual report, treaty, constitution, government document);
- Speeches;
- Survey Research (e.g., market surveys, public opinion polls);
- Video recordings (e.g. television programs);
- Works of art, architecture, literature, and music (e.g., paintings, sculptures, musical scores, buildings, novels, poems).
- Web site.

Secondary sources

Secondary sources are less easily defined than primary sources. Generally, they are accounts written after the fact with the benefit of hindsight. They are interpretations and evaluations of primary sources. Secondary sources are not evidence, but rather commentary on and discussion of evidence. However, what some define as a secondary source, others define as a tertiary source. Context is everything.

Examples include:

- Bibliographies (also considered tertiary);

- Biographical works;
- Commentaries, criticisms;
- Dictionaries, Encyclopedias (also considered tertiary);
- Histories;
- Journal articles (depending on the disciple can be primary);
- Magazine and newspaper articles (this distinction varies by discipline);
- Monographs, other than fiction and autobiography;
- Textbooks (also considered tertiary);
- Web site (also considered primary).

Tertiary sources

Tertiary sources consist of information which is a distillation and collection of primary and secondary sources.

- Almanacs;
- Bibliographies (also considered secondary);
- Chronologies;
- Dictionaries and Encyclopedias (also considered secondary);
- Directories;
- Fact books;
- Guidebooks;
- Indexes, abstracts, bibliographies used to locate primary and secondary sources;
- Manuals;
- Textbooks (also be secondary).

Comparison across the disciplines

SUBJECT	PRIMARY	SECONDARY	TERTIARY
Art and Architecture	Painting by Manet	Article critiquing art piece	ArtStor database
Chemistry/Life Sciences	Einstein's diary	Monograph on Einstein's life	Dictionary on Theory of Relativity
Engineering/Physical Sciences	Patent	NTIS database	Manual on using invention

SUBJECT	PRIMARY	SECONDARY	TERTIARY
Humanities	Letters by Martin Luther King	Web site on King's writings	Encyclopedia on Civil Rights Movement
Social Sciences	Notes taken by clinical psychologist	Magazine article about the psychological condition	Textbook on clinical psychology
Performing Arts	Movie filmed in 1942	Biography of the director	Guide to the movie

Definition of Terms

List and define conceptually unusual terms or acronyms to avoid misinterpretations particularly where they have different meanings to different people. (If such definitions are based on new instruments developed for the study, the operational definitions should come after the development of such instrument in section/chapter three). Make sure you do not repeat definitions implied in your theoretical foundations here.

Techniques of Data Analysis

A brief section on the methods used for analyzing the data is appropriate for large scale contract research projects and doctoral theses. With smaller projects, the proposed data analysis would be included within the research design section. Describe your proposed treatment and the theoretical basis for using the selected techniques. The object of this section is to assure the sponsor you are following correct assumptions and using theoretically sound data analysis procedures.

This is often an arduous section to write. By use of sample charts and dummy tables, you can make it easier to understand your data analysis. This will make the section easier to write and easier to read. The data analysis section is important enough to contract research that you should contact an expert to review the latest techniques available for your use. If there is no statistical or analytical expertise within your company, be prepared to hire a professional to help with this activity.

Test of Hypotheses

The statistical tests of the null hypothesis, H_0 may suggest the rejection of the H_0 at a particular level of significance and degree of freedom, as the case may be. However, it is necessary to know that an obtained mean is subject to sampling fluctuations or sampling error. This is defined as the difference between the result obtained from a sample (a statistic) and the result which would have been obtained from the population (the corresponding parameter). A sample error usually occurs when the complete survey of the population is not carried out, but a sample is taken for estimating the characteristics of the population. The sampling error is measured by the standard error of the statistics in terms of probability under the normal curve.

Even when the means of two samples are drawn from the same population, they will usually differ in some degree owing to sampling error. In order to test the significance of an obtained difference, it is necessary to have a Standard Error (SE) of the difference. From the difference between the sample means and the SE, it can be determined whether a difference might possibly exist between the population means. A difference is called significant when the probability is high that it cannot be attributed to chance as a result of temporary and accidental factors, and hence represents a true difference between population means.

A difference is non-significant or chance when it appears reasonably certain that it could easily have arisen from sampling fluctuations, and hence implies no real or true difference between the population means. Test of null hypothesis is made at essentially arbitrary levels of significance, usually0.05, or 0.01 or 0.10. These are also known as p-values. Thus, the confidence with which a researcher rejects or accepts a null hypothesis depends upon the level of significance adopted by him/her, if level of significance is set at 0.01 the level of confidence would be 99%, 0.05, 95% while 0.10, 90%.

The decision on whether to use a one tailed test depends on the way in which the hypothesis is formulated (whether it is directional or non-directional). If the hypothesis states that there is no significant difference between a sample and a population mean (i.e. non-directional), without any further qualification, then a two-tailed test is the appropriate one to use. If, on the other hand, the hypothesis states that the sample mean does not differ from the population mean in some specified direction (i.e. non-directional), then a one-tailed test is the right one to use. The

question whether to use on one-tailed test or two-tailed test shows how important It is to formulate the hypothesis clearly and precisely.

Nature and Form of Results

Upon finishing this section, the sponsor should be able to go back to the problem statement and research objectives and discover that each goal of the study has been covered. One should also specify the types of data to be obtained and the interpretations that will be made in the analysis. If the data are to be turned over to the sponsor for proprietary reasons, make sure this is reflected. Alternatively, if the report will go to more than one sponsor, that should be noted.

This section also contains the contractual statement telling the sponsor exactly what types of information will be received. Statistical conclusions, applied findings, recommendations, action plans, models, strategic plans, and so forth are examples of the forms of results.

Summary

Largely, this chapter has focused on research proposal, its importance and various components of research proposal. It starts with problem identification. Further studies into empirical literature make a title. After it, objectives and hypotheses are framed. Thereafter research design is finalized in form of coverage, sample, sources of data and analytical tools. This makes a complete research proposal. However, depending upon the requirements of different organizations, the order of items may change also.

Glossary

Bibliography: Alphabetical list of the bibliographic details for all relevant items consulted and used, including those items not referred to directly in the text. The university will specify the format of these.

Coverage: The extent to which a data set covers the population it is intended to cover.

Research idea: Initial idea that may be worked up into a research project.

Research objectives: Clear, specific statements that identify what the researcher wishes to accomplish as a result of doing the research.

Suggested Readings

Research Methodology-A Beginners, (2nd.ed.), Kumar, Ranjit, Singapore, Pearson Education. 2005.

Practical Research Methods, Dawson, Catherine, UBS Publishers' Distributors, New Delhi, 2002.

Business Research Methods, Donald R. Cooper, Pamela S. Schindler, 8/e, Tata McGraw-Hill Co. Ltd., 2006.

Terminal and Model Questions

1. Write short note on the following.

   k) Research Design
   l) Hypotheses
   m) Synopsis
   n) Sources of Information
   o) Research Proposal

2. Explain various contents of a research proposal.
3. What do you mean by research proposal? Explain its significance in modern times.
4. Differentiate between internal and external research proposal.
5. How are hypotheses formulated at the stage of research proposal?

USING LIBRARY, SOURCES OF INFORMATION AND NOTE TAKING

Structure

4.1 Learning Objectives
4.2 Use of Library

4.3 Finding the Information
4.4 Sources of Information
4.5 Evaluating Information Resources
4.6 Reading
4.7 Note-taking
4.8 Common Errors to Avoid
4.9 Collecting and Organization of Material
4.10 Publishing the Literature
4.11 Summary
4.12 Glossary
4.13 Suggested Readings
4.14 Terminal and Model Questions

Learning Objectives

- To learn the importance of library.
- To understand various sources of information and their evaluation.
- To know about the review of literature.
- To understand the purposes of taking down notes.
- To learn about organizing material.

Use of Library

One of the key capabilities that university students should be able to develop in themselves is the ability to use research findings from their own and related fields. A good place where they can assimilate an increasing amount of knowledge to keep abreast of recent developments in their field is the library. Literally thousands of books, periodicals, documents, and pamphlets are placed on library shelves each year. Skill is required in making a comprehensive search for information about a specific topic. A failure to develop these skills will lead to much wasted effort and frustration.

Although knowledge of library methods is desirable for the consumer of research, it is essential for the research worker. Too often graduate and undergraduate students and other beginning research workers try to solve a problem without attempting to determine whether others have conducted investigations in the same area.

This chapter, designed to help the consumer and research worker gain knowledge of library skills, emphasizes that library study is not a meaningless activity but an essential ingredient of the systematic approach to problem solving. The major sections of this chapter include (1) a statement of the purpose of library study, (2) a description of library resources, and (3) suggestions of methods which will aid in the collection of data from library resources.

A first step in the research process is the literature review, which helps to shape your research question. A literature review requires the author to identify, critically analyze and synthesize a set of useful articles and books on a particular topic. Often associated as a section within a dissertation, a literature review is characterized by the emphasis on sources, which are organized, summarized and synthesized with the goal of providing a new interpretation of old material or a trace of the intellectual progression of the field. Through a literature review, an author demonstrates comprehensive knowledge of the literature and the importance of the proposed research topic and its timeliness. The topic is also illustrated as distinct and different from previous work done on the topic while it builds upon and critiques that knowledge.

Careful consideration at this stage is crucial, as the way you organize your note-taking and storage will have repercussions in terms of both the management of your time and the quality of your results and written reports in the subsequent stages of the research process. Because a huge amount of relevant literature may be available, reviewing this literature ought to follow a systematic, meticulously designed process, characterized by perceptive reading and an attention to detail, particularly that which relates to your research problem. Your reading will help you to become aware of how others have dealt with topics in your research subject, and of what knowledge they have acquired, and of how to collect data appropriate to your research problem.

According to Wiersma, in his book Research Methods in Education (1986, pp. 47–8), the process should focus on three questions:

1. Where is the information to be found? The first question deals with specific sources of books, journals and written reports, and reproductions such as CD-ROM and the Internet that can be found in, or obtained through, the library. Looking for the relevant information means using printed reference works, such as bibliographies and indexes, and electronic guides, such as CD-ROM databases and computer-based catalogues. All are very useful means of finding potential data relating to the research problem.
2. What should be done with the information? The second question deals with critical analysis of the literature reviewed, the writing of notes, and the assembly and organization of the relevant data, so that they can be retrieved at later stages of the research process without the need to return to the information sources because of an unanticipated gap in the information assembled.
3. What use is to be made of the information? The third question considers the techniques involved in writing reports, chapters or papers, based on the material accumulated in your database of notes, whereby the information related to the research problem can be put together in a consistent and scholarly way.

This chapter is concerned with the first two of these questions: how to find the information, and how to deal with the information once it has been located.

Types of Literature Reviews

Literature review can be classified into four different parts as below.

Traditional Review

It adopts a critical approach, which might assess theories or hypotheses by critically examining the methods and results of single primary studies, with an emphasis on background and contextual material.

Conceptual Review

It synthesizes areas of conceptual knowledge that contribute to a better understanding of the issues. State of the art: brings readers up to date on the most recent research on the subject. It could be a useful beginning to your research project.

Scoping Review

It sets the scene for a future research agenda. This review documents what is already known and then, using a critical analysis of gaps in knowledge, helps to refine the research questions, concepts and theories to point the way to future research.

Systematic Review

It attempts to identify, appraise and synthesize all the empirical evidence that meets pre-specified eligibility criteria to answer a given research question [about health care or health policy. Researchers conducting systematic reviews use explicit methods aimed at minimizing bias, in order to produce more reliable findings that can be used to inform decision making."

Finding the Information

Finding the information involves reviewing the literature relevant to the research problem. This should start at the beginning of the research process and continue throughout the project. Reviewing the literature includes some specific activities that take place in a sequence. Because of the amount of information available, you should follow a systematic process. In addition, it is advisable that, at each stage of the review, you do as complete and as accurate a job as possible. This will minimize the need to go back to the source of the information for a missed detail, which will save you later time and effort. Students, in the last stages of writing their thesis, sometimes spend hours of valuable time frantically trying to retrace the details (e.g. page numbers, author's name or journal title) of an important reference that they had collected a year or two previously.

Reviewing the literature is essential, not only in providing a context for the research subject and specifically limiting and identifying the research problem, but also in providing you with important information for subsequent parts of the research investigation (Wiersma, 1986, p. 48; Leedy, 1985, p. 69).

Sources of Information

The university, college or specialist professional library is likely to be the most valuable starting point for seeking information. It provides access to a wide range of material, including books

containing background information, reports of research studies, periodicals, technical reports and academic theses, available either in the library itself or from other libraries.

There are different, but similar, systems of cataloguing the contents of libraries in different institutions. Therefore an essential early task is to find and understand the system your library utilizes, and where materials in the library are located. This should be done as soon as possible to allow you to find your way through the shelves and computer terminals of the library to obtain the materials required. Librarians are mobilized at the beginning of each academic year to help you and other new students to understand the way the library works and how to look for required materials. If you are a new student you are strongly advised to attend not only a library tour, usually arranged by the library staff at the beginning of term, but also information sources seminars which are often organized specifically for research students.

There are essentially two main types of information source which you need to be aware of:

1. *Bibliographic aids and indexes:* These are the indexes, catalogues and other bibliographic tools which enable you to trace the secondary sources you require.
2. *Secondary sources:* These consist of the 'literature' of your subject, i.e. the books, journal articles, reports and papers which you need to find for the information you require for your research.

This chapter concentrates on bibliographic aids and indexes, and describes the various types which you are likely to find useful.

Library Catalogue

Library catalogues are usually restricted to the bibliographical details of items in the library's collection, and their numbering on the library's shelves. Most library catalogues are now offered on computer, and are often referred to as online public access catalogues (OPACs). There is usually access to document references by author, title and subject, and most libraries operate on a similar basis. However, there may be significant differences. It is important to learn the best way to operate the catalogue, and library staff will be happy to show you. Note that some long

established libraries do not list their older books online, so you may need to resort to the card or microchip index for these.

It is also possible to search the OPACs of other libraries worldwide through the Internet. You may want to do this if there is a library specializing in your subject, e.g. German literature, or if there is a major copyright library which receives copies of all new books published in a particular country, e.g. the British Library.

Journal of abstracts

Journals of abstracts appear at regular intervals and commonly comprise catalogues of the bibliographical details (journal title, issue number, date, author/title of article etc.) of journal articles. They are devoted to journals in individual subject areas. Additionally there are publications which catalogue other document types, such as dissertations or conference proceedings. Entries are often arranged in broad subject groups, with a key word index. Some abstract journals cover a broad area, e.g. sociological abstracts; others are more specific, e.g. leisure, recreation and tourism abstracts. They may be limited by language(s) covered, geographical area of publication etc. The main feature of an abstract journal is that it contains summaries of articles, the length of which varies. They may simply indicate what the article is about (indicative abstracts) or may be more detailed, giving the main arguments and conclusions (informative abstracts).

Index journal

Index journals are similar to journals of abstracts, but do not contain summaries of articles. They often contain key words as part of the entry, to indicate the content of the article.

Bibliography

Bibliographies, that are lists of references on specific subjects, are often published in response to demand or as the by-product of research. These are often useful to researchers, and can be found via the library catalogue. Additionally you may find the large national bibliographies such as Books in Print (USA), which has a subject arrangement, or the British National Bibliography, useful for tracing details of relevant items.

Most books and many abstract and index journals are now available in bibliographic database form for key word searching. CD-ROM databases are increasingly available in libraries, for use

by staff and students. Training in their use is normally given by library staff. Some databases not purchased by the library in CD format can often be searched online for research students by library staff. This can be a relatively expensive service, but the cost may be borne by the library and/or your university or college department. Online searching is usually available at the discretion of the subject librarian. Results of both CD and online searching are normally available in machine-readable format, and can form the basis of a personal reference database.

Directories of organizations, although not bibliographical sources, are nevertheless useful in tracing details of organizations in specific fields, and of key personnel in those fields. Finally, people are also non-bibliographical sources, but frequently can advise on where to look! Librarians are people – use them! In particular, make sure that your subject librarian knows about what subject you are researching.

It is worth noting that bibliographic aids and indexes, even those devoted to a specific subject, are rarely anything like comprehensive. For example, the Architectural Periodicals Index contains references to articles from many, but not all, architectural journals. It is limited to those purchased by its producer, the library of the Royal Institute of British Architects. This means you will need to do an additional organized literature search through the sources most likely to cover your research subject. See whether there are any courses of instruction, organized by your subject librarian, to offer guidance on these.

Obviously, with the range of bibliographic aids and indexes available to you, you are likely to want to see books and articles which are not available in your own university library. The system of inter-library loans makes it possible to get hold of most published material, either from libraries in this country or from those abroad. Note that because of the paperwork and postage involved, several weeks can pass before the book, microfiche, journal etc. is delivered to you.

Do not overlook the existence of specialist libraries. Many professional bodies, associations and other organizations possess their own collection of specialist literature. A visit to the libraries appropriate to your subject may be essential, as the information contained therein may be unobtainable elsewhere. You can also gain access to other non-specialist but certainly ‘special’ libraries, such as the Bodleian in Oxford and the British Library in London, as well as the national libraries in other countries, e.g. the Bibliothèque Nationale de France or the Library of

Congress in Washington, where valuable historical publications and manuscripts can be found. Private collections and historical records, which are located throughout the country, may be of interest to you, particularly if you are doing historical research.

The Internet

The Internet provides a huge range of free and chargeable resources, growing all the time. However, specific subject information is variable in quality and quantity: some is extensive and heavily used (e.g. pharmaceutical and medical data), some much less so (Winship and McNab, 1998).

You will need browser software in your computer in order to access the World Wide Web. Most academic and commercial organizations running Windows 95 or Windows 98 or Windows NT will use Microsoft Explorer. Another standard browser is Netscape Navigator, often used as it is available for PC, Macintosh and Unix platforms. The main facilities provided by browsers enable you to save a file to disk, to print a file including pictures, to search the text of a file, and to cut and paste sections of the file to other Windows applications.

The strengths of the medium are its international content; it's usually good currency and its sheer mass of data. This leads to problems in tracking down relevant and reliable information, partially solved by the use of good search engines (programs which select data in response to key words). Access is convenient from a personal computer, and data can be easily saved and copied out (depending on copyright restrictions). Some information is charged for, but charges are defined before access is gained and therefore costs are controllable.

There are disadvantages though. Accessing some sites can be painfully slow in the afternoon in the UK owing to heavy use of the Internet by people in the USA. The mass of information can result in many false leads causing time waste and frustration. The authority of the information is often questionable, and should be checked with other sources if accuracy is vital. Though the searching procedure is relatively simple and easily learned, a familiarity with computer use is required. No special computer equipment is required apart from a modem or connection to a network with access to the Internet. If you are working from home, a subscription to an Internet service provider (ISP) is necessary, many of which now offer a free service. Payment for

information is sometimes required, and making payments over the Internet is not always secure. This problem may soon be overcome.

More data are continuously being posted on the Internet (there are currently over 20 million World Wide Web pages, with pages being added at the rate of one every four seconds), including research information which is not available elsewhere, e.g. in electronic journals, as well as free factual and bibliographic databases which include abstracts and summaries. You should consult your academic library for information about free access to information services (such as Janet in the UK), which make easy access available to a wide range of databases of journal articles, abstracts, conference literature etc.

There are numerous Internet guides published throughout the world that help you to find useful sites and services. Many are written from a US perspective, so if you wish to buy one it is worth looking carefully to select one that has the right information for you. Note that the price level is not always a guide to quality! Beware that these books tend to become rapidly out of date, especially those listing addresses of Internet sites.

The commonest way of searching for information on the World Wide Web is to use a search service (search engine) such as Google, Yahoo, Lycos, Alta Vista, Excite, Infoseek etc. You should carefully read the instructions on the search methods recommended. The commonest way is to use concepts in the form of key words. It is good to be familiar with the use of AND, OR and NOT between your key words to narrow down your search. The use of these is termed 'Boolean logic'. AND is used to join concepts to make the search more specific, i.e. all the concepts must appear; OR is used to widen the search; and NOT narrows down the search by excluding certain concepts. You can also truncate words to widen their possible applicability, e.g. dent* will include dentist, dental, dentistry etc.

The Internet also provides a simple and cheap (often free) method of communicating throughout the world in the form of e-mail. This can be really useful for making contacts relevant to your research effort.

Evaluating Information Resources

A range of information sources might be used to inform the research question and design. The evaluation of these sources is a very real problem. Typically in professional disciplines, like information systems, and business and management, there will be both academic and professional literature. Both may have a role in the identification of a research theme, but the academic literature contains a firmer theoretical basis, with more critical treatment of concepts and models.

Articles in scholarly and research journals should form the core of the literature review. Most such articles will be written by researchers. They will include a literature review, a discussion of the research methodology, an analysis of results, and focused statements of conclusions and recommendations. These articles are designed to record and distill systematically researched knowledge in the area, and have typically been peer refereed prior to acceptance for publication. Scholarly and research journals may also include review articles that provide a review of all of the recent work in an area. Such reviews will include a significant bibliography that may be an invaluable source of reference to other work in the area, even if the review does not match a proposed research topic precisely.

Professional and practitioner journal articles are often around three pages in length, they may be useful in identifying recent developments or topical themes in context, policy, legal frameworks, and technological advances, but should be carefully differentiated from research and scholarly articles.

Another source that needs to be used intelligently is books. Standard texts are a good place to start. They provide a summary of current ideas and in disciplines such as business and management and information systems many are regularly updated. Books include bibliographies or lists of references to other useful sources.

A good book is:

- Relevant to the research topic;
- written by an authoritative author; the biographical details given in the book will summarize the authors experience in the field;

- Up-to-date, as signaled by the publication date;
- Published by a reputable publisher in the discipline;
- One that includes extensive reference to other associated literature; and is
- Clearly structured and well presented, and easy to read.

Web resources are easy to locate through simple searches in standard search engines. The web provides access to a wide range of information, but these sources are provided by a range of different individuals and organizations, each with their own messages to communicate, and reasons for making the information available. It can be difficult to evaluate web resources. Many may be more suitable for the data gathering element of a research project, rather than as input to a literature review. They, may, for example, provide valuable statistics, or company information that can be used in desk based research.

Evaluating Web Resources

1. Who is the intended audience?
2. What is the frequency of update?
3. Which organization is the publisher or web site originator?
4. What is the web resource developer's claim to expertise and authority?
5. Are there links or references to other relevant web, electronic, or print sources?
6. What do reviews or evaluations of the site say?
7. Is a licence or payment necessary for access to the resources?

Reading

Since you are likely to be dealing with masses of written sources, you have to acquire the appropriate technique of reading their contents in a limited time. That means, as Newman (1989, p. 12) puts it, acquiring the technique of learning how to 'tear the heart out of books' or how to 'gut' them efficiently and quickly. This will enable you to work your way through the large masses of information.

According to Fairbairn and Winch (1991, pp. 7–14), reading involves (1) finding meaning in written texts, (2) literal, inferential and evaluative comprehension of texts, and (3) reading in different ways. In addition, Krantz and Kimmelman (1992, pp. 12–105) state that your goals are:

1. To review the text
2. To use context clues and a dictionary to understand new words
3. To identify and mark important ideas in a chapter
4. To recognize how authors organize and develop ideas
5. To identify new words and phrases that describe the methods or patterns of organizing and developing ideas
6. To apply comprehension skills to vocabulary and text material.

Reading text quickly is not easy if you do not have the appropriate technique. Reading systematically to fully understand a textbook demands a lot of effort and may be time-consuming and not really necessary. You can possibly find short cuts to locate the part or passage of the text that interests you and this will enable you to develop ways of using your reading time more effectively. There are, in fact, several available techniques contained in many publications on increasing reading and comprehension speed (Fairbairn and Winch, 1991, 1993, p. 41; Smith and Smith, 1994, pp. 53–89; Newman, 1989, pp. 12–14).

Each of the above-mentioned authors suggests techniques of reading, but do not forget that you might develop your own technique of reading that might work better for you in terms of time, effort and comprehension. For example, Freeman and Meed (1993, pp. 31–41) suggest the following techniques:

1. *Skimming:* This involves looking quickly through the book and reading only things like contents, headings, introductions and conclusions. This is a quick and efficient way of familiarizing yourself with a publication and is useful if you wish to check whether a written report is relevant, or wish to find particular information or ideas quickly.
2. *Scanning:* This is a very rapid search for some important point. It may be a page number, a title or a key word. The essential thing is that you deliberately ignore everything except the one item for which you are scanning. You use scanning when you look up a number in the telephone directory.
3. *Reading to understand:* This involves detailed study of a chapter, passage or article in order to absorb all the major facts and ideas. You may read it more than once, and take notes to summarize what you have read.

4. *Word-by-word reading:* Very occasionally, you actually need to read every word extremely carefully; for example, when reading an exam question or following a set of instructions.
5. *Reading for pleasure:* This is the reading you do to relax and enjoy, as with a novel.

Smith and Smith (1994, pp. 54–89), in an alternative approach, suggest some techniques for reading skills which include: (1) efficient scanning with the use of key words and key terms, (2) use of titles to anticipate the contents of a reading passage, and (3) finding out the content of a text by looking at the first sentence of each paragraph. With respect to an adequate reading speed, Newman (1989, pp. 12–14) argues that reading techniques fall into a basic pattern involving four stages:

- Stage 1: Try to gain some quick impression of what the book is about; what question or questions the author is trying to answer; how the book is structured; and whether, in fact, the questions tackled and the answers put forward are relevant to your needs. You can do this by glancing over the cover or jacket, the preface (if any), the list of contents, and the index. Try then to gain an overall impression of the book and its structure.

- Stage 2: If you decide that the book is relevant to your research subject, then you must formulate the question or questions that you anticipate will be answered in the book. This enables you to locate the required information and will save you time and effort as you cannot afford to go on reading aimlessly through the book. In addition, at this stage you must adopt an active and analytical attitude.

- Stage 3: After formulating the main question or questions that you anticipate the book will answer, you must review the book to look for answers for your questions. This involves locating the parts of the book where your questions are dealt with. You must then look for the answers or conclusions that the author has drawn, and also at how the author arrived at them. You will also look at arguments and evidence put forward to support the views expressed and you will make an attempt to assess the validity of the evidence and the structure of the argument which utilizes such evidence. There are,

however, cases where conclusions are unsupported, arguments or evidence are non-existent, or sometimes there is no conclusion at all.

- Stage 4: Supposing that you have extracted the relevant information from the written report, you must now record your data in note form, so that later you can retrieve it and use it easily at the appropriate stage. The different ways of doing this are explained later in this chapter.

Note-taking

Note-taking is an indispensable part of writing a documented essay or research paper. Your notes record information from the sources that you will use in writing your report. Therefore, it is necessary to critically evaluate the texts or articles you are reading and to make reasonable choices about what will and will not be useful for your paper. Otherwise, you will overload yourself with information and spend too much time sifting through notes. If there is an entire page in a book or article that you really need, it would be better to make a photocopy of it.

To take effective notes, you must do the following:

1. **Understand the information:** Before you can use information, you must understand it. Taking notes is a good way to develop your knowledge and comprehension of a subject; it is not just a mechanical process of recording data. Reading a source, making decisions about what is useful for your essay, and writing the notes on index cards or in a notebook will encourage you to think more deeply about what you are reading as well as how it relates to the subject of your research.

2. **Select the information**: The information to be used in a paper must be gathered from a variety of sources, which also, most likely, contain much information not necessarily relevant to your topic. Therefore, when you take notes, you must sort out the material you need from other information surrounding it in the text.

3. **Record the information**: To efficiently use the information in your sources, you must record it in such a way that it can be easily sorted, reorganized, and incorporated into your paper. This means that you should choose a style of recording that best suits you and that lists all necessary information- title, author, publisher, etc., which you will need later for your bibliography.

Using your own words, take notes that briefly summarize (commonly known as paraphrasing) the most important points of each source. Try to be as clear and concise as possible in your note-taking and try to omit details that are not relevant to your topic. Stick to main points rather than involved discussion or digressions. If you record a direct quotation, you can also write a brief explanation of how the quote will be useful for your topic.

Methods of Note-taking

The following methods will enable you to read your sources with understanding and take good notes:

1. A well-written article or book chapter usually makes a single main point and supports that point with a discussion of a series of subtopics related to it. Before you start writing notes, scan the complete piece of writing to determine what the main point is, what subtopics are discussed, and how each subtopic relates to the main point. An effective method of scanning is to read the first several paragraphs of a section, and then read the first (topic) sentence of each remaining paragraph. When you get to the concluding paragraph, read all of it. If your source is a book, the table of contents may help guide you to information that fits your topic.

2. After scanning the entire chapter or article, write your understanding of the author(s) thesis (her/his main point), in your own words. In addition, it is a good idea to read the section in the text that contains the author's first subtopic. The length of this segment will vary, but in the average book or substantial article, it will usually be discussed for one to five pages. After reading, scan the section again to make sure you understand the most significant points in it. Now, write your understanding of the subtopics in that section; of course, you also need to do this in your own words. Paraphrasing will help you to better understand the author's ideas rather than just mechanically copying them.

3. When you take notes, be as concise as possible, omitting unnecessary details and digressions. It is not always necessary to write complete sentences or even complete words-- occasionally abbreviation saves time--as long as what you have written will be clear to you when you consult your notes later. If you consider that the author's words are necessary to clarify a point, copy them exactly and put them in quotation marks. (It is a good idea to make note of the author's last name as well).

4. Remember to record the page number(s) in the text or article that corresponds to your notes. In addition, make sure you have all bibliographical information recorded for each source either on one index card or in your notebook.

5. Always try to review the chapter or article after note-taking to make sure your notes are accurate and complete.

Common Errors to Avoid

1. The most common and most serious error students make in taking notes is to copy the wording of the source directly, either word-for-word or with minor changes. This not only prevents students failing processing the information fully in their own minds, but also encourages plagiarism since the notes find their way into the paper. The best way to avoid this is not to look at your source as you write your notes. That way you will be sure to use your own words.
2. Including too much detail in notes slows you down. If you are doing this, you are not distinguishing between significant and insignificant information. Notes are meant to be concise!
3. Direct quotations should be used only when you have a special purpose. If you use a direct quotation, copy it accurately!
4. Remember to include page numbers in your notes. Otherwise, you will have to spend valuable time returning to the sources to find page numbers, and you will leave yourself open to error.

Collecting and Organization of Material

You will need to think of the manner in which you want to order to accumulate your notes. Many different formats are suggested, but you can design your own setup which might be more suitable for you than another. However, the most important feature is that each card, piece of paper or other form of record must include only one idea or one fact or one item or one question. That is because at this stage you do not yet know in which part of the structure of your research project this one piece of information will fit, or if it will be used at all.

An effective note-taking system preserves the most significant ideas in a form that facilitates shifting, comparing, grouping and ordering items (Newman, 1989, pp. 15–16; Van Dalen, 1979, p. 88). Leedy (1989, pp. 68–70, 131–3) makes useful suggestions on the use of coloured duplicated note cards and bibliography cards, with separate copies filed under different headings, producing parallel files of e.g. author, place, date, subject etc. The cards can be stored in different card boxes. Paper of A4 size can be similarly copied and filed in folders or ring-binders.

Although up till this point, paper in the form of filing cards and notepaper has been mentioned as the medium for recording and ordering your notes, you may consider using a computer database to achieve the same ends. There are several advantages and disadvantages in relying on a computer system compared with using a paper-based system. The advantages are:

- You need write the notes only once. You can copy the text when you want to use it and edit it without writing it all out again. This promotes accuracy as well as saving time. (There are dangers in using this facility; see the disadvantages to follow.)
- You can easily search through your notes for key words, authors, concepts etc.
- You can repeat bibliographic information for each note at the touch of a button.
- You can link notes to outlines, subjects, authors, dates and other categories of your choice.
- You can keep all your notes on highly portable floppy disks.
- You can easily devise bibliographic lists with the copy facility, so that you need write the bibliographic details only once. This means that you can be sure that the information is correct; however many times you need to copy the references.

The disadvantages are:

- It takes time to learn how to use the database program effectively.
- You need to have frequent (perhaps even constant) access to a computer.
- You are limited to where you can take notes, i.e. to where you can take or use a computer. Possessing a laptop computer helps in this respect.
- You can be tempted to miss out on valuable redrafting stages as you electronically copy and order your notes for use in essays, papers etc. There is a danger that you may consider the sets of ideas and quotations which you have listed in some sort of order from your notes, and printed out, to be a finished piece of writing. In fact, considerable further effort will be necessary to turn what is basically a list of notes into a clear and concise argument. Having to physically rewrite text always prompts you to think analytically about what you are writing.

Further information on which applications are suitable and how to use them can probably be obtained from your university computer centre. Standard database programs, such as Microsoft Access, have a limit on the length and format of fields used for storing your information, so do set up a typical record of the notes on one book to see if you can include all the information you want and in the way you want it.

Finally, do not forget that you should decide which form of note-taking you should adopt and which suits your research project best. Notes are a means to an end, not an end in them. However they are recorded and stored, the essential thing is that they are useful and contain the necessary information, and can be traced when required (Wiersma, 1986, p. 74).

Publishing the Literature

There are a variety of avenues for scholars to report the results of their research, and each has a role to play in scholarly communication. Not all of these avenues result in official or easily findable publications, or even any publication at all. The categories of scholarly communication listed here are a general outline; keep in mind that they can vary in type and importance between disciplines.

Peer Review

An important part of academic publishing is the peer review, or refereeing, process. When a scholar submits an article to an academic journal or a book manuscript to a university publisher, the editors or publishers will send copies to other scholars and experts in that field who will review it. The reviewers will check to make sure the author has used methodologies appropriate to the topic, used those methodologies properly, taken other relevant work into account, and adequately supported the conclusions, as well as consider the relevance and importance to the field. A submission may be rejected, or sent back for revisions before being accepted for publication.

Peer review does not guarantee that an article or book is 100% correct. Rather, it provides a "stamp of approval" saying that experts in the field have judged this to be a worthy contribution to the professional discussion of an academic field.

Peer reviewed journals typically note that they are peer reviewed, usually somewhere in the first few pages of each issue. Books published by university presses typically go through a similar review process. Other book publishers may also have a peer review process. But the quality of the reviewing can vary among different book or journal publishers. Use academic book reviews or check how often and in what sources articles in a journal are cited, or ask a professor or two in the field, to get an idea of the reliability and importance of different authors, journals, and publishers.

Informal Sharing

In person or online, researchers discuss their ongoing projects to let others know what they are up to or to give or receive assistance in their work. Conferences, listservs, and online discussion boards are common avenues for these discussions. Increasingly, scholars are using personal web sites to present their work.

Conference Presentations

Many academic organizations sponsor conferences at which scholars read papers, display at poster sessions, or otherwise present the results of their work. To give a presentation, scholars must submit a proposal which is reviewed by those sponsoring the conference. Unless a presentation is published in another venue, it will likely be difficult to find a copy, or even to

know what was presented. Some subject specific indexes and other sources list conference proceedings along with the author and contact information.

Conference Papers / Association Papers / Working Papers

Papers presented at a conference, submitted but not yet accepted for publication, works in progress, or not otherwise published are sometimes made available by academic associations. These are often not easy to find, but many are indexed in subject specific indexes or available in subject databases. Sometimes a collection of papers presented at a conference will be published in a book.

Journals

Articles in journals contain specific analyses of particular aspects of a topic. Since journal articles can be written and published more quickly than books, academic libraries subscribe to many journals, and the contents of these journals are indexed in a variety of sources so others can easily find them, researchers commonly use articles to report their findings to a wide audience. Thus journals are also a good readily available source for current information on a topic.

- Academic/Scholarly journals - Usually (but not always) peer reviewed, they come in a few different types:
- News/Letters journals - News reports, brief research reports, short discussions of current issues.
- Proceedings/Transactions journals - A common venue for publishing conference papers or other proceedings of academic conferences.
- Research journals - Articles reporting in detail the results of research.
- Review journals - Articles reviewing the literature and work done on particular topics.

General interest magazines

News and other magazines that report scholarly findings for a general, nonacademic audience. These are usually written by journalists (who are usually not academically trained in the field), but sometimes are written by researchers (or at least by journalists with training in the field). Magazines are not peer reviewed, and are usually not academically useful sources of information for research purposes, but they can alert you to work being done in your field and give you a quick summary.

Books

Books take a longer time to get from research to publication, but they can cover a broader range of topics, or cover a topic much more thoroughly, than articles or conference presentations. University press books typically go through some sort of a peer review process. There is a wide range of review processes (from rigorous to none at all) among other book publishers.

Dissertations/Theses

Graduate students working on advanced degrees typically must perform a substantial piece of original work, and then present the results in the form of a thesis or dissertation. Usually, only the library and/or department at the school where the work was done has copies of the dissertation, though especially significant ones are often collected by other libraries.

Web sites

In addition to researchers informally presenting and discussing their work on personal web pages, there are an increasing number of peer reviewed web sites publishing academic work. The rigor, and even existence, of peer reviewing can vary widely on the web, and it can be difficult to determine the reliability of information presented on the web, so always be careful in relying on a web-based information source. Do your own checking and reviewing to make sure the web site and the information it presents are reliable.

Reference Sources

Subject encyclopedias, dictionaries, and other reference sources present brief introductions to or summaries of the current work in a field or on a topic. These are typically produced by a scholar and/or publisher serving as an editor who invites submissions for articles from experts on the topics covered.

Summary

Undertaking a literature search, locating documents, and understanding the distilling the literature of a subject area is a complex task. This brief chapter has reviewed a number of aspects of the development of a literature review. The chapter is intended to assist students with the process of writing a literature review as a component in an undergraduate or Masters Project or dissertation.

Glossary

Hypothesis: Testable proposition about the relationship between two or more events or concepts.

Notebook of ideas: Technique for noting down any interesting research ideas as you thinks of them.

Review article: Article, normally published in a refereed academic journal, that contains both a considered review of the state of knowledge in a given topic area and pointers towards areas where further research needs to be undertaken. *See also* refereed academic journal.

Secondary literature: Subsequent publication of primary literature such as books and journals.

Tertiary literature source: Source designed to help locate primary and secondary literature, such as an index, abstract, encyclopedia or bibliography.

Suggested Readings

Research Methodology-A Beginners,(2nd.ed.), Kumar, Ranjit, Singapore, Pearson Education. 2005.

Practical Research Methods, Dawson, Catherine, UBS Publishers' Distributors, New Delhi, 2002.

Business Research Methods, Donald R. Cooper, Pamela S. Schindler, 8/e, Tata McGraw-Hill Co. Ltd., 2006.

Terminal and Model Questions

1. Write short note on the following.

    p) Review of Literature
    q) Note taking
    r) Encyclopedia
    s) Review Article

t) Research Abstract

2. Explain the use of library in academic research.
3. What do you mean by review of literature? How is a library helpful in it?
4. Explain note taking. How should notes be prepared for various sources of information?
5. Describe various avenues where review of literature can be published.

DATA COLLECTION METHODS: SAMPLING, INTERVIEWS, DIARY & QUESTIONNAIRES

Structure

5.1 Learning Objectives
5.2 Sampling
5.3 Questionnaires
5.4 Diary Method
5.5 Interviews: structured, semi-structured and open
5.6 Accounts
5.7 Observations and physical surveys
5.8 Summary
5.9 Glossary
5.10 Suggested Readings
5.11 Terminal and Model Questions

Learning Objectives

- To learn different techniques of random and non-random sampling.
- To understand various aspects of interviewing.
- To elaborate diary as a method of data collection.
- To learn about questionnaires and their uses in research.

Sampling

The world is full of potential data. You will, however, only be interested in collecting data which are relevant to your study and specifically required in order to investigate your research problem. Even so, the amount of information you could collect on your specific subject is likely to be enormous, so a method must be used to limit the amount of data you must collect to achieve your aims. The main technique for reducing the scope of your data collection is to study a sample, i.e. a small section of the subject of your study. There are several things one must consider in selecting a sample, so before discussing the different methods of data collection, let us first deal with the issue of sampling.

When conducting any kind of survey to collect information, or when choosing some particular cases to study in detail, the question inevitably arises: how representative is the information collected of the whole population? When we talk about population in research, it does not necessarily mean a number of people. 'Population' is a collective term used to describe the total quantity of cases of the type which are the subject of your study. So a population can consist of objects, people or even events, e.g. schools, miners, revolutions. A sample is a selected number of cases in a population.

If you wish to survey the opinions of the members of a small club, there might be no difficulty in getting information from each member, so the results of the survey will represent those of the whole club membership. However, if you wish to assess the opinions of the members of a large trade union, apart from organizing a national ballot, you will have to devise some way of selecting a sample of the members who you are able to question, and who are a fair representation of all the members of the union. Sampling must be done whenever you can gather information from only a fraction of the population of a group or a phenomenon which you want to study. Ideally, you should try to select a sample which is free from bias. You will see that the type of sample you select will greatly affect the reliability of your subsequent generalizations.

There are basically two types of sampling procedure – random and non- random. Random sampling techniques give the most reliable representation of the whole population, while non-random techniques, relying on the judgment of the researcher or on accident, cannot generally be used to make generalizations about the whole population.

Random Sampling

The simplest form of random sampling is to represent all the units (sometimes called elements or cases) in a population on slips of paper, put them into a hat, and draw out the slips in a random fashion. As with all samples, the larger the sample the better. However, for a researcher facing the practicalities of a specific research situation, this example is not very useful, so a set of guidelines is called for. First, a question should be asked about the nature of the population: is it homogeneous or are there distinctly different classes of cases within it? Different sampling techniques are appropriate for each. The next question to ask is: which process of randomization will be used? The following gives a guide to which technique is suited to the different population characteristics.

Simple Random Sampling

Simple Random Sampling is used when the population is uniform or has sampling similar characteristics in all cases, e.g. a production batch of cars of a particular model from which random samples are selected for testing as to their quality. When the population is not quite as uniform or one-dimensional as a particular model of a car, simple random sampling is not quite as simple as it sounds. The procedure should aim to guarantee that each element (person, group, class, type etc.) has an equal chance of being selected and that every possible combination of the elements also has an equal chance of being selected. While it is virtually impossible to achieve this in practice, several methods, some using randomly generated numbers, have been devised to produce some form of a fair lottery in which each combination of elements has an equal chance in coming up.

Simple Stratified Sampling

Simple Stratified sampling should be used when cases in the population stratified fall into distinctly different categories (strata), e.g. a business whose workforce sampling is divided into the three categories of production, research and management. With the presence of distinctly different strata in a population, in order to achieve simple randomized sampling, an equally sized randomized sample is obtained from each stratum separately to ensure that each is equally represented. The samples are then combined to form the complete sample from the whole population.

Proportional stratified sampling

Proportional stratified sampling is used when the cases in a population stratified fall into distinctly different categories (strata) of a known proportion of that sampling population, e.g. a university in which the proportions of the students studying arts and sciences is 61% and 39%. When the proportions of the different strata in a population are known, then each stratum must be represented in the same proportions within the overall sample. In order to achieve proportional randomized sampling, a randomized sample is obtained from each stratum separately, sized according to the known proportion of each stratum in the whole population, and then combined as previously to form the complete sample from the population.

Cluster Sampling

In cluster sampling, cases in the population form clusters by sharing one sampling or some characteristics but are otherwise as heterogeneous as possible, e.g. travellers using main railway stations. They are all train travellers, with each cluster experiencing a distinct station, but individuals vary as to age, sex, nationality, wealth, social status etc. Also known as area sampling, cluster sampling is used when the population is large and spread over a large area. Rather than enumerating the whole population, it is divided into segments, and then several segments are chosen at random. Samples are subsequently obtained from each of these segments using one of the above sampling methods.

Systematic Sampling

Systematic sampling is used when the population is very large and of no sampling known characteristics, e.g. the population of a town. Systematic sampling procedures involve the selection of units in a series (for example, on a list) according to a predetermined system. There are many possible systems. Perhaps the simplest is to choose every nth case on a list, for example, every tenth person in a telephone directory or list of ratepayers. In using this system, it is important to pick the first case randomly, i.e. the first case on the list is not necessarily chosen. The type of list is also significant; not everyone in the town owns a telephone or is a ratepayer.

Non-random Sampling

Although non-random sampling can be useful for certain studies, it provides only a weak basis for generalization.

Convenience Sampling

Convenience Sampling involves using what is immediately available, e.g. studying the building you happen to be in, examining the work practices in your firm etc. There are no ways of checking to see if this kind of sample is in any way representative of others of its kind, so the results of the study can be applied only to that sample.

Quota Sampling

Used regularly by reporters interviewing on the streets, quota sampling is an attempt to balance the sample interviewed by selecting responses from equal numbers of different respondents, e.g. equal numbers from different political parties. This is an unregulated form of sampling, as there is no knowledge of whether the respondents are typical of their parties. For example, Labor respondents might just have come from an extreme left- wing rally.

Theoretical Sampling

A useful method of getting information from a sample of the population that you think knows most about a subject is theoretical sampling. A study on homelessness could concentrate on questioning people living in the street. This approach is common in qualitative research where statistical inference is not required.

Three other methods can be briefly mentioned: purposive sampling, where the researcher selects what he/she thinks is a 'typical' sample; systematic matching sampling, when two groups of very different size are compared by selecting a number from the larger group to match the number and characteristics of the smaller one; and snowball techniques, where you contact a small number of members of the target population and get them to introduce you to others, e.g. of a secret society.

Sample Size

Having selected a suitable sampling method, the remaining problem is to determine the sample size. There is no easy answer to this problem. If the population is very homogeneous, and the study is not very detailed, then a small sample will give a fairly representative view of the whole. In other cases, you should consider the following.

The greater the accuracy required in the true representation of the population, then the larger the sample must be. The size of the sample also should be in direct relationship to the number of questions asked, the amount of detail required in the analysis of the data, and the number of controls introduced. It is generally accepted that conclusions reached from the study of a large sample are more convincing than those from a small one. However, the preference for a large sample must be balanced against the practicalities of the research resources, i.e. cost, time and effort.

The amount of variability within the population (technically known as the standard deviation) is another important factor in determining a suitable sample size. Obviously, in order that every sector of a diverse population is adequately represented, a larger sample will be required than if the population were more homogeneous. If statistical tests are to be used to analyze the data, there are usually minimum sample sizes specified from which any significant results can be obtained. A later part of this chapter deals briefly with statistical methods.

Questionnaires

Asking questions is an obvious method of collecting both quantitative and qualitative information from people. Using a questionnaire enables you to organize the questions and receive replies without actually having to talk to every respondent. As a method of data collection, the questionnaire is a very flexible tool, but it must be used carefully in order to full the requirements of a particular piece of research. While there are whole books on the art of questioning and questionnaires, it is possible to isolate a number of important factors to consider before deciding to use a questionnaire.

Before examining its form and content, we will briefly consider why one might choose this form of data collection, and ways in which the questionnaire can be delivered. One of the main features of a questionnaire is its impersonality. The questions are fixed, i.e. do not change according to how the replies develop, and they are the same for each respondent, and the person posing the questions is remote. The responses can be completely anonymous, allowing potentially embarrassing questions to be asked with a fair chance of getting a true reply. Another feature is that there is no geographical limitation with regard to the location of the respondents: they can be anywhere in the world as long as they can be reached by post. Questionnaires can be a relatively economic method, in cost and time, of soliciting data from a large number of people. Time for checking facts and pondering on the questions can also be taken by the respondents, which tends to lead to more accurate information.

There are two basic methods of delivering questionnaires, personally and by post. The advantages of personal delivery are that respondents can be helped to overcome difficulties with the questions, and that personal persuasion and reminders by the researcher can ensure a high response rate. The reasons why some people refuse to answer the questionnaire can also be established, and there is a possibility of checking on responses if they seem odd or incomplete. This personal involvement of the researcher enables more complicated questionnaires to be devised. Obviously, there are problems in both time and geographical location which limit the scope and extent to which this method of delivery can be used.

Postal questionnaires do not suffer from these two limitations. However, the most serious problem is that the rate of response is difficult to predict or control, particularly if there is no system of follow-up. The pattern of non- response can have a serious effect on the validity of the sample by introducing bias into the data collected. Cost is often a determining factor in choosing postal distribution: it is cheap compared with interviewing. It might also be the only method of questioning people spread over a large area or situated in relatively inaccessible regions.

There are simple rules to devising a questionnaire, though it is not always easy to carry them out perfectly:

1. You must establish exactly which variables you wish to gather data about, and how these variables can be assessed. This will enable you to list the questions you need to ask (and those that you do not!) and to formulate the questions precisely in order to elicit the responses that are required.

2. The language must be unmistakably clear and unambiguous and make no inappropriate assumptions. Leedy gives an illuminating example of a seemingly simple question which is quite ambiguous: 'How many cigarettes do you smoke each day: more than 25, 25–16, 15–11, 10–6, 5–1, none?' (1989, p. 142). There is no problem answering this if you are a regular smoker, but what if you smoke only at weekends, at parties or in the holidays?

3. In order to enhance the response rate, questions generally should be kept simple, and the questionnaires kept as short as possible. This minimizes the effort required by the respondent.

4. Clear and professional presentation is another essential factor in encouraging a good response.

5. Consider how you will process the information from the completed forms. This may influence the layout of the questionnaire, e.g. by including spaces for codes and scoring.

Pretesting

A questionnaire should be pre-tested on a small number of people in what Pilot study is called a pilot study. It is best to test it on people of a type similar to that of the intended sample, so as to anticipate any problems of comprehension or other sources of confusion. When sending out the questionnaire, you should courteously invite the recipients to complete it, and encourage them by explaining the purpose of the survey, how the results could be of benefit to them, and how little time it will take to complete. Simple instructions on how to complete the responses are also required. Some form of thanks and appreciation of their efforts should be included at the end. If you needed to be sure of a response from particular persons, you should send a preliminary letter,

with a reply-paid response card, to enquire whether the person is willing to complete the questionnaire before you send it (Leedy, 1989, pp. 145–148).

Diary Method

Biographers, historians and literary scholars have long considered diary documents to be of major importance for telling history. More recently, sociologists have taken seriously the idea of using personal documents to construct pictures of social reality from the actors' perspective (see Plummer's 1983 book Documents of Life). In contrast to these 'journal' type of accounts, diaries are used as research instruments to collect detailed information about behaviour, events and other aspects of individuals' daily lives.

Self-completion diaries have a number of advantages over other data collections methods. First, diaries can provide a reliable alternative to the traditional interview method for events that are difficult to recall accurately or that are easily forgotten. Second, like other self-completion methods, diaries can help to overcome the problems associated with collecting sensitive information by personal interview. Finally, they can be used to supplement interview data to provide a rich source of information on respondents' behaviour and experiences on a daily basis. The 'diary interview method' where the diary keeping period is followed by an interview asking detailed questions about the diary entries is considered to be one of the most reliable methods of obtaining information.

The following discussion is largely concerned with fairly 'structured' diaries, as opposed to free text diaries, and with those where events or behaviour are recorded as they occur ('tomorrow diaries', rather than 'yesterday' or retrospective diaries).

You can think of the use of a diary in research as a kind of self-administered questionnaire. The form of text can be totally unstructured or can be a response to a series of questions. Although diaries can provide a huge amount of data for very little effort from the researcher, the content can be quite haphazard depending on the interpretation of the task by the respondent. Bias is especially prone to creep in if the respondents believe that some actions will be taken as a result

of the contents, and therefore record events in such a way that might be beneficial to them. It is therefore important to ensure that respondents are clear as to what they have to do, why and when, and that they agree to full co-operation. Confidentiality is obviously a major issue.

A diary method can be used as a substitute for observation where direct observation is difficult or impossible, e.g. in intimate or private situations. It can also be usefully used as a precursor to interviews: the information gained will provide pointers to an appropriate list of questions to be asked in the interview (Robson, 1993, pp. 254–255).

The subject matter of diary surveys

A popular topic of investigation for economists, market researchers, and more recently sociologists, has been the way in which people spend their time. Accounts of time use can tell us much about quality of life, social and economic well-being and patterns of leisure and work. The 'time-budget' schedule, pioneered by Sorokin in the 1930s (Sorokin & Berger 1938) involved respondents keeping a detailed log of how they allocated their time during the day. More qualitative studies have used a "standard day" diary which focuses on a typical day in the life of an individual from a particular group or community.

One of the most fruitful time-budget endeavours, initiated in the mid 60s, has been the Multinational Time Budget Time Use Project (Szalai 1972). Its aim was to provide a set of procedures and guidance on how to collect and analyse time-use data so that valid cross-national comparisons could be made. This group has contributed much to our knowledge of time budget methodology, and for researchers wishing to conduct their own survey into time use, writings published by this group should be their first port of call (Harvey 1990). The BBC Daily Life surveys are also a well-known source of time budget data documenting radio and television audience behaviour (BBC 1984).

Two other major areas where diaries are often used are consumer expenditure and transport planning research. For example, the U.K. Family Expenditure Survey (OPCS) uses diaries to

collect data for the National Accounts and to provide weights for the Retail Price Index. In the National Travel Survey (OPCS) respondents record information about all journeys made over a specified time period in a diary. Other topics covered using diary methods are social networks, health, illness and associated behaviour, diet and nutrition, social work and other areas of social policy, clinical psychology and family therapy, crime behaviour, alcohol consumption and drug usage, and sexual behaviour (see references for examples). Diaries are also increasingly being used in market research.

Using diaries in surveys

Diary surveys often use a personal interview to collect additional background information about the household and sometimes about behaviour or events of interest that the diary will not capture (such as large items of expenditure for consumer expenditure surveys). A placing interview is important for explaining the diary keeping procedures to the respondent and a concluding interview may be used to check on the completeness of the recorded entries. Often retrospective estimates of the behaviour occurring over the diary period are collected at the final interview.

Diary design and format

Diaries may be open format, allowing respondents to record activities and events in their own words, or they can be highly structured where all activities are pre-categorised. An obvious advantage of the free format is that it allows for greater opportunity to recode and analyse the data. However, the labour intensive work required to prepare and make sense of the data may render it unrealistic for projects lacking time and resources, or where the sample is large. Although the design of a diary will depend on the detailed requirement of the topic under study, there are certain design aspects which are common to most. Below are a set of guidelines recommended for anyone thinking about designing a diary. They are by no means definitive and readers should consult existing examples of protocols (see references). Furthermore, the amount of piloting required to perfect the diary format should not be under-estimated.

1. An A4 booklet of about 5 to 20 pages is desirable, depending on the nature of the diary. Disappointing as it might seem, most respondents do not carry their diaries around with them.
2. The inside cover page should contain a clear set of instructions on how to complete the diary. This should stress the importance of recording events as soon as possible after they occur and how the respondent should try not to let the diary keeping influence their behaviour.
3. A model example of a correctly completed diary should feature on the second page.
4. Depending on how long a period the diary will cover, each page denoting either a week, a day of the week or a 24 hour period or less. Pages should be clearly ruled up as a calendar with prominent headings and enough space to enter all the desired information (such as what the respondent was doing, at what time, where, who with and how they felt at the time, and so on).
5. Checklists of the items, events or behaviour to help jog the diary keeper's memory should be printed somewhere fairly prominent. Very long lists should be avoided since they may be off-putting and confusing to respondents. For a structured time budget diary, an exhaustive list of all possible relevant activities should be listed together with the appropriate codes. Where more than one type of activity is to be entered, that is, primary and secondary (or background) activities, guidance should be given on how to deal with "competing" or multiple activities.
6. There should be an explanation of what is meant by the unit of observation, such as a "session", an "event" or a "fixed time block". Where respondents are given more freedom in naming their activities and the activities are to be coded later, it is important to give strict guidelines on what type of behaviour to include, what definitely to exclude and the level of detail required. Time budget diaries without fixed time blocks should include columns for start and finish times for activities.
7. Appropriate terminology or lists of activities should be designed to meet the needs of the sample under study, and if necessary, different versions of the diary should be used for different groups.

8. Following the diary pages it is useful to include a simple set of questions for the respondent to complete, asking, among other things, whether the diary keeping period was atypical in any way compared to usual daily life. It is also good practice to include a page at the end asking for the respondents' own comments and clarifications of any peculiarities relating to their entries. Even if these remarks will not be systematically analysed, they may prove helpful at the editing or coding stage.

Data quality and response rates

In addition to the types of errors encountered in all survey methods, diaries are especially prone to errors arising from respondent conditioning, incomplete recording of information and under-reporting, inadequate recall, insufficient cooperation and sample selection bias.

Diary keeping period: The period over which a diary is to be kept needs to be long enough to capture the behaviour or events of interest without jeopardising successful completion by imposing an overly burdensome task. The OPCS National Travel Survey and the Adult Dietary Survey use seven day diaries, while the UK Family Expenditure Survey uses a fourteen day recording period. For collecting time-use data, anything from one to three day diaries may be used. Household expenditure surveys usually place diaries on specific days to ensure an even coverage across the week and distribute their field work over the year to ensure seasonal variation in earnings and spending is captured.

Reporting errors: In household expenditure surveys it is routinely found that the first day and first week of diary keeping shows higher reporting of expenditure than the following days. This is also observed for other types of behaviour and the effects are generally termed "first day effects". They may be due to respondents changing their behaviour as a result of keeping the diary (conditioning), or becoming less conscientious than when they started the diary. Recall errors may also extend to 'tomorrow' diaries. Respondents often write down their entries at the end of a day and only a small minority are diligent (and perhaps obsessive!) diary keepers who carry their diary with them at all times. Expenditure surveys find that an intermediate visit from

an interviewer during the diary keeping period helps preserve 'good' diary keeping to the end of the period.

Literacy: All methods that involve self-completion of information demand that the respondent has a reasonable standard of literacy. Thus the diary sample and the data may be biased towards the population of competent diary keepers.

Participation: The best response rates for diary surveys are achieved when diary keepers are recruited on a face-to-face basis, rather than by post. Personal collection of diaries also allows any problems in the completed diary to be sorted out on the spot. Success may also depend on the quality of interviewing staff who should be highly motivated, competent and well-briefed. Appealing to respondent's altruistic nature, reassuring them of confidentiality and offering incentives are thought to influence co-operation in diary surveys. The FES gives a 10 pound postal order for completion of their fourteen day diary and other surveys offer lottery tickets or small promotional items.

Coding, editing and processing

The amount of work required to process a diary depends largely on how structured it is. For many large scale diary surveys, part of the editing and coding process is done by the interviewer while still in the field. Following this is an intensive editing procedure which includes checking entries against information collected in the personal interview. For unstructured diaries, involving coding of verbatim entries, the processing can be very labour intensive, in much the same way as it is for processing qualitative interview transcripts. Using highly trained coders and a rigorous unambiguous coding scheme is very important particularly where there is no clear demarcation of events or behaviour in the diary entries. Clearly, a well designed diary with a coherent pre-coding system should cut down on the degree of editing and coding.

Relative cost of diary surveys

The diary method is generally more expensive than the personal interview, and personal placement and pick-up visits are more costly than postal administration. For the majority of OPCS diary surveys, interviewers usually make at least two visits and are often expected to spend time checking the diary with the respondent. If the diary is unstructured, intensive editing and coding will push up the costs. However, these costs must be balanced against the superiority of the diary method in obtaining more accurate data, particularly where the recall method gives poor results. The ratio of costs for diaries compared with recall time budgets are of the order of three or four to one (Juster & Stafford 1985).

Computer software for processing and analysis

Probably the least developed area relating to the diary method is the computer storage and analysis of diary data. One of the problems of developing software for processing and manipulating diary data is the complexity and bulk of the information collected. Although computer assisted methods may help to reduce the amount of manual preparatory work, there are few packages and most of them are custom built to suit the specifics of a particular project. Time-budget researchers are probably the most advanced group of users of machine readable diary data and the structure of these data allows them to use traditional statistical packages for analysis. More recently, methods of analysis based on algorithms for searching for patterns of behaviour in diary data are being used (Coxon 1991). Software development is certainly an area which merits future attention. For textual diaries, qualitative software packages such as The ETHNOGRAPH can be used to code them in the same way as interview transcripts (Fielding & Lee 1991).

Interviews: structured, semi-structured and open

While questionnaire surveys are relatively cheap and are effective in preventing the personality of the interviewer having effects on the results, they do have certain limitations. They are not suitable for questions which require probing to obtain adequate information, as they should only contain simple, one-stage questions. There are also problems in gaining the required response from the complete sample, especially as the questionnaires tend to be returned by the more

literate sections of the population. While interviewing is suitable for quantitative data collection, it is particularly useful when qualitative data are required.

The use of interviews to question samples of people is a very flexible tool with a wide range of applications. There are two main methods of conducting interviews; face-to-face and telephone. Face-to-face interviews can be carried out in a variety of situations – in the home, at work, outdoors, on the move (e.g. while travelling) – and can be used to question members of the general public, experts or leaders, specific segments of society, e.g. elderly or disabled people, ethnic minorities, both singly and in groups. Interviews can be used for subjects both general or specific in nature and even, with the correct preparation, for very sensitive topics. They can be one-off or, for longitudinal studies, repeated several times over a period to track developments. The interviewer is in a good position to be able to judge the quality of the responses of the subjects, to notice if a question has not been properly understood, and to reassure and encourage the respondent to be full in his/her answers. Visual signs, such as nods, smiles etc., are valuable tools in promoting complete responses.

Telephone interviews avoid the necessity of travelling to the respondents, and all the time and problems associated with contacting people personally. With wider telephone ownership, particularly in developed countries, it is often possible to contact a suitable sample of the target population by this method. Surveys can be carried out more quickly than face-to-face, especially if the questionnaire is short (20–30 minutes is the accepted maxi- mum). However, visual aids cannot be used to explain questions, and important visual clues between interviewer and interviewee, e.g. eye contact, smiling, puzzled looks, are absent. Non-response tends to be 5–10% higher on telephone surveys than with equivalent face-to-face surveys (Morton-Williams, 1993, p. 156). It is interesting to note that voice quality is an important factor in successful phone interviews. Interviewers with the highest success rates spoke rapidly and loudly, used standard pronunciation and sounded competent and confident (Morton-Williams, 1993, p. 169).

The structuring of the interview depends on the type of information you wish to elicit. For very precise answers to very precise questions, used for quantitative and statistical analysis, a tightly structured interview is required with closed questions formulated in a method similar to a

questionnaire. At the other extreme, if you need to explore a situation and wish to get information which you cannot predict, a very open and unstructured form of interview is appropriate. A semi-structured interview falls between the two, achieving defined answers to defined questions, while leaving time for further development of those answers, and including more open-ended questions. The most important issue when you set up an interview is to know exactly what you want to achieve by it, and what you intend to do with the information gained, and to choose the appropriate structure of interview to achieve this.

Interviews, because of their flexibility, are a useful method of obtaining information and opinions from experts during the early stages of your research project. It is important, however initial your research enquiry, to devise an efficient method of recording what is discussed in the interview and to form a simple structure for organizing the data collected. These early interviews often provide very important information which helps not only to indicate your future research direction, but also to identify and prioritize issues. You should aim to achieve a balance between open questioning to explore issues, and obtaining responses which can subsequently be easily examined and compared.

There is a great difference in technique for conducting interviews 'cold' with the general public and interviewing officials or experts by appointment. In both cases, however, the personality and bearing of the interviewer are of great importance. There is not space here to go into detail about the different techniques which should be acquired for the various interview situations. These are examined in detail in Morton-Williams (1993). What must be stressed, however, is the need for preparation on the part of the interviewer, both in the groundwork (i.e. writing letters for appointments, explaining the purpose of the interview) and in presenting the interview, with confidence, friendliness, good appearance etc. and in the method of recording the responses (tape recording, writing notes, completing forms etc.).

Standardized scales and tests

These can perhaps be seen as versions of structured interviews or of self- completion questionnaires. There is a wide range of standardized scales and tests that have been devised by

social scientists and psychologists to establish people's abilities, attitudes, aptitudes, opinions etc. A well known example of one of these is the IQ or intelligence test. The objective of the tests is usually to measure in some way the abilities etc. of the subjects according to a standardized scale, so that easy comparisons can be made. One of the main problems facing the researcher is to select or devise a suitable scale for mea- suring the often rather abstract concepts under scrutiny, such as attitude to school meals, military service, capital punishment etc.

A common precaution to prevent over-simplification of responses is to ask many questions about the same topic, from a variety of different angles. This form of triangulation helps to build up a more complete picture of complex issues. The use of arbitrary scales should be avoided. It is safer to use well tried and tested standard scales, of which there are several, each taking different approaches according to the results aimed at. To mention a few: the Likert scale, one of the most common, which uses a summated rating approach; the Thurlstone scale, which aims to produce an equal appearing interval scale; the Guttman scale, a unidimensional scale where items have a cumulative property; and the semantic differential scale, where the subjective meaning of a concept to a respondent is gauged, rather than his/her attitude towards it. At this stage you are unlikely to need to know the details of these testing methods, unless they form a central part of your research. If you want to know more, Robson (1993, pp. 255–68) gives a useful succinct introduction and further references.

Accounts

An account is a method of qualitative data collection, used mainly in sociological research; it seeks to find information on people's actions and feelings by asking them to give their own interpretation, or account, of what they experience. This form of study is called 'ethnogenic', and is founded on the belief that human beings are plan-making, self-monitoring agents, aware of goals, and deliberately consider the best ways of achieving them (Cohen and Manion, 1994, p. 205; and if you want a more comprehensive account of the ethno- genic approach see Harré, 1977). Accounts can consist of a variety of data sources: people's spoken explanations, behaviour (such as gestures), personal records of experiences and conversations, letters and

diaries. As long as the accounts are authentic, there should be no reason why they cannot be used as an argued explanation of people's actions.

Since the information must come directly from the respondents, care must be taken to avoid leading questions, excessive guidance and other factors which may cause distortion. Checking the authenticity of the accounts is an important element in this form of data collection. This can be done by cross- checking with other people involved in the events, examining the physical records of the events (e.g. papers, documents etc.) and checking with the respondents during the account gathering process.

The transformation of the collected accounts into working documents which can be coded and analyzed is the next procedure to be considered. At this stage, additional checks on the authenticity of the accounts can be made as well as on the reliability of the transformation. The documents can then be analyzed qualitatively or quantitatively, depending on the type of research problem and the nature of the enquiry. More details of this process can be seen in Brown and Sime (1981).

Observations and physical surveys

Observation is a method of recording conditions, events and activities through the non-inquisitorial involvement of the researcher. The non-participant researcher takes a detached stance to the phenomena, and aims to be 'invisible', either in fact or in effect (i.e. by being ignored). The participant observer is seen as involved in the process or activity. Observation can also be used for recording the nature or conditions of objects, e.g. buildings. This type of observation is often referred to as a survey, and can range from a preliminary visual survey to a detailed survey using a range of instruments for measurement. As an activity, as opposed to a method, observation is of course required in many research situations, for example, observing the results of experiments, the behavior of models and even the reactions of people to questions in an interview. Observation can be used to record both quantitative and qualitative data.

Observation can record whether people act differently to what they say or intend. They can sometimes demonstrate their understanding of a process better by their actions than by verbally explaining their knowledge. For example, a machine operator will probably demonstrate more clearly his/her understanding of the techniques of operating the machine by working with it than by verbal explanation. Observation is not limited to the visual sense. Any sense, e.g. smell, touch, hearing, can be involved, and these need not be restricted to the range perceptible by the human senses. A microscope or telescope can be used to extend the capacity of the eye, just as a moisture meter can increase sensitivity to the feeling of dampness. You can probably think of instruments which have been developed in every discipline to extend the observational limits of the human senses.

On the one hand, observations of objects can be a quick and efficient method of gaining preliminary knowledge or making a preliminary assessment of its state or condition. For example, after an earthquake, a quick visual assessment of the amount and type of damage to buildings can be made before a detailed survey is undertaken. On the other hand, observation can be very time-consuming and difficult when the activity observed is not constant (i.e. much time can be wasted waiting for things to happen, or so much happens at once that it is impossible to observe it all and record it). Instrumentation can sometimes be devised to overcome the problem of infrequent or spasmodic activity, e.g. automatic cameras and other sensors.

Certain basic hints on how to carry out observations can be given here:

1. Make sure you know what you are looking for. Events and objects are usually complicated and much might seem to be relevant to your study. Identify the variables that you need to study, and concentrate on these.

2. Devise a simple and efficient method of recording the information accurately. Rely as much as possible on ticking boxes or circling numbers, particularly if you need to record fast-moving events. Obviously, you can leave yourself more time when observing static objects to notate or draw the data required. Record the observations as they happen. Memories of detailed observations fade quickly.

3. Use instrumentation when appropriate or necessary. Instruments which make an automatic record of their measurements are to be preferred in many situations.

4. If possible, process the information as the observations progress. This can help to identify critical matters which need study in greater detail, and others which prove to be unnecessary.

5. If you are doing covert observations, plan in advance what to do if your presence is discovered, to avoid potentially embarrassing or even dangerous situations.

Summary

Sampling and data collection plays an important role in qualitative research. Sampling can be based on some scientific method which is called random sampling. It may also be non-random sampling. Further, questionnaires and interviews can also play an important role in relevant data collection. In some cases, diary method can be helpful to collect some live data. In all cases, it is generally the judgment of researcher about the specific method to be selected for data collection.

Glossary

Observation: The systematic observation, recording, description, analysis and interpretation of people's behaviour.

Cluster sampling: Probability sampling procedure in which the population is divided into discrete groups or clusters prior to sampling. A random sample (systematic or simple) of these clusters is then drawn.

Interviewer bias: Attempt by an interviewer to introduce bias during the conduct of an interview, or where the appearance or behaviour of the interviewer has the effect of introducing bias in the interviewee's responses.

Interviewer-administered questionnaire: Data collection technique in which an interviewer reads the same set of questions to the respondent in a predetermined order and records his or her responses.

Stratified random sampling: Probability sampling procedure in which the population is divided into two or more relevant strata and a random sample (systematic or simple) is drawn from each of the strata.

Suggested Readings

Management Research Methodology; Integration of Principles, Methods and Techniques, Krishnaswamy, K.N., Sivakumar, Appa Iyer and Mathiranjan M., Pearson Education, New Delhi. 2006.

Research Methodology, Dipak Kumar Bhattacharya, Excel Books, 2009.

Business Research Methods, Alan Bryman, Emma Bell, 3/e, Oxford University Press. 2011.

Terminal and Model Questions

1. Write short note on the following.

    u) Random Sampling
    v) Stratified Sampling
    w) Diary Method
    x) Semi-structured Interview
    y) Physical Surveys

2. Explain various methods of random sampling.
3. How is diary method helpful in research? Explain various situations where it can be used.
4. Explain various types of interviews in research.
5. Describe the importance and applicability of Observation method.

DATA COLLECTION METHODS: EXPERIMENTATION, CASE STUDY & DOCUMENTARY METHOD

Structure

6.1 Learning Objectives

6.2 Experimentation

6.3 Case Study Method

6.4 Documentary Research

6.5 Summary

6.6 Glossary

6.7 Suggested Readings

6.8 Terminal and Model Questions

Learning Objectives

- To learn about experimentation as a method of data collection.
- To understand about case study method.
- To know about various stages of case study method.
- To learn about documentary method of research.

Experimentation

As a method of analyzing phenomena, and gaining more information about them, it is sometimes possible artificially to create a microcosm of the real world, where only the elements which are regarded as important are included, so that these can be studied in detail by directly manipulating the variables. The laboratory experiment is such a method. There are many other locations where experiments can be carried out, but the laboratory situation is the one which provides the greatest possibilities for control. Use of models is another method of obtaining information about the real world in a controlled situation. In these methods, the collection and analysis of data are

inextricably linked. The preliminary data on which the experiments and models are based are used to create new data which, in their turn, can be used for further analysis.

The difference between an experiment and a model is that:

- An experiment is used to examine actual phenomena, which are controlled in scope and size.
- A model provides an artificial version of the phenomena for study, either by mimicking it at a reduced scale or by abstracting it diagrammatically or mathematically (often using computer techniques).

Experiments are powerful and versatile techniques which can be designed to fulfill virtually any of the analytical functions mentioned in the next main section. Generally, experiments are designed and carried out in order to examine causes and effects (studying dependent and independent variables), and are used to find explanations for them, e.g. what happens if? And why? The design of the experiments depends on the type of data required, the level of reliability of the data required, and practical matters associated with the problem under investigation.

Checks should be carried out on both experiments and models to test whether the assumptions made are valid. In experiments, a control group is used to provide a 'baseline' against which the effects of the experimental treatment may be evaluated. The control group is one that is identical (as near as possible) to the experimental group, but does not receive experimental treatment (for example, in a medical experiment, the control group will be given placebo pills instead of the medicated pills).

Campbell and Stanley (1963, pp. 171–246) divided experiments into four general types:

(1) Pre-experimental designs;
(2) True experimental designs;
(3) Quasi-experimental designs; and
(4) Correlational and ex post facto designs.

Here is a brief summary of the most important experiment designs within each type, with a brief example using the same context to illustrate each. (See Leedy, 1989, Chapter 10; Neale and Liebert, 1986, Chapter 7; Cohen and Manion, 1994, Chapter 8, for a more comprehensive explanation. Most books on research methods have a chapter devoted to experiment design.)

Pre-experiment

- One-shot case study (after only): This is the most primitive type of design where observations are carried out only after the experiment, lacking any control or check. Example: a building material sample is painted and then tested for water absorption; low absorption is observed; conclusion, paint prevents water absorption? (In all these examples, the sample could be multiple, i.e. a group.)

- One group pre-test and post-test (before–after) design: Here the group is examined before the experiment takes place. Example: a material sample is tested for water absorption before painting; after drying it is painted; then it is again tested for water absorption; conclusion, painting reduces absorption in materials?

- Static group comparison (before–after) design: Similar to the previous design except that a control group is introduced. Example: two material samples are taken at random; the experimental sample is painted, the control sample is left untreated; both are tested for water absorption and the results compared; conclusion, painting reduces absorption?

It is evident that in these designs, lack of control of the variables can seriously affect the outcomes, e.g. what happens if some of the unpainted material samples do not absorb water?

True experiment

- Pre-test–post-test control group (before–after) design: This is the commonest true experimental design. Example: a pair of material samples is selected in the same random

procedure; both are tested for water absorption; after drying, one is painted, the other is left untreated; the samples are tested again; the results are compared. Best results are gained if both samples achieve identical results in the pre-test.

- Solomon four-group (before–after) design: This is a refinement of the previous design, using four samples, which additionally tests the effects of the pre-test. Example: four material samples are selected in the same random procedure. Two are pre-tested for water absorption; one of these is painted. Of the other two, one is painted; all four are tested for water absorption; the results are compared. It will be detectable if the pre-test wetting of two of the samples affected their subsequent performance by comparing them with those which were not pre-tested.

- Post-test only control group (after only) design: This is used when a pretest is not possible, e.g. in a one-off situation like an earthquake or during continuous development or, as in this example, if the pre-test would destroy the material. Example: a pair of building material samples (e.g. delicate plaster mouldings) are selected in the same random procedure; one is painted, the other left unpainted; both are tested for water absorption; the results are compared. The validity of this test critically depends on the randomness of the sample.

Quasi-experiment

- Non-randomized control group, pre-test/post-test design when random selection cannot be achieved, the control group and the experimental group should be matched as nearly as possible. Example: two sets of adjacent unpainted panels on a building façade are tested for water absorption; one set is painted, the other left unpainted; both are retested for water absorption and the results compared.

- Time-series experiment Repeated identical experiments are made, then one variable is changed to produce a new outcome, and the new experiment is repeated, to check if the variable consistently creates the changed outcome. Example: the water absorption of a

sample of an unpainted building material is repeatedly tested; the same sample is painted; the water absorption of the painted sample is repeatedly tested. The danger with this design is that, over time, other unknown factors might affect the results (e.g. the water used in these tests may break down the material in the building sample and make it less absorbent).

- Control group, time series The same process as above, but with a parallel control group which does not undergo the variable change. Example: as above but with a parallel sample which remains unpainted and is used to compare outcomes.

Correlational and ex post facto

- Correlational is a design that is prone to misuse. After a correlation between two factors is statistically proved, a claim is made that one factor has caused the other. Life is rarely so simple! There may be many other factors that have not been recognized in the research, one or some of which could be the cause or could have contributed to the cause.

- Ex post facto is not really an experimental approach in that the investigation begins after the event has occurred so no control over the event is possible. The search for the cause of the event, e.g. a plane crash or the outbreak of an unknown disease, relies on the search for, and analysis of, relevant data. The most likely cause has to be discovered from amongst all possible causes, so there are many opportunities to search in the wrong area! This is a common form of scientific investigation, and needs the skills of a detective in addition to those of a scientist.

Case Study Method

Case study research excels at bringing us to an understanding of a complex issue or object and can extend experience or add strength to what is already known through previous research. Case studies emphasize detailed contextual analysis of a limited number of events or conditions and their relationships. Researchers have used the case study research method for many years across

a variety of disciplines. Social scientists, in particular, have made wide use of this qualitative research method to examine contemporary real-life situations and provide the basis for the application of ideas and extension of methods. Researcher Robert K. Yin defines the case study research method as an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used (Yin, 1984, p. 23).

Critics of the case study method believe that the study of a small number of cases can offer no grounds for establishing reliability or generality of findings. Others feel that the intense exposure to study of the case biases the findings. Some dismiss case study research as useful only as an exploratory tool. Yet researchers continue to use the case study research method with success in carefully planned and crafted studies of real-life situations, issues, and problems. Reports on case studies from many disciplines are widely available in the literature.

This introduction to case study research draws upon their work and proposes six steps that should be used:

1. Determine and define the research questions
2. Select the cases and determine data gathering and analysis techniques
3. Prepare to collect the data
4. Collect data in the field
5. Evaluate and analyze the data
6. Prepare the report

Step 1. Determine and Define the Research Questions

The first step in case study research is to establish a firm research focus to which the researcher can refer over the course of study of a complex phenomenon or object. The researcher establishes the focus of the study by forming questions about the situation or problem to be studied and determining a purpose for the study. The research object in a case study is often a program, an entity, a person, or a group of people. Each object is likely to be intricately connected to political, social, historical, and personal issues, providing wide ranging possibilities

for questions and adding complexity to the case study. The researcher investigates the object of the case study in depth using a variety of data gathering methods to produce evidence that leads to understanding of the case and answers the research questions.

Case study research generally answers one or more questions which begin with "how" or "why." The questions are targeted to a limited number of events or conditions and their inter-relationships. To assist in targeting and formulating the questions, researchers conduct a literature review. This review establishes what research has been previously conducted and leads to refined, insightful questions about the problem. Careful definition of the questions at the start pinpoints where to look for evidence and helps determine the methods of analysis to be used in the study. The literature review, definition of the purpose of the case study, and early determination of the potential audience for the final report guide how the study will be designed, conducted, and publicly reported.

Step 2. Select the Cases and Determine Data Gathering and Analysis Techniques

During the design phase of case study research, the researcher determines what approaches to use in selecting single or multiple real-life cases to examine in depth and which instruments and data gathering approaches to use. When using multiple cases, each case is treated as a single case. Each cases conclusions can then be used as information contributing to the whole study, but each case remains a single case. Exemplary case studies carefully select cases and carefully examine the choices available from among many research tools available in order to increase the validity of the study. Careful discrimination at the point of selection also helps erect boundaries around the case.

The researcher must determine whether to study cases which are unique in some way or cases which are considered typical and may also select cases to represent a variety of geographic regions, a variety of size parameters, or other parameters. A useful step in the selection process is to repeatedly refer back to the purpose of the study in order to focus attention on where to look for cases and evidence that will satisfy the purpose of the study and answer the research questions posed. Selecting multiple or single cases is a key element, but a case study can include

more than one unit of embedded analysis. For example, a case study may involve study of a single industry and a firm participating in that industry. This type of case study involves two levels of analysis and increases the complexity and amount of data to be gathered and analyzed.

A key strength of the case study method involves using multiple sources and techniques in the data gathering process. The researcher determines in advance what evidence to gather and what analysis techniques to use with the data to answer the research questions. Data gathered is normally largely qualitative, but it may also be quantitative. Tools to collect data can include surveys, interviews, documentation review, observation, and even the collection of physical artifacts.

The researcher must use the designated data gathering tools systematically and properly in collecting the evidence. Throughout the design phase, researchers must ensure that the study is well constructed to ensure construct validity, internal validity, external validity, and reliability. Construct validity requires the researcher to use the correct measures for the concepts being studied. Internal validity (especially important with explanatory or causal studies) demonstrates that certain conditions lead to other conditions and requires the use of multiple pieces of evidence from multiple sources to uncover convergent lines of inquiry. The researcher strives to establish a chain of evidence forward and backward. External validity reflects whether or not findings are generalizable beyond the immediate case or cases; the more variations in places, people, and procedures a case study can withstand and still yield the same findings, the more external validity. Techniques such as cross-case examination and within-case examination along with literature review helps ensure external validity. Reliability refers to the stability, accuracy, and precision of measurement. Exemplary case study design ensures that the procedures used are well documented and can be repeated with the same results over and over again.

Step 3. Prepare to Collect the Data

Because case study research generates a large amount of data from multiple sources, systematic organization of the data is important to prevent the researcher from becoming overwhelmed by the amount of data and to prevent the researcher from losing sight of the original research

purpose and questions. Advance preparation assists in handling large amounts of data in a documented and systematic fashion. Researchers prepare databases to assist with categorizing, sorting, storing, and retrieving data for analysis.

Exemplary case studies prepare good training programs for investigators, establish clear protocols and procedures in advance of investigator field work, and conduct a pilot study in advance of moving into the field in order to remove obvious barriers and problems. The investigator training program covers the basic concepts of the study, terminology, processes, and methods, and teaches investigators how to properly apply the techniques being used in the study. The program also trains investigators to understand how the gathering of data using multiple techniques strengthens the study by providing opportunities for triangulation during the analysis phase of the study. The program covers protocols for case study research, including time deadlines, formats for narrative reporting and field notes, guidelines for collection of documents, and guidelines for field procedures to be used. Investigators need to be good listeners who can hear exactly the words being used by those interviewed. Qualifications for investigators also include being able to ask good questions and interpret answers. Good investigators review documents looking for facts, but also read between the lines and pursue collaborative evidence elsewhere when that seems appropriate. Investigators need to be flexible in real-life situations and not feel threatened by unexpected change, missed appointments, or lack of office space. Investigators need to understand the purpose of the study and grasp the issues and must be open to contrary findings. Investigators must also be aware that they are going into the world of real human beings who may be threatened or unsure of what the case study will bring.

After investigators are trained, the final advance preparation step is to select a pilot site and conduct a pilot test using each data gathering method so that problematic areas can be uncovered and corrected. Researchers need to anticipate key problems and events, identify key people, prepare letters of introduction, establish rules for confidentiality, and actively seek opportunities to revisit and revise the research design in order to address and add to the original set of research questions.

4. Collect Data in the Field

The researcher must collect and store multiple sources of evidence comprehensively and systematically, in formats that can be referenced and sorted so that converging lines of inquiry and patterns can be uncovered. Researchers carefully observe the object of the case study and identify causal factors associated with the observed phenomenon. Renegotiation of arrangements with the objects of the study or addition of questions to interviews may be necessary as the study progresses. Case study research is flexible, but when changes are made, they are documented systematically.

Exemplary case studies use field notes and databases to categorize and reference data so that it is readily available for subsequent reinterpretation. Field notes record feelings and intuitive hunches, pose questions, and document the work in progress. They record testimonies, stories, and illustrations which can be used in later reports. They may warn of impending bias because of the detailed exposure of the client to special attention, or give an early signal that a pattern is emerging. They assist in determining whether or not the inquiry needs to be reformulated or redefined based on what is being observed. Field notes should be kept separate from the data being collected and stored for analysis.

Maintaining the relationship between the issue and the evidence is mandatory. The researcher may enter some data into a database and physically store other data, but the researcher documents, classifies, and cross-references all evidence so that it can be efficiently recalled for sorting and examination over the course of the study.

Step 5. Evaluate and Analyze the Data

The researcher examines raw data using many interpretations in order to find linkages between the research object and the outcomes with reference to the original research questions. Throughout the evaluation and analysis process, the researcher remains open to new opportunities and insights. The case study method, with its use of multiple data collection methods and analysis techniques, provides researchers with opportunities to triangulate data in

order to strengthen the research findings and conclusions.

The tactics used in analysis force researchers to move beyond initial impressions to improve the likelihood of accurate and reliable findings. Exemplary case studies will deliberately sort the data in many different ways to expose or create new insights and will deliberately look for conflicting data to disconfirm the analysis. Researchers categorize, tabulate, and recombine data to address the initial propositions or purpose of the study, and conduct cross-checks of facts and discrepancies in accounts. Focused, short, repeat interviews may be necessary to gather additional data to verify key observations or check a fact.

Specific techniques include placing information into arrays, creating matrices of categories, creating flow charts or other displays, and tabulating frequency of events. Researchers use the quantitative data that has been collected to corroborate and support the qualitative data which is most useful for understanding the rationale or theory underlying relationships. Another technique is to use multiple investigators to gain the advantage provided when a variety of perspectives and insights examine the data and the patterns. When the multiple observations converge, confidence in the findings increases. Conflicting perceptions, on the other hand, cause the researchers to pry more deeply.

Another technique, the cross-case search for patterns, keeps investigators from reaching premature conclusions by requiring that investigators look at the data in many different ways. Cross-case analysis divides the data by type across all cases investigated. One researcher then examines the data of that type thoroughly. When a pattern from one data type is corroborated by the evidence from another, the finding is stronger. When evidence conflicts, deeper probing of the differences is necessary to identify the cause or source of conflict. In all cases, the researcher treats the evidence fairly to produce analytic conclusions answering the original "how" and "why" research questions.

Step 6. Prepare the report

Exemplary case studies report the data in a way that transforms a complex issue into one that can be understood, allowing the reader to question and examine the study and reach an understanding independent of the researcher. The goal of the written report is to portray a complex problem in a way that conveys a vicarious experience to the reader. Case studies present data in very publicly accessible ways and may lead the reader to apply the experience in his or her own real-life situation. Researchers pay particular attention to displaying sufficient evidence to gain the reader's confidence that all avenues have been explored, clearly communicating the boundaries of the case, and giving special attention to conflicting propositions.

Techniques for composing the report can include handling each case as a separate chapter or treating the case as a chronological recounting. Some researchers report the case study as a story. During the report preparation process, researchers critically examine the document looking for ways the report is incomplete. The researcher uses representative audience groups to review and comment on the draft document. Based on the comments, the researcher rewrites and makes revisions. Some case study researchers suggest that the document review audience include a journalist and some suggest that the documents should be reviewed by the participants in the study.

Documentary Research

Documentary research is associated with historical research, and history sits uneasily alongside social science disciplines. Documentary research is regarded as being not clear-cut, not having a method and nothing on how a researcher uses it. Yet these criticisms are misplaced. History as a discipline provides us with a sense of our past and with that the ways in which our present came about, and employing a range of documentary sources (e.g., state government files) enables researchers to reflect on contemporary issues.

A broad definition of a document is a written text. Writing is the making of symbols representing words and involves the use of a pen, printing machine and other tools for inscribing messages on some material medium (such as paper). Similarly, electronic means of storing and displaying texts (files and documents) are also true documents. Documents may be regarded as physically embodied texts, where the containment of the text is the primary purpose of the physical

medium. Sources of documentary research include historical documents such as laws, declarations, statutes and people's accounts of events and periods. Also, reports based on official statistics would be covered, as well as governmental records, mass media, novels, plays, drawings, and personal documents such as dairies and biographies. To this list, photographs can be added – though they lie between aesthetic and documentary record.

There are three ways of classifying documents.

1. Primary, secondary and tertiary documents: Primary sources refer to those materials which are written or collected by those who actually witnessed events which they describe. While considered to be reliable and accurate, such sources have to be seen in their social context (i.e., selective and bias reporting), and for this reason the researcher may employ secondary sources. These are written after an event that the author has not personally witnessed, and the researcher must be aware of problems (i.e., incomplete and prejudice coverage) in the production of this data. Tertiary sources enable researchers to locate other references such as indexes, abstracts and other bibliographies. Libraries are sites for such collections of tertiary sources. Internet search engines can also be added.

2. Public and private documents: Documents can divided into four categories according to the degree of their accessibility: closed (e.g., secret police files), restricted (e.g., medical files and confidential corporate reports), open-archival (e.g., census reports) and open-published (e.g., government budget statistics).

3. Solicited and unsolicited documents: some documents (e.g., government surveys and research projects) would have been produced with the aim of research in mind, whereas others (e.g., diaries) would have been produced for personal use. However, even if unsolicited documents are for personal use, they still are addressed to an audience.

The process of documentary research

1. Conceptualizing documents

There are several ways in which researchers might conceptualize a document and frame their research questions accordingly. According to positivists, documents (e.g., news reports and crime statistics) represent an objective reflection of reality. They become mediums through which the researchers search for a correspondence between their descriptions and the events to which they refer. Here, documents account for social facts that exist independently of interpretations.

In contrast, for interpretivists (in particular, ethnomethodologists), documents (indeed, news and crime reports) are representatives of practical requirements and constructed for those purposes. Here, documents are seen as 'accomplishments' that construct what happened, based on a form of practical reasoning that renders the social order accountable and comprehensible, and yet also open to negotiation and manipulation by interested parties. Documents are to be used to examine unstated, tacit and implicit meanings and structures embedded within the documents, as they refer to some underlying social patterns or values. Like interviews and statistics, documents are seen as topics, not as resources – i.e., to be used to make sense of how social actors construct reality, rather than to be used to reflect it.

For critical realists, documents cannot be read in a detached manner. Instead, researchers must approach documents in an engaged, not detached, fashion. The analysts must consider the differences between their own frames of meanings and those found in the text. A researcher begins with an analysis of the common sense procedures that came to formulate the document (for instance, short term cost saving measures generating part-time and temporary employment contracts), and then locates it within a wider social and political context (e.g., free market forces and weakening collective bargaining and trade union powers). Researchers next examine the factors surrounding the processes of its production and social context (say, neo-liberalism and marketisation of society). It then becomes necessary to rise above the particularity of the text and the rules of the context to produce an understanding and explanation of the text in the context of wider political, economic and social forces.

Here, documents are viewed as media through which social mechanisms, structures and powers are expressed. They are approached in terms of the cultural and economic context in which they

were written, and may be viewed as attempts at persuasion. Approaching documents in this way tells researchers a great deal about the societies in which writers write and readers read. A document (e.g., a newspaper) might, for example, reflect the marginalisation of particular groups of people and the social characterisation of others (say, social deviant groups such as gays and lesbians).

For feminists, a text (e.g., an advertisement featuring scantily-dressed women) is a reading to revise its premises and also an act of refusal. The researcher concentrates on the way in which the text constructed the contribution of women to an event, but the strategy of refusal enables women to see their contemporary social and political situation in a new light (i.e., women exploitation and oppression). Here, feminist researchers, and women in general, must understand the assumptions behind the text, and resist, refuse and revise them to enable themselves and women to liberate themselves from patriarchal powers.

Critical theorists share much of critical realists' approach to texts. They focus not only on the relationship between the author and the document, but the ways in which the use of a document (say, a mythical story) is linked to the present as acts of historical writings are inevitably linked to current uses (say, nationalism and identity). The post-structuralist approaches suggest that a text (e.g., media) does not refer to anything beyond itself nor to the intentions of its author. Here, the debate whether the text is (which would include an interview transcript or observation field notes) a topic of social research, or a resource for social research is revived.

Generally, theorists suggest that a researcher should approach a document in terms of three levels of meaning and interpretation:

1. The meanings that the author intended to produce;
2. The received meanings as constructed by the audience in differing social situations;
3. The internal meanings that semioticians exclusively concentrate upon.

2. Using documents

There are often practical impediments to the research aims of collecting and analyzing documents:

1. Lack of time, finance and resources to undertake a full inquiry;
2. The relevant data may not be available;
3. Gatekeepers to the sources may not grant access to it;
4. The publication of materials (e.g., criminal and sexual affairs) may be detrimental (and so unethical) to the memory of an author or group of people;
5. The publication may lead to a public outcry (and so politically insensitive) that would not advance understanding of a process or event;
6. The data (especially hand-written documents) may be difficult to read;
7. The historical and local documents may have been damaged;
8. The documents (especially personal sources) may use abbreviations and coded references for individuals, practices and relations that may be difficult to interpret;
9. The documents are always context-specific, so making empathy and understanding quite demanding.

In such cases, imagination, along with an understanding of the issues and methods of social research, is often required to gather data from a wide range of documentary sources (i.e., primary, secondary and tertiary sources, private and public documents and solicited and unsolicited reports).

3. Assessing documents

There are four criteria for assessing the quality of the evidence available from documentary sources.

Authenticity: There are several guidelines for assessing a document's authenticity:

1. The document may contain obvious errors, or is not consistent in its representation;
2. Different versions of the same document exist;
3. There are internal inconsistencies in terms of style, content and handwriting, and so on;
4. The document has been in the hands of a person or persons with a vested interest in a particular reading of its content;
5. The version derives from a suspect secondary source;

6. It is inconsistent in relation to other similar documents;
7. It is ‘too neat’ in terms of being representative of a certain group of documents.

Credibility: This refers to the extent to which the evidence is undistorted and sincere, free from error and evasion. Are the people who record the information reliable in their translations of the information that they receive? How accurate were their observations and records? To achieve this, researchers may employ other sources, and question the political sympathies of the authors.

Representativeness: The issue of whether a document is typical depends on the aim of the research. If the researchers are concerned with drawing conclusions which are intended to argue that there is a ‘typical document’ or ‘typical method’ of representing a topic in which they are interested, then this is an important consideration in order to demonstrate how one interpretation of an event predominates to the exclusion of others. However, ‘untypical’ documents may be of interest.

Meaning: This refers to the clarity and comprehensibility of a document. While meanings change and the use of words varies, social context enables understandings. Here, meaning can be divided into intended, received and content/internal meaning.

4. The analysis of documents

Documents do not stand on their own, but need to be situated within a theoretical frame of reference in order that its content is understood. For this purpose, we can use content analysis, which compromise three stages: stating the research problem, retrieving the text and employing sampling methods, and interpretation and analysis. Content analysis takes both quantitative and qualitative forms.

Quantitative content analysis

It seeks to show patterns of regularities in content through repetition. The analyst would seek to derive categories from the data (e.g., a daily newspaper) in order that it can be compared with other data. Words and phrases (say, ‘truth’, ‘liberties’, ‘freedom’, ‘opposition parties’, ‘civic

associations', and so on) in the documents are transformed into numbers. The number of times in which a word or phrase occurs in the text is taken as an indicator of its significance in the text (e.g., more references to 'freedom' than 'authoritarianism' may show the political tendencies of the editor and owner of the newspaper). This quantification strategy is assumed to enhance both the reliability and validity of the classified data. It is taken for granted that there exists a defensible correspondence between the transformed account and the way the information was meant in its original form.

However, there are several weaknesses with this quantification approach.

1. Quantification deals only with what has been produced (i.e., the frequency of words and phrases), not with the decisions that informed its production, which tells the researcher so much more about the its intended and received meanings;
2. It only deals with information that can be measured and standardized, and therefore provides only a simplified system of categories of data;
3. It tends to reproduce the meanings used by authors as opposed to subjecting them to critical analysis in terms of the political, social and economic context of their production;
4. It fails to understand the common-sense context in which the words and phrases are produced and interpreted as people make sense of their social world;
5. It is assumed that the audience/reader who receives the text must translate it as the researcher does.

In short, the approach negates the idea that a text is open to multiple and contradictory readings by its audience. It is wrong to assume that the textual interpretation can be simply read off without considering the readers' understanding. The frequency with which words or phrases occur in a text may therefore say nothing about its significance within the document.

Qualitative content analysis

For researchers to grasp a document's significance, they must concentrate on intended, received, and content/internal meanings. Qualitative analysis views the author as a self-conscious actor addressing an audience under particular social and political circumstances. The task of the

researcher is to read the text in terms of its symbols – as an anthropologist does with rituals. This 'reading' may be derived from secondary sources and/ or other research methods such as observational studies. The researcher considers not only how existing interpretations are constructed, but also how new ones are developed and employed. While author's intended meanings are important, analysing the reader's social situation is also crucial to interpreting the text.

Aside from the emphasis on intended and received meanings, there is also content meaning upon which content analysts and semioticians focus their attention. This examines the relationship between a signifier (i.e., a symbol or word) and a signified (i.e., a concept or idea to which the signifier refers to), and its relationship to a referent (i.e., a material object or language system). The signified may not refer to a material object, but instead refer to the way in which a system of language (through its signs) organises the world. Content analysts focus upon the relationships within the text, and its relationship to other texts. A critical-analytic stance considers how the document (e.g., a government news report) represents the events that it describes and closes off potential contrary interpretations (e.g., oppositional understandings) to the reader. This stance considers the way in which a text attempts to stamp its political, cultural and economic authority upon the social world it describes. In so doing, the social world might be characterised by the exclusion of valuable information (e.g., on women and minority groups) and the characterisation of events and people in particular ways according to certain powerful interests.

5. Issues in documentary research

There are several criticisms of documentary research methods.

1. Given its social context and identity, the researcher will give a selective and biased understanding of a document, and may even deliberately chose and select particular documents. This is a common criticism against researchers using any technique of data collection.
2. Inevitably, authors of documents will decide to record and leave out information informed by their social, political and economic environment of which they are part. Historical documents, thus, are amenable to manipulation and selective influence. In undertaking documentary research, researchers should be aware of these influences and

not assume that documents are simply neutral artifacts from the past. Indeed, uncritical readings of texts can reproduce and reinforce marginalization of groups, such as working class, women and ethnicities.

3. While new technologies (e.g., the internet) offer possibilities for acquiring documents, researchers have to exercise a critical reflexivity since much of the documents on the internet are produced by powerful political, cultural and economic groups, who want to ensure that particular images reach the public domain, and wish to counter bad images with more favourable representations.
4. While digital technology (e.g., computers) provides opportunities for new forms of research, it should be remembered that it lends to the creation, modification, destruction and replacement of information with very little effort and cost.
5. More generally, using documents without due consideration to the process and social context of their construction, leaves researchers (especially semioticians) open to the charge of being unreflexive and uncritical in their 'readings'.

Summary

Experimental Research - An attempt by the researcher to maintain control over all factors that may affect the result of an experiment. In doing this, the researcher attempts to determine or predict what may occur. Case studies emphasize detailed contextual analysis of a limited number of events or conditions and their relationships. Documentary research is the use of outside sources, documents, to support the viewpoint or argument of an academic work. The process of documentary research often involves some or all of conceptualizing, using and assessing documents.

Glossary

Case study: Research strategy that involves the empirical investigation of a particular contemporary phenomenon within its real-life context, using multiple sources of evidence.

Documentary secondary data: Written documents such as notices, minutes of meetings, diaries, administrative and public records and reports to shareholders as well as non-written documents such as tape and video recordings, pictures, films and television programmes.

Experiment: Research strategy that involves the definition of a theoretical hypothesis; the selection of samples of individuals from known populations; the allocation of samples to different experimental conditions; the introduction of planned change on one or more of the variables; and measurement on a small number of variables and control of other variables.

Suggested Readings

Practical Research Methods, Dawson, Catherine, UBS Publishers' Distributors, New Delhi, 2002.

Business Research Methods, Donald R. Cooper, Pamela S. Schindler, 8/e, Tata McGraw-Hill Co. Ltd., 2006.

Research Methods, Donald H. McBurney, 5th Edition, Thomson Learning, ISBN:81-315-0047-0,2006.

Terminal and Model Questions

1. Write short note on the following.

   z) Authenticity of Documents
   aa) Tertiary Documents
   bb) Ex Post Facto Designs
   cc) Case Study Method
   dd) True Experimental Designs

2. Briefly describe various steps involved in a case study method of research.
3. What do you mean by experiment? Explain its types in research.
4. Comment upon the usage of documentary method in research. How would you check the authenticity of various documents?
5. Critically examine the process of documentary research.

CLASSIFICATION AND PRESENTATION OF DATA

Structure

7.1 Learning Objectives

7.2 Classification of Data

7.3 Presentation of Statistical Data

7.4 General Considerations Concerning Tables

7.5 Construction of the Table

7.6 Constructing a Table in Microsoft Word 2007

7.7 Using Figures

7.8 Summary

7.9 Glossary

7.10 Suggested Readings

7.11 Terminal and Model Questions

Learning Objectives

- To find the relevance and ways of classification of data.
- To understand various forms of presentation of data.
- To study various parts of a standard table.
- To learn the art of making tables and figures in MS Office-2007.

Classification of Data

Connor defined classification as: “the process of arranging things in groups or classes according to their resemblances and affinities and gives expression to the unity of attributes that may subsist amongst a diversity of individuals”. The raw data, collected in real situations and arranged haphazardly, do not give a clear picture. Thus to locate similarities and reduce mental

strain we resort to classification. Classification condenses the data by dropping out unnecessary details. It facilitates comparison between different sets of data clearly showing the different points of agreement and disagreement. It enables us to study the relationship between several characteristics and make further statistical treatment like tabulation, etc.

During population census, people in the country are classified according to sex (males/females), marital status (married/unmarried), place of residence (rural/urban), Age (0–5 years, 6–10 years, 11–15 years, etc.), profession (agriculture, production, commerce, transport, doctor, others), residence in states (West Bengal, Bihar, Mumbai, Delhi, etc.), etc.

Primary Rules of Classification

In quantitative classification, we classify data by assigning arbitrary limits called class-limits. The group between any two class-limits is termed as class or class-interval. The primary rules of classification are given below:

I. There should not be any ambiguity in the definition of classes. It will eliminate all doubts while including a particular item in a class.
II. All the classes should preferably have equal width or length. Only in some special cases, we use classes of unequal width.
III. The class-limits (integral or fractional) should be selected in such a way that no value of the item in the raw data coincides with the value of the limit.
IV. The number of classes should preferably be between 10 and 20, i.e., neither too large nor too small.
V. The classes should be exhaustive, i.e., each value of the raw data should be included in them.
VI. The classes should be mutually exclusive and non-overlapping, i.e., each item of the raw data should fit only in one class.
VII. The classification must be suitable for the object of inquiry.
VIII. The classification should be flexible and items included in each class must be homogeneous.
IX. Width of class-interval is determined by first fixing the no. of class-intervals and then dividing the total range by that number.

Modes of Classification

There are four types of classification, viz., qualitative; quantitative; temporal and spatial.

(i) Qualitative classification

It is done according to attributes or non-measurable characteristics; like social status, sex, nationality, occupation, etc. For example, the population of the whole country can be classified into four categories as married, unmarried, widowed and divorced. When only one attribute, e.g., sex, is used for classification, it is called simple classification. When more than one attributes, e.g., deafness, sex and religion, are used for classification, it is called manifold classification.

(ii) Quantitative classification

It is done according to numerical size like weights in kg or heights in cm. Here we classify the data by assigning arbitrary limits known as class-limits. The quantitative phenomenon under study is called a variable. For example, the population of the whole country may be classified according to different variables like age, income, wage, price, etc. Hence this classification is often called 'classification by variables'.

- **Variable**: A variable in statistics means any measurable characteristic or quantity which can assume a range of numerical values within certain limits, e.g., income, height, age, weight, wage, price, etc. A variable can be classified as either discrete or continuous.

    - Discrete variable: A variable which can take up only exact values and not any fractional values is called a 'discrete' variable. Number of workmen in a factory, members of a family, students in a class, number of births in a certain year, number of telephone calls in a month, etc., are examples of discrete-variable.
    - Continuous variable: A variable which can take up any numerical value (integral/fractional) within a certain range is called a 'continuous' variable. Height, weight, rainfall, time, temperature, etc., are examples of continuous variables. Age of students in a school is a continuous variable as it can be measured to the nearest fraction of time, i.e., years, months, days, etc.

(iii)Temporal classification

It is done according to time, e.g., index numbers arranged over a period of time, population of a country for several decades, exports and imports of India for different five year plans, etc.

(iv)Spatial classification

It is done with respect to space or places, e.g., production of cereals in quintals in various states, population of a country according to states, etc.

Presentation of Statistical Data

Statistical data can be presented in two different ways: Tabular presentation, and Graphical presentation. Tables and figures are used in most fields of study to provide a visual presentation of important information to the reader. They are used to organize the statistical results of a study, to list important tabulated information, and to allow the reader a visual method of comparing related items. Tables offer a way to detail information that would be difficult to describe in the text.

A figure is a graphic or pictorial representation, such as a chart, graph, photograph, or line drawing. These figures may include pie charts, line charts, bar charts, organizational charts, flow charts, diagrams, blueprints, or maps. Limit figures to situations in which a visual helps the reader understand the methodology or results. Use a table to provide specific numbers and summary text, and use figures for visual presentations.

The meaning and major focus of the table or figure should be evident to the readers without their having to make a thorough study of it. A glance should be all it takes for the idea of what the table or figure represents to be conveyed to the reader. By reading only the text itself, the reader may have difficulty understanding the data; by constructing tables and figures that are well presented, readers will be able to understand the study results more easily.

The purpose of this appendix is to provide guidelines that will enhance the presentation of research findings and other information by using tables and figures. It will highlight the important aspects of constructing tables and figures using the *Publication Manual of the American Psychological Association, Sixth Edition* (2010) as the guide for formatting.

An ideal statistical table should contain the following items:

- Table number:

A number must be allotted to the table for identification, particularly when there are many tables in a study.

- Title:

The title should explain what is contained in the table. It should be clear, brief and set in bold type on top of the table. It should also indicate the time and place to which the data refer.

- Date:

The date of preparation of the table should be given.

- Stubs or, Row designations:

Each row of the table should be given a brief heading. Such designations of rows are called “stubs”, or, “stub items” and the entire column is called “stub column”.

- Column headings or, Captions:

Column designation is given on top of each column to explain to what the figures in the column refer. It should be clear and precise. This is called a “caption”, or, “heading”. Columns should be numbered if there are four or, more columns

General Considerations Concerning Tables

Be selective as to how many tables are included in the total document. Determine how much data the reader needs to comprehend the material, and then decide if the information would be better presented in the text or as a table. A table containing only a few numbers is unnecessary, whereas a table containing too much information may not be understandable. Tables should be easy to read and interpret. If at all possible, combine tables that repeat data, so that results are presented only once.

Keep a consistency to all of your tables throughout your document. All tables and figures in your document should use a similar format, with the results organized in a comparable fashion. Use the same name and scale in all tables, figures, and the text that use the same variable.

In a final manuscript such as a thesis or dissertation, adjust the column headings or spacing between columns so the width of the table fits appropriately between the margins. Fit all of one table on one page. Reduce the data, change the type size, or decrease line spacing to make it fit. A short table may be on a page with text as long as it follows the first mention of it. Each long table is on a separate page immediately after it is mentioned in the text. If the fit and appearance would be improved, turn the table sideways (landscape orientation, with the top of table toward the spine) on the page.

Each table and figure must be discussed in the text. An informative table will supplement but will not duplicate the text. In the text, discuss only the most important parts of the table. Make sure the table can be understood by itself without the accompanying text; however, it is never independent of the text. There must be a reference in the text to the table.

Construction of the Table

Table 1.1 is an example of an APA table for displaying simple descriptive data collected in a study. It also appears in correct relation to the text of the document; that is, it is inserted below the place that the table is first mentioned either on the same page, if it will fit, or the next page. (Fig. 1.1 shows the same table with the table parts identified.) The major parts of a table are the number, the title, the headings, the body, and the notes.

Table 1.1. An Example of a Table in APA Format for Displaying Simple Descriptive Data

Table 1

Means and Standard Deviations on the Measure of Self-Direction in Learning as a Function of Age in Adult Students

		Self-directed learning inventory score	
Age group	*n*	*M*	*SD*
20–34	15	65	3.5
35–40	22	88	6.3
50–64	14	79	5.6
65–79	7	56	7.1
80+	--[a]	--	--

Note. The maximum score is 100.

[a] No participants were found for the over 80 group.

Table Numbering

Arabic numerals are used to number tables in the order in which they appear in the text. Do NOT write in the text "the table on page 17" or "the table above or below." The correct method would be to refer to the table number like this: (see Table 1) or "Table 1 shows…" Left-justify the table number (see Table 1.1). In an article, each table should be numbered sequentially in the order of appearance. Do not use suffix letters or numbers with the table numbers in articles. However, in a book, tables may be numbered within chapters; for example, Table 7.1. If the table appears in an appendix, identify it with the letter of the appendix capitalized, followed by the table number; for instance, Table 1.3 is the third table in Appendix C.

Table Titles

Include the variables, the groups on whom the data were collected, the subgroups, and the nature of the statistic reported. The table title and headings should concisely describe what is contained in the table. Abbreviations that appear in the body of the table can sometimes be explained in the title; however, it may be more appropriate to use a general note (see also comments on ***Table Headings***). The title must be italicized. Standard APA format for journal submission requires double spacing throughout. However, tables in student papers may be partially single spaced for better presentation.

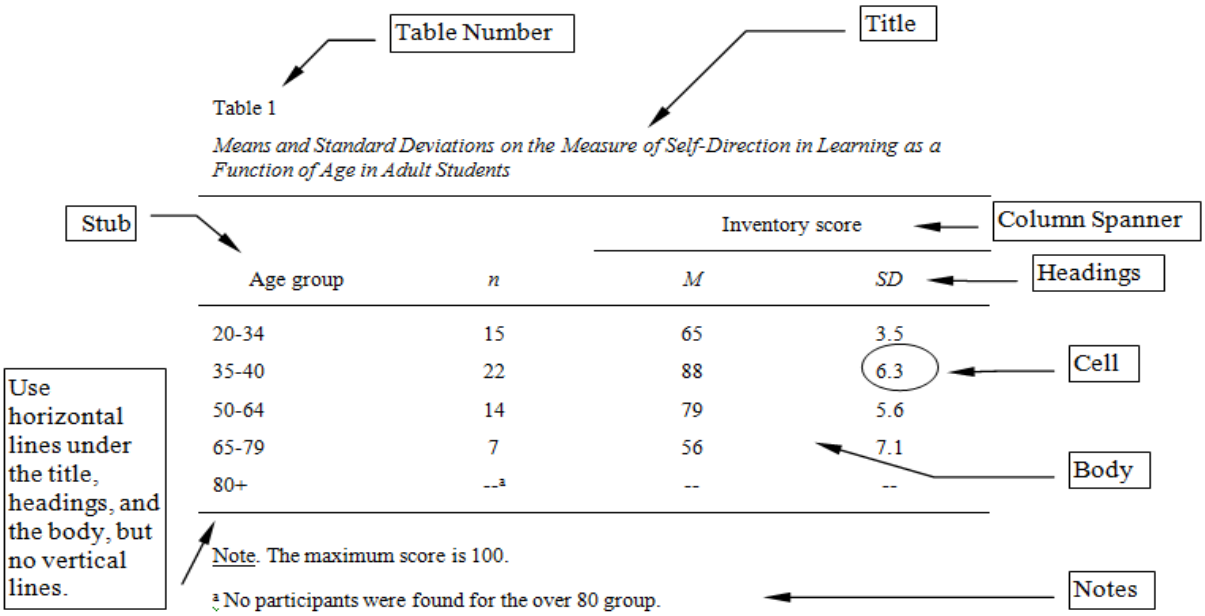


Fig. 1.1. The major parts of an APA table.

Table Headings

Headings are used to explain the organization of the table. You may use abbreviations in the headings; however, include a note as to their meaning if you use mnemonics, variable names, and scale acronyms. Standard abbreviations and symbols for nontechnical terms can be used without explanation (e.g., *no.* for *number* or *%* for *percent*). Have precise title, column headings, and row labels that are accurate and brief. Each column must have a heading, including the ***stub column***, or leftmost column. Its heading is referred to as the ***stubhead***. The stub column usually lists the significant independent variables or the levels of the variable, as in Table 1.1.

The ***column heads*** cover one column, and the ***column spanners*** cover two or more columns—each with its own column head (see Table 1.1 and Fig. 1.1). Headings stacked in this manner are called ***decked heads***. This is a good way to eliminate repetition in column headings but try to avoid using more than two levels of decked heads. **Column heads, column spanners**, and **stubheads** should all be singular, unless referring to a group (e.g., children). Table spanners, which cover the entire table, may be plural. Use sentence capitalization in all headings.

Notice that there are no vertical lines in an APA style table. The horizontal lines can be added by using a "draw" feature or a "borders" feature for tables in the computer word processor, or they could be drawn in by hand if typed. If translating from an SPSS table or box, the vertical lines must be removed.

The Body of the Table

The body contains the actual data being displayed. Round numbers improve the readability and clarity more than precise numbers with several decimal places. A good guideline is to report two digits more than the raw data. A reader can compare numbers down a column more easily than across a row. Column and row averages can provide a visual focus that allows the reader to inspect the data easily without cluttering the table. If a cell cannot be filled because the information is not applicable, then leave it blank. If it cannot be filled because the information could not be obtained, or was not reported, then insert a dash and explain the dash with a note to the table.

Notes to a Table

Notes are often used with tables. There are three different forms of notes used with tables: (a) to eliminate repetition in the body of the table, (b) to elaborate on the information contained in a particular cell, or (c) to indicate statistical significance:

- A ***general note*** provides information relating to the table as a whole, including explanations of abbreviations used:

  Note. This could be used to indicate if the table came from another source.

- A ***specific note*** makes a reference to a specific row, column, or cell of the table and is given a superscript lowercase letter, beginning with the letter "a":

  $^{a}n = 50$. Specific notes are identified in the body with a superscript.

- **A *probability note*** is to be included when one or more inferential statistics have been computed and there isn't a column showing the probability, *p*. Asterisk(s) indicate the

statistical significance of findings presented within the table. Try to be consistent across all tables in a paper. The important thing is to use the fewest asterisks for the largest *p* value. It is common to use one asterisk for .05 and two for .01. For example:

$*p < .05$. $**p < .01$.

Notes should be listed with general notes first, then specific notes, and concluded with probability notes, without indentation. They may be single spaced for better presentation. Explain all uses of dashes and parentheses. Abbreviations for technical terms, group names, and those of a similar nature must be explained in a note to the table.

Constructing a Table in Microsoft Word 2007

For this step-by-step example, results from an ANOVA analysis were chosen from previous examples in the book. See Fig. 1.2. The data are transferred from the standard SPSS output to an APA table.

ANOVA

grades in h.s.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	18.143	2	9.071	4.091	.021
Within Groups	155.227	70	2.218		
Total	173.370	72			

Fig. 1.2. An example of the type of default table generated from an SPSS ANOVA output.

The finished table should look like Table 1.2. This explanation is accomplished using MS Word 2007. In earlier versions the functionality will generally be the same but with 2007 Microsoft greatly changed the look and feel so the screens will differ (how you find the right command). Also, you will need to adjust the number of columns and rows for the type and amount of data that you need to present.

Table 1.2. An Example of an ANOVA Table in APA Format

Table 2

The **Title** is in italics but the **Table Number** is not. Also note the space between the title and the top of the

One-Way Analysis of Variance of Grades in High School by Father's Education

Source	*df*	*SS*	*MS*	*F*	*p*
Between groups	2	18.14	9.07	4.09	.02
Within groups	70	155.23	2.22		
Total	72	173.37			

Step One: Insert the Table

The **Headings** and **Body** of the table are actually built using Word's table function. Type your **Table Number** and **Title**. Then on the next line after the title, insert a 6 × 4 table:

- **Insert → Table…** (see Fig. 1.3).
- For our example of the ANOVA, click on the 6 × 4 box. You will need to adjust the number of columns and rows for the type and amount of data that you need to present.
- Compare your table to Table 1.3.

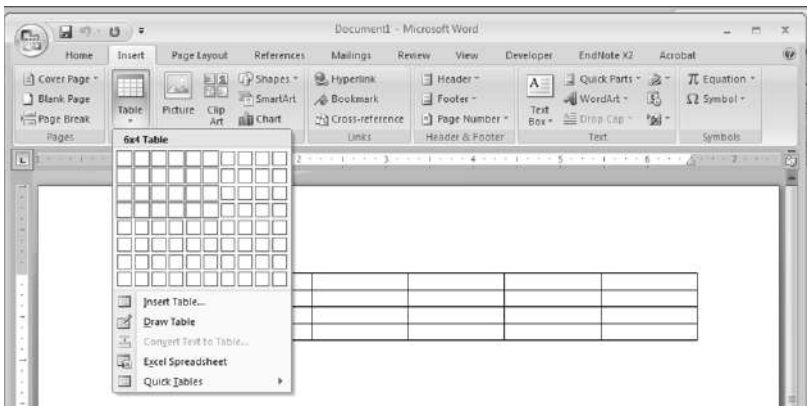


Fig. 1.3. Using MS Word to make a table.

Table 1.3. Step 1

Step Two: Correcting the Grid Lines

APA uses no vertical and just a few horizontal lines, so it is best to remove them all and then put back the ones that are needed. However, you need to first turn on your table gridlines if they aren't on already:

- **Home** → In the Paragraph Box click the arrow next to the **Border** button and select **View Gridlines.** See Fig. 1.4.

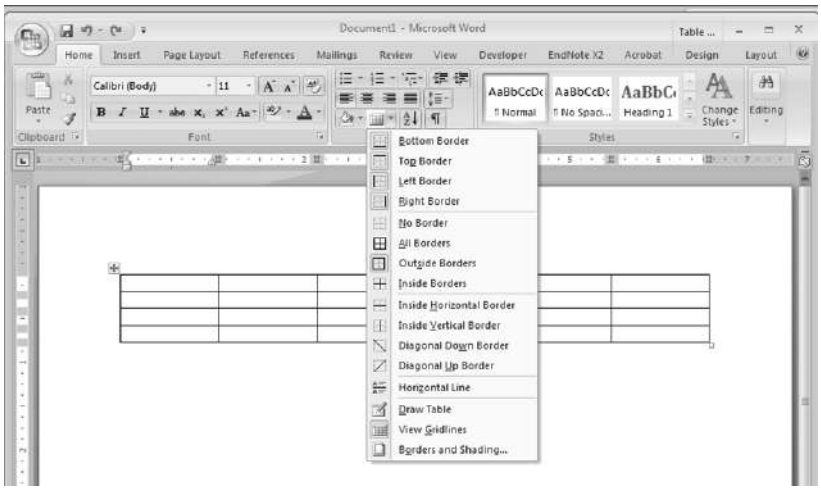


Fig. C.4. Turning the View Gridlines on.

Then remove all the table border lines by:

- Right click anywhere on the table and select: **Borders and Shading…** to get Fig. 1.5.

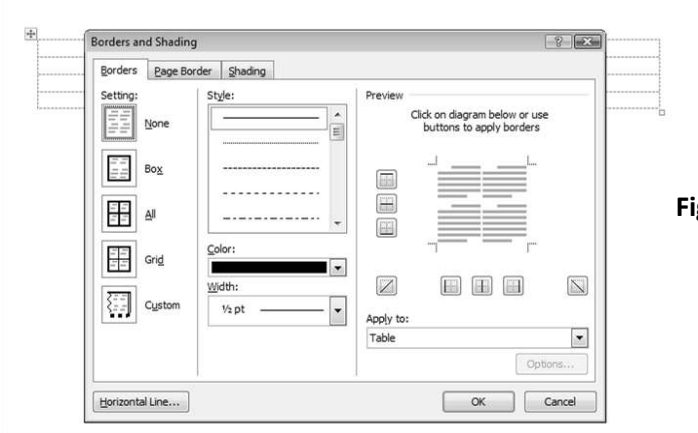
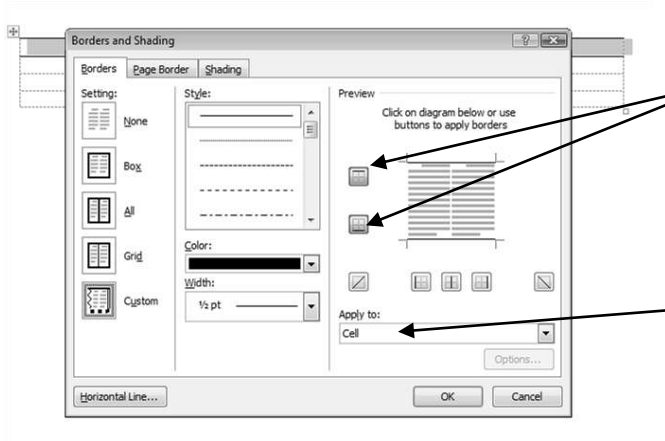


Fig. 1.5. Clearing the borders.

- Select the **Borders** tab, if it's not already selected.
- Under **Settings** click the box to the left of **None** to remove them. Make sure under **Apply to:** it says **Table**.
- Click **OK.**

To add the correct lines for the APA table in our example:

- Left click to the left of the top row to select the top row.
- Right click anywhere on the top row and select: **Borders and Shading…** to get Fig. 1.6.
- Make sure the solid line **Style** is selected and the **Width** is **1/2 pt**.
- In the **Preview** picture click the **Upper** and **Lower** bar buttons. This inserts the top two lines in the table.
- Click **OK**.
- Select the last row in your table.
- Click the **Lower** bar button only. This inserts the bottom line in the table.
- Click **OK.**



Upper and **Lower** bar buttons.

Fig. 1.6. Setting the horizontal lines.

Note: the **Apply to** is set to **Cell** but because you have selected the entire row, it will look like a solid line across the table.

Compare your table to Table 1.4.

Note: If you can't see the gridlines, turn them on to better see where the rows and cells are. They won't show when printed. See Fig C.5 above.

Table 1.4. Step 2

Step 3: Adding the Text and Data

The text in the body of an APA table is an equal distance between the top and bottom of the cell:

- Select the table by pointing at the table and clicking the target that appears in the upper left corner .
- Click the **Home** tab and the **Paragraph** dialog box button (see Fig. 1.7).
- Set **Line spacing** to **Single** (see note on Fig. 1.7).

- Set **Spacing Before** and **After** to **6pt** (see Fig. 1.7).
- Click **OK.**

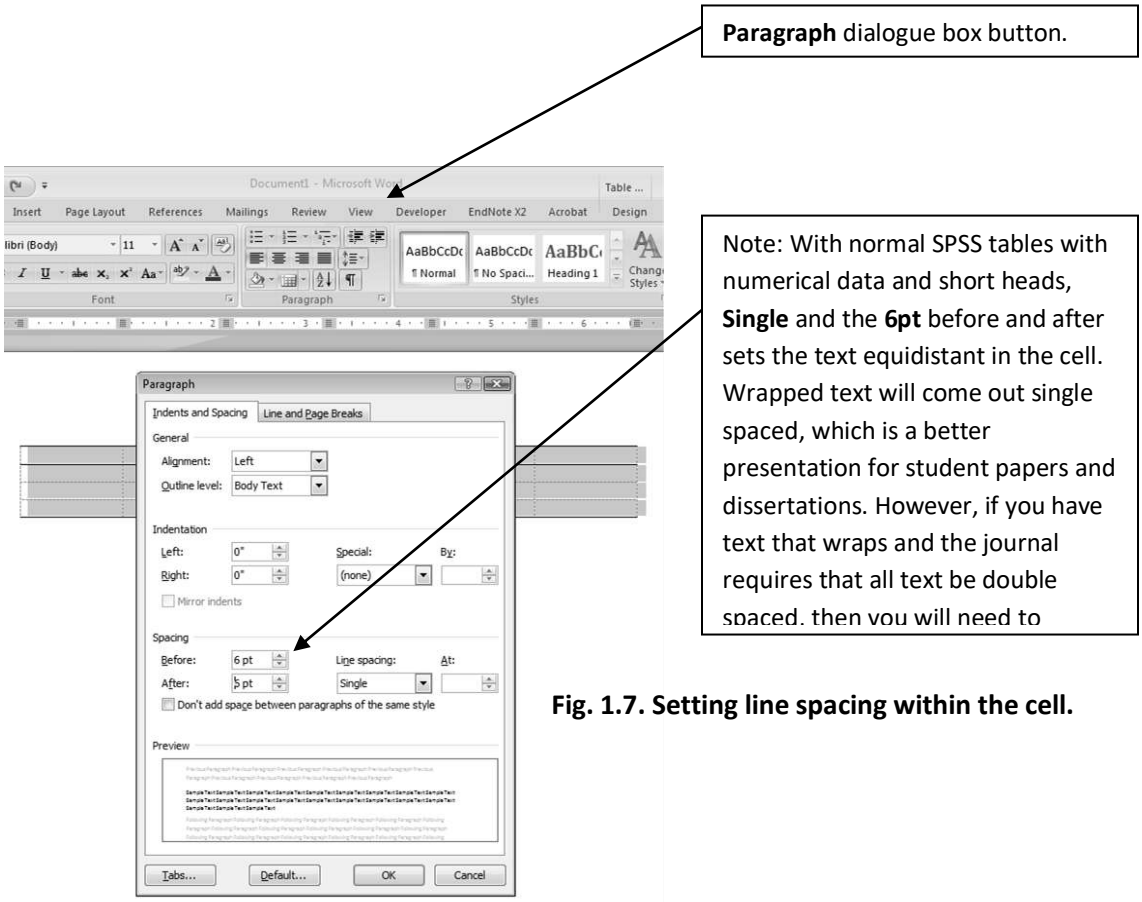


Fig. 1.7. Setting line spacing within the cell.

Enter the headings and data into each cell; the SPSS printout will have all of the information to accomplish this. Don't worry about wrapping and aligning at this time. That is easier to do after the data are entered.

Compare your table to Table 1.5.

Table 1.5. Step 3

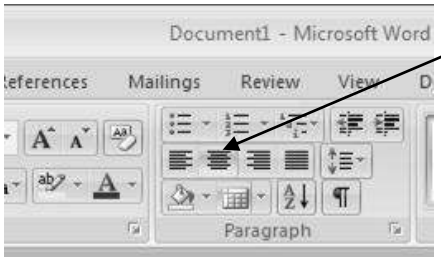
Source	*df*	*SS*	*MS*	*F*	*p*
Between groups	2	18.14	9.07	4.09	.02
Within groups	70	155.23	2.22		
Total	72	173.37			

Step 4: Adjusting the Column Widths

In an APA table, the **Heads** should be center aligned in the cell and the **Stubs** are left aligned. The numbers in the **Cell** are decimal aligned and centered under the **Heads**. Notice also that "Between groups" wrapped. Let's first align the **Heads** and **Stubs**, then fix that wrap and finally align the data under the **Heads**.

To center align the **Heads**:

- Select the **Header Row** of your table by clicking to the left of the top row.
- Click the **Center** align button in the Formatting Toolbar (see Fig. 1.8).
- The stub column should already be left aligned; if not, select the cells and click the **Align Left** button.



Note: If the **Align Buttons** aren't showing on the **Paragraph Toolbar,** you can select the proper alignment from the menu: **Paragraph** dialogue box.

Fig. 1.8. Center aligning the heads.

When MS Word creates a table it will generally make all of the columns the same width. To fix the wrap on the "Between groups" cell, that column will need to be widened slightly and then to keep the table within the margins the data columns will need to be decreased slightly. This may be a trial and error process to get the right spacing for your text.

- Right click anywhere on the **Stubs** column and select **Table Properties…** to get Fig. 1.9.
- Click the **Column** Tab.
- Set the **Preferred width** to 1.4″.
- Click the **Next Column** button and set it to 1.0″.
- Repeat for all of the columns, setting them to 1.0″.
- Click **OK**.

Note: This can also be accomplished by dragging the vertical column separator lines until the "Between groups" is not wrapped and then dragging the other column separator lines so that they are within the margins. However, this produces uneven column spaces. We recommend the method outlined.

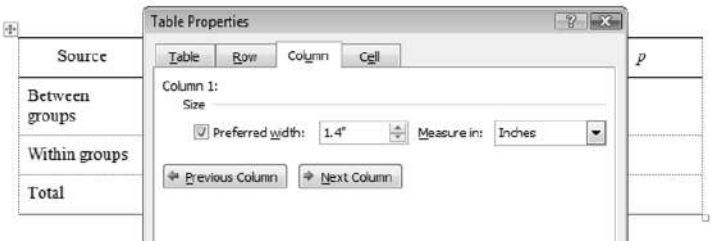


Fig. 1.9. Adjusting the column widths.

Compare your table to Table 1.6.

Table 1.6. Step 4

Source	*df*	*SS*	*MS*	*F*	*p*
Between groups	2	18.14	9.07	4.09	.02
Within groups	70	155.23	2.22		
Total	72	173.37			

Step 5: Centering the Data Cells

To set the **Cell** columns so that they are all centered under their **Heads**, you will need to set the **Tabs** for each column of data cells to a **Decimal Tab**. We recommend this method of setting all columns the same and then adjusting them separately so they look right, because it requires less individual column adjustment:

- Select just the data cells by clicking in the upper left one, holding the shift key down, and then clicking in the lower right cell.
- Click the **Paragraph** dialog box button and then the **Tabs** button to get Fig. 1.10.

- Clear all of the Tabs in the selected cells first by clicking the **Clear All** button.
- Click **Alignment Decimal**.
- Type .35″ in the **Tab stop position** box.
- Click the **Set** button.
- Click **OK.**

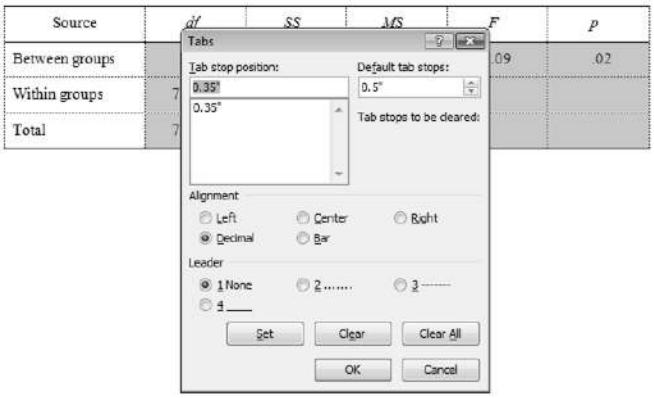


Fig. 1.10. Setting the decimal tabs.

Compare your table to Table 1.7.

Table 1.7. Step 5

Source	*df*	*SS*	*MS*	*F*	*p*
Between groups	2	18.14	9.07	4.09	.02
Within groups	70	155.23	2.22		
Total	72	173.37			

Step 6: Touch Up the Finished Table

The *df* numbers looks like they could be adjusted slightly to the right and the *p* slightly to the left. We show you this so that you will know how to get a perfect decimal alignment of the data under the column head text. This may be trial and error depending on your data.

- Select the cells of the *df* column by clicking first on the top data cell, “2,” hold the **Shift key** down, and then click on the bottom data cell, “72.”
- Click the **Paragraph** dialog box button and then the **Tabs** button.
- Clear all of the Tabs in the selected cells first by clicking the **Clear All** button.
- Under **Alignment**, Click **Decimal**.
- Type .45″ in the **Tab stop position** box, to set decimal tab .45″ from the left edge of the cell.
- Click the **Set** button.
- Click **OK.**
- Repeat for the *p* column but set it to .25″ to set decimal tab .25″ from the left edge of the cell.

Compare your finished table to Table 1.8.

Table 1.8. Step 6

Table 2

One-Way Analysis of Variance of Grades in High School by Father's Education

Source	*df*	*SS*	*MS*	*F*	*p*
Between groups	2	18.14	9.07	4.09	.02
Within groups	70	155.23	2.22		
Total	72	173.37			

Adjusting the SPSS Output to Approximate the APA Format

The preceding example shows how the standard SPSS output can be used to create a table in APA format. However, this does require some knowledge of your word processing program's table creation capabilities in order to accomplish this task. It also requires retyping the data into the table. You can adjust SPSS so that the output will approximate the APA format. We would not recommend submitting this to an APA journal, but it may be acceptable for student papers and some graduate program committees.

Follow these commands <u>before</u> running the SPSS analyses of your data:

- Click **Edit → Options**.
- Under the **Pivot Tables** tab select **Academic** (see Fig. 1.11).
- Press **OK**.

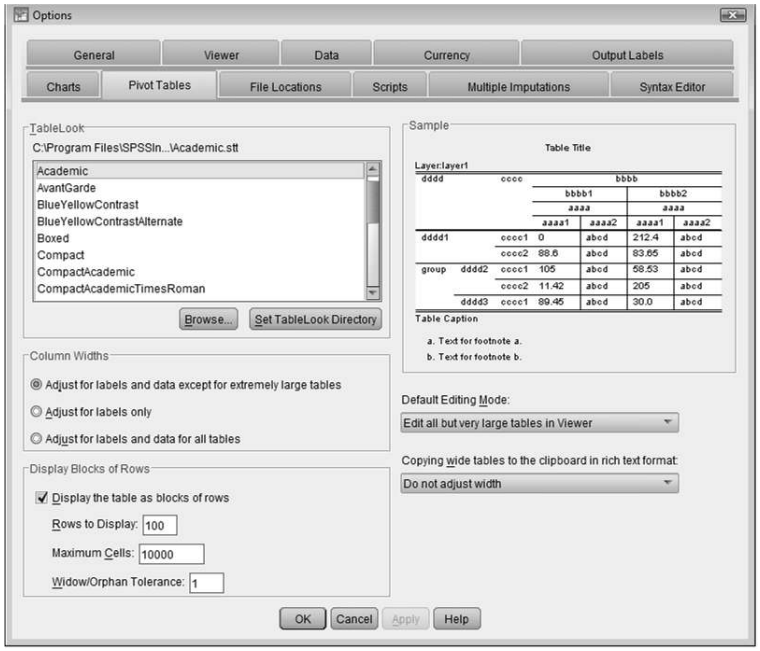


Fig. 1.11. Setting SPSS for an approximate APA format output.

- Run the SPSS statistical analysis.

Your outputs will look similar to Table 1.9, which approximates an APA table.

In order to transfer it to MS Word:

- On the SPSS output, **right click** on the table that you want to transfer.
- Select **Copy** from the short menu presented (see Fig. 1.12)**.**
- Place the curser in the MS Word file where you want to put the table.
- Select **Paste** in MS Word.

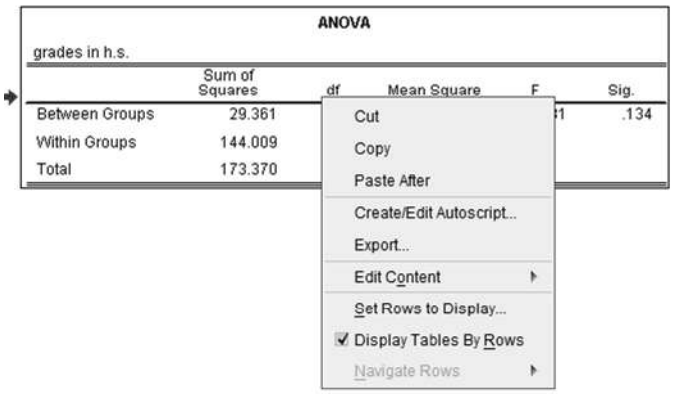


Fig. 1.12. Copying tables from SPSS.

- Place the curser in the MS Word file where you want to put the table.
- Select **Paste** in MS Word.

You can then move it and format it like any other image in MS Word, but it cannot be edited.

Table 1.9. An Example of the SPSS "Academic" Output

Table 2

One-Way Analysis of Variance of Grades in High School by Father's Education

ANOVA

grades in h.s.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	18.143	2	9.071	4.091	.021
Within Groups	155.227	70	2.218		
Total	173.370	72			

Using Figures

Generally, the same concepts apply to figures as have been previously stated concerning tables: They should be easy to read and interpret, consistent throughout the document when presenting the same type of figure, kept on one page if possible, and supplement the accompanying text or

table. Considering the numerous types of figures, I will not attempt to detail their construction in this document. However, one thing is consistent with all figures. In contrast to table titles, the figure number and caption description are located *below* the figure, but the caption provides enough detail so that the figure can be understood without reading the accompanying text. See Fig. 1.13.

Some cautions in using figures:

1. Make it simple. Complex diagrams that require lengthy explanation should be avoided unless they are an integral part of the research.
2. Use a minimum number of figures for just your important points. If too many figures are used, your important points may be lost.
3. Integrate text and figure. Make sure your figure compliments and enhances the accompanying text.

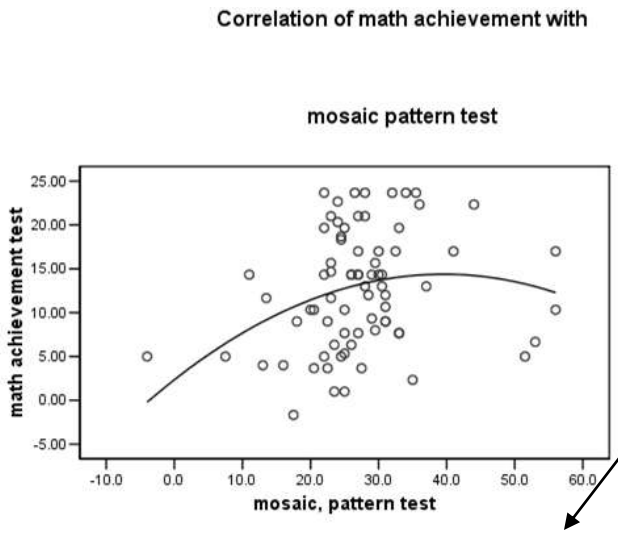


Fig. 1.13. An example of a figure and caption in APA format.

Note: The figure number is italicized but the caption itself is not. Also, the caption text is sentence case (only the first word and proper nouns are capitalized and it ends in a period).

Figure. 1. Scatterplot showing a curvilinear relationship between mathematics achievement and mosaic pattern test score.

Summary

Glossary

Table: Technique for summarizing data from one or more variables so that specific values can be read.

Scatter graph: Diagram for showing the relationship between two quantifiable or ranked data variables.

Raw data: Data for which little, if any, data processing has taken place.

Pie chart: Diagram frequently used for showing proportions for a categorical data or a grouped continuous or discrete data variable.

Suggested Readings

Research Methods, Donald H. McBurney, 5th Edition, Thomson Learning, ISBN:81-315-0047-0,2006.

Management Research Methodology; Integration of Principles, Methods and Techniques, Krishnaswamy, K.N., Sivakumar, Appa Iyer and Mathiranjan M., Pearson Education, New Delhi. 2006.

Research Methodology, Dipak Kumar Bhattacharya, Excel Books, 2009.

Terminal and Model Questions

1. Write short note on the following.

   ee) Temporal Classification
   ff) Caption
   gg) Footnote
   hh) Pie Chart

2. Describe various parts of a table.

3. What do you mean by Classification? Explain various types of classification.

4. How would you draw tables in a computer?

5. Examine the uses and applicability of various modes of classification.

INFORMATION COMPOSITION AND CONTENT CO-ORDINATION

Structure

8.1 Learning Objectives

8.2 Composition of Information

8.3 Footnotes and Citations

8.4 Quotations

8.5 References

8.6 Bibliographies

8.7 Abbreviations and Punctuation

8.8 Coordinating Contents

8.9 Front Matter

8.10 Text Proper

8.11 Back Matter

8.12 Summary

8.13 Glossary

8.14 Suggested Readings

8.15 Terminal and Model Questions

Learning Objectives

- To understand the usage of footnotes in research.
- To learn the formatting of citation and referencing.
- To know how to use quotations in research properly.

- To know about front matter, text proper and back matter of report.

Composition of Information

Composition of information is an important task of research methodology or report writing. It includes footnotes, citations and quotations, references etc. Here also APA format is generally followed. A detailed discussion on how to compose such information is as below.

Footnotes and Citations

Traditionally, a footnote was normally defined as a note at the bottom of a page, giving further information about something mentioned in the text above. A reference number or symbol would usually be printed after the relevant word in the text and before the corresponding footnote at the foot of the page. More recently, the term "footnote" has been extended to mean 'an extra comment or information added to what has just been said within the text' (usually within parentheses). APA style uses the label "parenthetical citation" to refer to this kind of footnoting.

In APA style, footnotes take one of the two forms: (a) traditional footnoting style, and (b) parenthetical citations. The former is sparingly used when you want to draw the readers' attention to important information. Here, you will place a super-scribed number after the text that requires the footnote. In the past, the footnote would be presented at the foot of the page—being set off from the main text by a line, and carrying the same numeral code (See figure 1).

Spacapan (1991). There are two aims of this study: (a) to explore the relationship between perceived control of internal states as measured by the PCOISS[1] and psychological wellbeing as . . . .

1 Perceived Control of Internal States Scale

Elements of footnote

Figure 1. Traditional footnoting method

Recently, however, footnotes are presented at the end of the paper or research report on a separate page that carries the heading "Footnotes."

Parenthetical Citations

"Parenthetical citation" is the technical term used in APA style to refer to a popular form of footnoting. Your readers should be able to discover—without undue fuss—the source of any language or ideas you have used in writing your paper/project that are not your own. This is an important part of being a responsible member of the academic community. When you use the ideas or language of someone else, you can refer your readers easily to that resource by using something called a parenthetical citation. Within parentheses, at the end of the "quoted language" or "borrowed idea," key words should be used that refer your readers to your page of references, where the readers can then find out whatever bibliographic information is necessary to track down that resource. The APA system of citing sources indicates the author's last name and the date, in parentheses, within the text of your paper or project (i.e., inline with the main text of your report or paper. Figure 2 shows how a parenthetical citation will look within the running text:

(Wesche, 1992). In this context, performance testing borrowed from the field of vocational testing in which a test taker needs to carry out realistic tasks applying language skills in actual or simulated settings (Carroll and Hall, 1985). The criteria used for . . . .

Figure 2. Example of parenthetical citation

The commonest form of parenthetical citation of an entire work or source consists of the author's last name followed by a comma and the year of publication.

Example: (Jason,1994) (Bachman, 1990)

Use the last name only in both first and subsequent citations, except when there is more than one author with the same last name. In that case, use the last name and the first initial.

Example: (Jason, K.,1994) (Bachman, L., 1990)

If the author is named in the text, only the year is cited.

Example: According to Irene Taylor (1990), the personalities **. . . .**

If both the name of the author and the date are used in the text, parenthetical reference is not necessary.

Example: In a 1989 article, Gould explains Darwin's **. . . .**

Parenthetical citations are needed when you quote the language of other people. In this case, the page number(s) should follow the year. Specific citations of pages or chapters follow the year.

Example: Emily Bronte "expressed increasing hostility for the world of human relationships, whether sexual or social" (Taylor, 1988, p. 11).

As you see, in the above example, the language of Taylor (1988) has been quoted from page 11 of his work. In this case, the following formula has been used:

(Author's last name + comma + year + comma + p. +page number)

If the quotation is made from two or more pages, the system needs some variations. For consecutive pages—pages that follow each other—a hyphen (-) is used; for non-consecutive pages, on the other hand, the page numbers are set off by means of commas. The hyphen means

"to" and the comma means "and" in parenthetical citations of this type. Take the following examples: Example

Consecutive pages: (Jason, 1994, pp. 23-37)

Non-consecutive pages: (Jason, 1994, pp. 23, 27, 36)

Some universities (or even your supervisor) may want you to use a colon (:) between the year and the page numbers instead of using the abbreviations p. or pp. This is part of Modern Language Association (MLA) style. Therefore, you need to ask your supervisor about the preferred style. Take the following examples:

	APA	MLA
Single page:	(Jason, 1994, p. 23)	(Jason, 1994: 23)
Consecutive pages:	(Jason, 1994, pp. 23-37)	(Jason, 1994: 23-37)
Non-consecutive pages:	(Jason, 1994, pp. 23, 27)	(Jason, 1994: 23, 27)

Quotations

APA style instructs writers to document quotations, paraphrases, summaries, and other information from sources as follows: "Document your study throughout the text by citing by author and date the works you used in your research. This style of citation briefly identifies the source for readers and enables them to locate the source of information in the alphabetical reference list at the end of the article" (*Publication Manual*, p. 207). When using APA style, you should consult the *Publication Manual* for general style requirements (e.g., style for metric units) and for advice on preparing manuscripts and electronic texts.

You can remember from the preceding section that language quoted directly from other people should be identified by the use of parenthetical citations that show, the author's name, year of publication, and page number(s). Short quotations (fewer than 40 words) are incorporated into the text, enclosed by double quotations marks ("), and followed by parenthetical citations. Line spacing for short quotations is the same as line spacing for the main text of the report. Take a look at figure 3:

the following claim: "We are rarely concerned just with the particular performance *per se* but also with the knowledge, skill, and other attributes that enable both the given performance and a range of other performances engaging the same knowledge and skills" (Messick, 1994, p. 16). This suggests that constructs like relevant knowledge and skills, rather . . . .

Figure 3. Example of in-line quotation

Long quotations of 40 or more words are displayed in a double-spaced block of typewritten lines with no quotation marks. APA style suggests that you *do not single space*; however, some instructors will require that indented quotations be single-spaced, especially when quoting poetry, which loses some of its formal characteristics when double-spaced. Check with your instructor before single-spacing quotations. Indent five spaces from the left margin and type the entire quotation on the indented margin *without* the usual opening paragraph indentation. If the quotation is more than one paragraph, indent the first line of the second and additional paragraphs five spaces from the already indented margin—that is, ten spaces from the left margin. Take a look at figure 4:

(Bachman, 1990, p. 312). Skehan hypothesizes a similar problem in another domain that of a waiter in a restaurant:

> Although at first sight 'waiter behavior' might seem to be a straightforward affair, we soon need to ask questions like: what range of customers needs to be dealt with? What range of food is to be served? Once one probes a little, the well-defined and restricted language associated with any role is revealed to be variable, and requiring a range of language skills. (Skehan, 1984, p. 216)

Tests developed in the real-life mold, which equate language ability with a specific language performance, are analogs to the training courses . . . .

Figure 4. Example of block quotation

If you have a quotation within a block quotation, enclose it in double (") quotation marks. If you have a quotation within a short quote (one incorporated within the text), enclose it within single quotation marks (). Ellipsis points (**. . .**) are used to indicate omitted material. Type three periods with a space before and after each period to indicate omission within a sentence (**. . .**). To indicate an omission between sentences, type a punctuation mark for the sentence followed by three spaced periods (**. . . .**) (**? . . .**) (**! . . .**). When a period or comma occurs with closing quotation marks, place the period or comma *within* the closing quotation mark. Put any other punctuation mark *outside* the quotation marks unless that mark is part of the quoted material (See figures 5 and 6).

Douglas claims "A specific purpose language test . . . . allows us to make inferences a bout a test taker's capacity to use language in the specific purpose domain." (2000, p. 19)

Figure 5. Ellipsis points in in-line quotations

Douglas (2000) proposes a more precise definition of specific purpose language tests:

> A specific purpose language test is one in which test content and methods are derived from an analysis of a specific purpose target language use situation . . . allowing for an interaction between the test takers' language ability and specific purpose content knowledge, on the one hand, and the test tasks on the other. Such a test allows us to make inferences about a test taker's capacity to use language in the specific purpose domain. (Douglas, 2000, p. 19)

Douglas discusses reasons for wishing to develop 'specific purpose language' tests, and notes that language performance . . . .

Figure 6. Ellipsis points in block quotations

References

According to APA style, the sources in a paper or research report should be listed alphabetically on a separate page headed References. It follows the final page of the text and is numbered. Entries appear in alphabetical order according to the last name of the author; two or more works by the same author appear in chronological order by date of publication. When there are two or more books or articles by the same author, repeat the name of the author in each entry. Two or more works by the same author with the same publication date are identified by lower-case letters of the alphabet. Do not double space the distance between different sources. Do not use first-line hanging or dangling indentation in your reference list either.

In listing the references of your report or paper, notice that the title of books and journals must be italicized unless you are using regular typewriters that lack this feature. Here you need to use

underlining instead of italicizing the book/journal title. To give you an insight as to how different types of sources should be listed in your References section, a few examples are provided here.

Books

Books fall into a few categories. Each kind requires referencing of its own. There are seven major kinds of books: (a) single-author books, (b) multi-author books, (c) editions other than first, (d) edited volumes, (e) books without author or editor listed, (f) multi-volume works, and (g) multi-author articles in a multi-author volume. Examples of reference for each kind have been presented here.

Notice that the abbreviation et al. (for "and others") is not used in the reference list, regardless of the number of authors, although it can be used in the parenthetical citation of material with three to five authors (after the initial citation, when all are listed) and in all parenthetical citations of material with six or more authors..

- ***Single-author books***

Alverez, A. (1970). *The savage god: A study of suicide*. New York: Random House.

- ***Multi-author books***

Natarajan, R., & Chaturvedi, R. (1983). *Geology of the Indian Ocean*. Hartford, CT: University of Hartford Press.

Hesen, J., Carpenter, K., Moriber, H., & Milsop, A. (1983). *Computers in the business world*. Hartford, CT: Capital Press.

- ***Editions other than first***

Creech, P. J. (1975). *Radiology and technology of the absurd* (3rd ed.). Boston: Houghton-Mifflin.

- ***Edited volumes***

Stanton, D. C. (Ed.). (1987). *The female autograph: Theory and practice of autobiography*. Chicago: University of Chicago Press.

If you are referring to an article or signed chapter in an edited volume, your reference would look like this:

Pepin, R. E. (1998). Uses of time in the political novels of Joseph Conrad. In C. W. Darling, Jr., J. Shields, & V. B. Villa (Eds.), *Chronological looping in political novels* (pp. 99-135). Hartford: Capital Press.

- ***Books without author or editor listed***

Webster's New Collegiate Dictionary. (1961). Springfield, MA: G. & C. Merriam.

- ***Multi-volume works***

To refer to a single volume, include only the relevant date and volume number; to refer to another volume in the work, create another entry.

Nadeau, B. M. (Ed.). (1994). *Studies in the history of cutlery*. (Vol. 4). Lincoln: University of Nebraska Press.

- ***Multi-author articles in a multi-author volume***

Pepin, R.E., Darling, C.W., & Villa, V. (1997). Poe and the French symbolistes. In P. Wursthorn, Jr., J. Darling, & J. Brother (Eds.), *The era of decadence* (pp. 110-145). Hartford, CT: Woodland Press.

Journals and periodicals

In reference to journals or periodicals, use inclusive page numbers. Do not use the abbreviations "p." or "pp." unlike what you did in the main text of the paper or report. Take the following examples:

Heyman, K. (1997). Talk radio, talk net. *Yahoo!*, *3*, 62-83.

Maddux, K. (1997, March). True stories of the internet patrol. *NetGuide Magazine*, 88-92.

- ***Periodicals without volume numbers***

Include month and day (if any) as well as the year. Months are not abbreviated. Military style is not used for dates (not 2 April; instead, use April 2). Page numbers are not condensed (not 178-88; instead, use 178-188). Discontinuous pages are cited in full (1A, 9A; not 1A+). Take the following example:

Grover, R. (1988, September 19). A megawatt power play. *Business Week*, 34-35.

- ***Newspaper articles***

If the article is "signed" (that is, you know the author's name), begin with that author's name. (Notice the discontinuous pages.)

Poirot, C. (1998, March 17). HIV prevention pill goes beyond 'morning after'. *The Hartford Courant*, pp. F1, F6.

If the author's name is not available, begin the reference with the headline or title in the author position.

New exam for doctor of future. (1989, March 15). *The New York Times*, B-10.

Government Documents

Government documents are often used in research, especially when the topic has to do with politics, economics, legislation, and so on. In this case, the reference list shows which documents were used in the study.

1) The reference to a report from the Government Printing Office, corporate author, may look like this:

National Institute of Mental Health. (1982). *Television and behavior: Ten years of scientific progress* (DHHS Publication No. A 82-1195). Washington, DC: U.S. Government Printing Office.

2) Reports from a Document and Deposit Service (e.g., NTIS, ERIC, etc.) other than U.S. government may take the following form:

Tandy, S. (1980). *Development of behavioral techniques to control hyperaggressiveness in young children* (CYC Report No. 80-3562). Washington, DC: Council on Young Children. (NTIS No. P880-14322).

Gottfredson, L. S. (1980). *How valid are occupational reinforcer pattern scores*? (Report No. CSOS-R-292). Baltimore, MD: Johns Hopkins University. Center for Social Organization of Schools. (ERIC Document Reproduction Service No. ED 182 465)

Electronic Sources

Electronic correspondences, such as e-mail or discussions on bulletin boards or discussion groups, is regarded by APA style as personal communication (like phone conversations or memos), because it is not recoverable by others. Such instances of personal communication are cited only within the text and not on the reference page. For citing personal communications in the text, give the initials and surname of the author and provide as exact a date as possible. Take this example:

Example 1: R.W. Runyon (personal communication, April 18, 1993)

Example 2: (M. Kohel, personal communication, June 28, 1993)

However, if the information is, in fact, retrievable, the following elements are necessary for the reference page:

Author, I. (date). Title of article. *Name of periodical* : (On-line), xx.available: specify path

The *date* should be the year of publication or the most recent update. If the date of the source cannot be determined, provide the exact date of your search. Take the following example:

Sosteric, M. (1996). Electronic journals: The grand information future? *Electronic Journal of Sociology*: (On-line), *4* (1). Available: http://www.sociology.org/content/vol004.001/sosteric.html

The path information should be sufficient for someone else to retrieve the material. For example, specify the method used to find the material: the protocol (Telnet, FTP, Internet, etc.), the directory, and the file name. *Do not end the path statement with a period.*

In the following sections, examples of different types of sources, and how they should appear in the reference list, are provided. Please understand that commas, periods, underlined and italicized words, etc. are vital in listing references. So, follow them closely.

- ***Online journals, FTP***

Funder, D.C.(1994, March). Judgmental process and content: Commentary on Koehler on base-rate [9 paragraphs] *Pscyoloquy* [Online serial]. *5*(17). Available FTP: Hostname:princeton.edu Directory: pub/harnad/Psycholoquy.94.5.17.base-rate.12.funder

- ***Online articles (WWW)***

Klein, Donald F. (1997). Control group in Pharmacoptherapy and psychotherapy evaluations. *Treatment, I.* Retrieved November 16, 1997 from the World Wide Web: http://www.apa.org/treatment/vol1/97_a1.html

- ***On-line journals, subscriber-based***

Central Vein Occlusion Study Group. (1993. October 2). Central vein occlusion study of photocoagulation: Manual of operations [675 paragraphs]. Online *Journal of Current Clinical Trials* [On-line serial]. Availabe: Doc No. 92

Abstracts

Abstracts are the short synopses of long research reports that appear in one-paragraph or one-page formats. Very often they can be retrieved from online sources. Some libraries provide CD-ROMs or Microfilms that contain abstracts. Within brackets, identify the source: (e.g., [CD-ROM] or [Microfilm]). Citing reference to abstracts requires specific skills. The following examples will help.

- ***On-line abstract***

Meyer, A.S., & Bock, K.. (1992). The tip-of-the-tongue phenomenon: Blocking or partial activation? [On-line]. *Memory & Cognition*, *20*. 715-726. Abstract from: DIALOG File: PsychINFO Item: 80-16351

- ***Abstract on CD-ROMs***

Bower, DL. (1993). Employee assistant programs supervisory referrals: Characteristics of referring and nonreferring supervisors [CD-ROM]. Abstract from: Proquest File: Dissertation Abstracts Item: 9315947

Unpublished Materials

Unpublished materials are usually housed by college and university libraries. The often-referred-to materials of this kind are masters' theses and PhD dissertations.

- ***Dissertations***

When you have used the actual dissertation (usually from the shelves of the University where it was written, sometimes obtained through interlibrary loan), the reference will look like:

Darling, C. W. (1976). *Giver of due regard: the poetry of Richard Wilbur*. Unpublished doctoral dissertation, University of Connecticut, Storrs.

- ***Dissertation abstracts***

When you have used an abstract of the dissertation found on microfilm in Dissertation Abstracts International (DAI), your reference may take the following form:

Darling, C. W. (1976). Giver of due regard: the poetry of Richard Wilbur. *Dissertation Abstracts International*, *44*(02), 221A. (University Microfilms No. AAD44-8794)

For masters' theses, do the same thing. This time, you will use the phrase "Unpublished masters' thesis" in the reference instead of the phrase "Unpublished doctoral dissertation."

Bibliographies

Bibliographies are alphabetical lists of books and articles dealing with specific subjects or general areas of study; for example, the *Cambridge Bibliography of English Literature*. Although

they contain no facts themselves, bibliographies are the most complete references of where to find the facts. Most are annotated with notes about each item to indicate special qualities or usefulness.

You are seldom asked to write bibliographies because the reference list of your research report should normally include only reference to the items you actually used in your study. However, your supervisor or university may require that you prepare a bibliography in addition to the list of references of your report. If so, notice that the points discussed in sections 2 through 2.10 above must be observed.

Annotated Bibliographies

An annotated bibliography will have the same basic layout as a Reference page. However, There are three major differences. First, you can include in your bibliography works that you think would be useful to your reader that you might not have used in the writing of this particular paper or article. Second, you can break down the references into useful categories and arrange those categories in ways that you think would be helpful to your reader. Third, you can add commentary to the references, telling your reader the particular virtues (or, if necessary, the shortcomings) of that resource. Commentaries should be concise, economical summaries, written in sentence fragments; if related, fragments should be connected with semicolons. The commentary should begin on a new line, indented slightly from the preceding line.

Example:

National Institute of Mental Health. (1982). *Television and behavior: Ten years of scientific progress* (DHHS Publication No. A 82-1195). Washington, DC: U.S. Government Printing Office.

Documents connections between children's lack of attention in school and hours of television watching; provides scientific evidence of changed viewing habits over ten years.

Abbreviations and Punctuation

The APA publication manual provides very clear guidelines concerning the abbreviations and punctuation to be used throughout your report. You should check these carefully. Some commonly used abbreviations are listed here:

e.g.	for example	n	number of subjects in each group or subset of the sample
etc.	and so forth	M	mean
i.e.,	that is	SD	standard deviation
vs.	versus	ns	not significant
et al.	used when you have multiple authors and you have already provided the full citation	p	probability
N	number of subjects in the total sample	df	degrees of freedom

Punctuation Spacing

Punctuation includes commas, colons, end-of-sentence punctuation (or periods/full stops), punctuation in quotations, spaces between words, and semicolons should be closely observed in your research reports. APA style makes some suggestions for the correct use of punctuation in your reports.

Place one space after punctuation (**: ; . , ? !** etc.) because the APA now calls for one space to appear after all punctuation marks. If you are using a mono-space font (such as Courier), you may consider using two spaces after end-periods and colons, but consult your supervisor first to make sure about his/her preferences.

Coordinating Contents

The research report is made up of a number of distinct sections. These sections include the title page, abstract, introduction, method, results, discussion, references and appendix. Including all of the necessary parts of a report and putting them in the right order is the first step to making your report credible and professional. The inside of your report is divided into three main sections: the front matter, text proper, and back matter. See a detailed explanation and

breakdown of all parts of your book below, followed by a checklist to help you ensure your report includes all the necessary sections.

Front Matter

The front matter may be as simple as a single title page or table of contents or it could have multiple title pages, a detailed table of contents, and several pages for the preface and foreword.

The Title Page

The format of the title page in APA style is illustrated below. The title page should have the title of the paper centered on the page. The Short Title and page number appear at the top right of the title page. The student's name appears one double-space below the title. The institutional affiliation (name of the college or university for which the paper has been written) appears one double-space below student name. If there is no institutional affiliation, the city and state or city and country of the author should be identified instead (See figure 1).

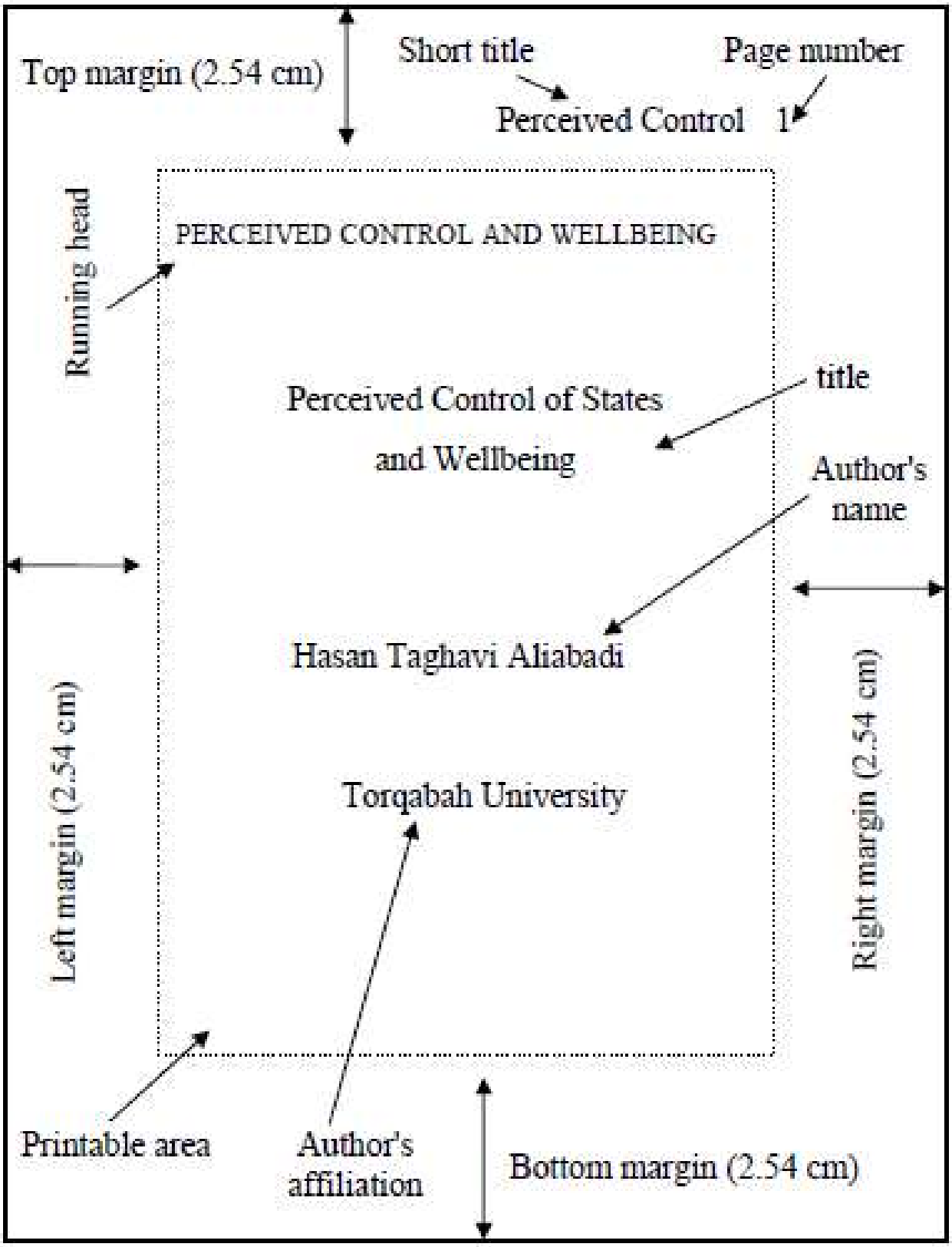


Figure 1. Appearance of title page recommended by APA

Acknowledgments

This refers to acknowledgments to publishers and authors who granted you permission to reprint their material. If the acknowledgments (or credit lines) do not appear on the text page on which the material falls, they can be grouped together on the copyright page or directly following the copyright page. (If there are many acknowledgments, they may be included in the back matter.) It is common to begin the section with a statement such as, "Grateful acknowledgment is made for use of the following material."

Dedication

It includes a dedication if you desire. A dedication is a personal message of thanks, usually given to a special person or persons who helped you on the project. Many of our authors dedicate their texts to close family members or colleagues who proved essential in writing the text. The dedication page usually follows the copyright page. (The dedication may be placed on the copyright page, if we find that we need to conserve space when we calculate the total page count.)

Preface

The preface is a selling and marketing tool and thus should be written with care. Because it should be a concise and positive statement about the book as you wrote it, it must be written last. It will be read by faculty looking for a summary of what the book is about, why you wrote it, and what is special about your text. It will also be read by sales representatives needing a quick re-briefing before making sales calls or presentations. The preface should start with the rationale or approach of your book. Be sure to discuss what makes your text unique and better than other books. What are its special features, and how will they benefit students and faculty? Also cover the supplements, if any, and describe what is special about them (your acquisitions editor can help you with this). If you are writing a revision, the preface must explain what is new to this edition and why you made the changes. Be aware of your audience. If you want to write something to students, do so in a separate preface entitled "To the Student."

Table of Contents

The table of contents (or contents) must include at least all part titles (if any), chapter titles, and first-level text heads. Check with your acquisitions editor to see if second- and, possibly, third-

level heads should be included as well. Even if second- and third-level heads will not ultimately be included in the contents, it is very helpful for us to have a complete table of contents to which we can refer throughout the production process. (Including manuscript page numbers next to heads is also useful.) Before you submit the final manuscript, double-check the contents against the manuscript to be sure that there is agreement.

In addition to the detailed table of contents, some disciplines require a brief table of contents, or brief contents, listing the front matter elements, part and chapter titles, and back matter elements. This is especially important as a quick reference if the detailed contents will include several levels of heading. Please consult your acquisitions editor or project manager if you are uncertain whether to include both types of contents.

List of Illustrations

If your book includes several key illustrations that provide information or enhance the text in some way, consider creating a page that lists them. If this material is included simply for comic relief or as a visual aid, a page listing may not be necessary. Just as with the table of contents, you won't need to list the page numbers.

List of Tables

If your book includes several key tables that provide information or enhance the text in some way, consider creating a page that lists them. If this material is included simply as a visual aid, a page listing may not be necessary. Just as with the table of contents, you won't need to list the page numbers.

List of Abbreviations or Chronology

If many abbreviations are used or if a few are used frequently, a list is useful. Its location should always be given in the table of contents. Alphabetize terms by the abbreviation, not by the spelled-out form.

Text Proper

The bulk of your book will be the text and the accompanying elements such as tables and figures. The most common text elements are listed below.

Part titles

You may choose to group your chapters into sections or parts. Parts are numbered with Arabic or Roman numerals. Part titles should be short, no more than six words long. Part titles should be included in your table of contents, and a page with each part title should be placed in its proper order in the hard copy of your manuscript.

Chapters

Chapters are numbered with Arabic numerals. Chapter titles should be kept brief, no more than 8 to 10 words long. Chapters should be of a reasonable length, generally between 40 and 80 double-spaced pages. If you have a chapter that is running longer than 80 pages, consider breaking it into two or three separate chapters.

Back Matter

Back matter includes the materials at the end of a book or report, after the text proper. Back matter continues the page numbering from the last chapter of text. The following appear most commonly in books and reports. Main components are appendices, bibliography and index. A detailed description of these contents are as below.

Appendix

Material that doesn't fit within the body of the book is often included in an appendix. In a software manual, a table of shortcuts might appear in an appendix. A craft book might have an appendix listing names, addresses, and other contact information for craft supplies and other resources mentioned in the book. A technical manual that must include lengthy warranty information might put it in an appendix instead of in the title page.

Bibliography

Often found in scholarly publications, the bibliography is a list of resources related to the subject of the book. The bibliography may list other books, magazines or specific articles, and Web sites.

Endnotes

When footnotes (see Text Block elements) are consolidated at the end of a chapter or at the end of the book, they are called endnotes.

Glossary

The glossary lists acronyms, words, and phrases relevant to the subject of the book along with a brief definition. The format may vary but two typical glossary formats are:

1 column: The glossary term in bold followed by the definition.

2 columns: The glossary term in one column with the definition across from it in the second column.

Index

Arranged alphabetically and by subject with page numbers, the index breaks the book down into all the many sub-topics and ideas covered in the body of the book. Desktop publishing software can often handle the creation of simple index pages. More complex indexing is often accomplished with third-party software and the services of a professional indexer.

Blank Pages

A blank page at the front and back of a book is called a flyleaf, or perhaps an end sheet. It's included to provide some protection to the text block in the event the cover is damaged. It is probably also included as a function of the processes associated with bookbinding. That's because a book is printed in "sections" and these are called gathers. (It is possible to see the gathers in a bound book by looking at the top or bottom of the book near the spine, or back.) Blank pages allow "evening out" the layout to make for identical gathers. Blank pages have been included to "fill out" a gather to make it like all the others and keep assembly simpler. Additionally, the flyleaves allow space for a book to be personalized or dedicated because a blank page is there, and it can be used for that purpose.

An intentionally blank page is a page that is devoid of content, and may be unexpected. Such pages may serve purposes ranging from place-holding to space-filling and content separation. Sometimes, these pages carry a notice such as, "This page is intentionally left blank." Such notices typically appear in printed works, such as legal documents, manuals and exam papers, in which the reader might otherwise suspect that the blank pages are due to a printing error and where missing pages might have serious consequences.

Summary

This chapter has largely focused on formatting and standardization of contents of any report. Special attention has been provided to citation and referencing style of various articles, books, newspapers, reports and dissertations. Additionally, the usage of footnotes and endnotes has been discussed in detail. Towards the end, content coordination has been covered in three parts namely front matter, text proper and back matter. It covers essential contents like title, preface, acknowledgment, table of contents, chapters, bibliography, appendices etc.

Glossary

Abstract: (1) Summary, usually of an article or book, also containing sufficient information for the original to be located. **(2)** Summary of the complete content of the project report.

Appendix: A supplement to the project report. It should not normally include material that is essential for the understanding of the report itself, but additional relevant material in which the reader may be interested.

Bibliography: Alphabetical list of the bibliographic details for all relevant items consulted and used, including those items not referred to directly in the text. The university will specify the format of these.

Refereed academic journal: Journal in which the articles have been evaluated by academic peers prior to publication to assess their quality and suitability. Not all academic journals are refereed.

References, list of: Bibliographic details of all items referred to directly in the text. The university will specify the format required.

Suggested Readings

Research Methodology-A Beginners,(2nd.ed.), Kumar, Ranjit, Singapore, Pearson Education. 2005.

Management Research Methodology; Integration of Principles, Methods and Techniques, Krishnaswamy, K.N., Sivakumar, Appa Iyer and Mathiranjan M., Pearson Education, New Delhi. 2006.

Research Methods for Business Students, 4th edition, Mark Saunders, Philip Lewis and Adrian Thornhill – Pearson Education – New Delhi- 2007.

Terminal and Model Questions

1. Write short note on the following.

   ii) Footnotes

   jj) Quotations

   kk) References

   ll) Citation of resources

   mm) Annotated Bibliography

2. How would you cite various documents like books, research papers etc.?
3. What do you mean by references? Explain APA style referencing system of documents.
4. Differentiate between references, bibliography and annotated bibliography.
5. Write down various components in front matter, text proper and back matter.

AN INTRODUCTION TO MULTIVARIATE STATISTICS

Structure

9.1 Learning Objectives

9.2 Meaning

9.3 Independent vs. Dependent Variables

9.4 Descriptive vs. Inferential Statistics

9.5 Categorical Variables and Log Linear Analysis
9.6 Canonical Correlation/Regression
9.7 Principal Components and Factor Analysis
9.8 Multiple Regression
9.9 Structural Equation Modeling (SEM)
9.10 Discriminant Function Analysis
9.11 Multiple Analysis Of Variance, MANOVA
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Learning Objectives

- To learn the meaning and importance of multivariate statistics
- To understand difference between univariate, bivariate and multivariate statistics.
- To know the usage of multiple regression analysis.
- To know the uses of various analysis of variance.
- To understand the concept of factor analysis.

Meaning

The term "**multivariate statistics**" is appropriately used to include all statistics where there are more than two variables simultaneously analyzed. You are already familiar with bivariate statistics such as the Pearson product moment correlation coefficient and the independent

groups *t*-test. A one-way ANOVA with 3 or more treatment groups might also be considered a bivariate design, since there are two variables: one independent variable and one dependent variable. Statistically, one could consider the one-way ANOVA as either a bivariate curvilinear regression or as a multiple regression with the *K* level categorical independent variable dummy coded into *K*-1 dichotomous variables.

Independent vs. Dependent Variables

We shall generally continue to make use of the terms "independent variable" and "dependent variable," but shall find the distinction between the two somewhat blurred in multivariate designs, especially those observational rather than experimental in nature. Classically, the independent variable is that which is manipulated by the researcher. With such control, accompanied by control of extraneous variables through means such as random assignment of subjects to the conditions, one may interpret the correlation between the dependent variable and the independent variable as resulting from a cause-effect relationship from independent (cause) to dependent (effect) variable.

Whether the data were collected by experimental or observational means is NOT a consideration in the choice of an analytic tool. Data from an experimental design can be analyzed with either an ANOVA or a regression analysis (the former being a special case of the latter) and the results interpreted as representing a cause-effect relationship regardless of which statistic was employed. Likewise, observational data may be analyzed with either an ANOVA or a regression analysis, and the results cannot be unambiguously interpreted with respect to causal relationship in either case.

We may sometimes find it more reasonable to refer to "independent variables" as "**predictors**", and "dependent variables" as "response-," "outcome-," or "**criterion-variables**."

For example, we may use SAT scores and high school GPA as predictor variables when predicting college GPA, even though we wouldn't want to say that SAT causes college GPA. In general, the independent variable is that which one considers the causal variable, the prior variable (temporally prior or just theoretically prior), or the variable on which one has data from which to make predictions.

Descriptive vs. Inferential Statistics

While psychologists generally think of multivariate statistics in terms of making inferences from a sample to the population from which that sample was randomly or representatively drawn, sometimes it may be more reasonable to consider the data that one has as the entire population of interest. In this case, one may employ multivariate descriptive statistics (for example, a multiple regression to see how well a linear model fits the data) without worrying about any of the assumptions (such as homoscedasticity and normality of conditionals or residuals) associated with inferential statistics. That is, multivariate statistics, such as R^2, can be used as descriptive statistics. In any case, psychologists rarely ever randomly sample from some population specified a priori, but often take a sample of convenience and then generalize the results to some abstract population from which the sample could have been randomly drawn.

Rank-Data

I have mentioned the assumption of normality common to "parametric" inferential statistics. Please note that ordinal data may be normally distributed and interval data may not, so scale of measurement is irrelevant. Rank-ordinal data will, however, be non-normally distributed (rectangular), so one might be concerned about the robustness of a statistic's normality assumption with rectangular data. Although this is a controversial issue, I am

moderately comfortable with rank data when there are twenty to thirty or more ranks in the sample (or in each group within the total sample).

Why (and Why Not) Should One Use Multivariate Statistics?

One might object that psychologists got along OK for years without multivariate statistics. Why the sudden surge of interest in multivariate stats? Is it just another fad? Maybe it is. There certainly do remain questions that can be well answered with simpler statistics, especially if the data were experimentally generated under controlled conditions. But many interesting research questions are so complex that they demand multivariate models and multivariate statistics. And with the greatly increased availability of high speed computers and multivariate software, these questions can now be approached by many users via multivariate techniques formerly available only to very few. There is also an increased interest recently with observational and quasi-experimental research methods. Some argue that multivariate analyses, such as ANCOV and multiple regression, can be used to provide statistical control of extraneous variables. While I opine that statistical control is a poor substitute for a good experimental design, in some situations it may be the only reasonable solution. Sometimes data arrive before the research is designed, sometimes experimental or laboratory control is unethical or prohibitively expensive, and sometimes somebody else was just plain sloppy in collecting data from which you still hope to distill some extract of truth.

But there is danger in all this. It often seems much too easy to find whatever you wish to find in any data using various multivariate fishing trips. Even within one general type of multivariate analysis, such as multiple regression or factor analysis, there may be such a variety of "ways to go" that two analyzers may easily reach quite different conclusions when independently analyzing the same data. And one analyzer may select the means that maximize e's chances of finding what e wants to find or e may analyze the data many different ways and

choose to report only that analysis that seems to support e's a priori expectations (which may be no more specific than a desire to find something "significant," that is, publishable). Bias against the null hypothesis is very great.

It is relatively easy to learn how to get a computer to do multivariate analysis. It is not so easy correctly to interpret the output of multivariate software packages. Many users doubtlessly misinterpret such output, and many consumers (readers of research reports) are being fed misinformation. I hope to make each of you a more critical consumer of multivariate research and a novice producer of such. I fully recognize that our computer can produce multivariate analyses that cannot be interpreted even by very sophisticated persons. Our perceptual world is three dimensional, and many of us are more comfortable in two dimensional space. Multivariate statistics may take us into hyperspace, a space quite different from that in which our brains (and thus our cognitive faculties) evolved.

Categorical Variables and Log Linear Analysis

We shall consider multivariate extensions of statistics for designs where we treat all of the variables as categorical. You are already familiar with the bivariate (two-way) Pearson Chi-square analysis of contingency tables. One can expand this analysis into 3 dimensional space and beyond, but the **log-linear** model covered in **Chapter 17 of Howell** is usually used for such multivariate analysis of categorical data. As a example of such an analysis consider the analysis reported by Moore, Wuensch, Hedges, & Castellow in the *Journal of Social Behavior and Personality*, 1994, *9*: 715-730. In the first experiment reported in this study mock jurors were presented with a civil case in which the female plaintiff alleged that the male defendant had sexually harassed her.

The manipulated independent variables were the physical attractiveness of the defendant (attractive or not), and the social desirability of the defendant (he was described in the one condition as being socially desirable, that is, professional, fair, diligent, motivated, personable, etc., and in the other condition as being socially undesirable, that is, unfriendly, uncaring, lazy, dishonest, etc.) A third categorical independent variable was the gender of the mock juror. One of the dependent variables was also categorical, the verdict rendered (guilty or not guilty). When all of the variables are categorical, log-linear analysis is appropriate. When it is reasonable to consider one of the variables as dependent and the others as independent, as in this study, a special type of log-linear analysis called a **LOGIT ANALYSIS** is employed. In the second experiment in this study the physical attractiveness and social desirability of the plaintiff were manipulated.

Earlier research in these authors' laboratory had shown that both the physical attractiveness and the social desirability of litigants in such cases affect the outcome (the physically attractive and the socially desirable being more favorably treated by the jurors). When only physical attractiveness was manipulated (Castellow, Wuensch, & Moore, *Journal of Social Behavior and Personality*, 1990, *5*: 547-562) jurors favored the attractive litigant, but when asked about personal characteristics they described the physically attractive litigant as being more socially desirable (kind, warm, intelligent, etc.), despite having no direct evidence about social desirability. It seems that we just assume that the beautiful are good. Was the effect on judicial outcome due directly to physical attractiveness or due to the effect of inferred social desirability? When only social desirability was manipulated (Egbert, Moore, Wuensch, & Castellow, *Journal of Social Behavior and Personality*, 1992, *7*: 569-579) the socially desirable litigants were favored, but jurors rated them as being more physically attractive than the socially undesirable litigants, despite having never seen them! It seems that we also infer that the bad are ugly. Was the effect of social desirability on judicial outcome direct or due to the effect on inferred physical attractiveness? The 1994 study attempted to address these questions by simultaneously manipulating both social desirability and physical attractiveness.

In the first experiment of the 1994 study it was found that the verdict rendered was significantly affected by the gender of the juror (female jurors more likely to render a guilty verdict), the social desirability of the defendant (guilty verdicts more likely with socially undesirable defendants), and a strange Gender x Physical Attractiveness interaction: Female jurors were more likely to find physically attractive defendants guilty, but male jurors' verdicts were not significantly affected by the defendant's physical attractiveness (but there was a nonsignificant trend for them to be more likely to find the unattractive defendant guilty). Perhaps female jurors deal more harshly with attractive offenders because they feel that they are using their attractiveness to take advantage of a woman.

The second experiment in the 1994 study, in which the plaintiff's physical attractiveness and social desirability were manipulated, found that only social desirability had a significant effect (guilty verdicts were more likely when the plaintiff was socially desirable). Measures of the strength of effect (ϕ^2) of the independent variables in both experiments indicated that the effect of social desirability was much greater than any effect of physical attractiveness, leading to the conclusion that social desirability is the more important factor—if jurors have no information on social desirability, they infer social desirability from physical attractiveness and such inferred social desirability affects their verdicts, but when jurors do have relevant information about social desirability, litigants' physical attractiveness is of relatively little importance.

Continuous Variables

We shall usually deal with multivariate designs in which one or more of the variables is considered to be continuously distributed. We shall not nit-pick on the distinction between continuous and discrete variables, as I am prone to do when lecturing on more basic topics in

statistics. If a discrete variable has a large number of values and if changes in these values can be reasonably supposed to be associated with changes in the magnitudes of some underlying construct of interest, then we shall treat that discrete variable as if it were continuous. IQ scores provide one good example of such a variable.

Canonical Correlation/Regression

Also known as multiple multiple regression or multivariate multiple regression. All other multivariate techniques may be viewed as simplifications or special cases of this "fully multivariate general linear model." We have two sets of variables (set X and set Y). We wish to create **a linear combination** of the X variables ($b_1X_1 + b_2X_2 + ... + b_pX_p$), called a **canonical variate**, that is maximally correlated with a linear combination of the Y variables ($a_1Y_1 + a_2Y_2 + ... + a_qY_q$). The coefficients used to weight the X's and the Y's are chosen with one criterion, maximize the correlation between the two linear combinations.

As an example, consider the research reported by Patel, Long, McCammon, & Wuensch (*Journal of Interpersonal Violence*, 1995, *10*: 354-366). We had two sets of data on a group of male college students. The one set was personality variables from the MMPI. One of these was the PD (psychopathically deviant) scale, Scale 4, on which high scores are associated with general social maladjustment and hostility. The second was the MF (masculinity/femininity) scale, Scale 5, on which low scores are associated with stereotypical masculinity[i]. The third was the MA (hypomania) scale, Scale 9, on which high scores are associated with overactivity, flight of ideas, low frustration tolerance, narcissism, irritability, restlessness, hostility, and difficulty with controlling impulses. The fourth MMPI variable was Scale K, which is a validity scale on which high scores indicate that the subject is "clinically defensive," attempting to present himself in a favorable light, and low scores indicate that the subject is unusually frank. The second set of variables was a pair of homonegativity variables. One was the IAH (Index of Attitudes Towards Homosexuals), designed to measure affective components of homophobia.

The second was the SBS, (Self-Report of Behavior Scale), designed to measure past aggressive behavior towards homosexuals, an instrument specifically developed for this study.

With luck, we can interpret the weights (or, even better, the **loadings**, the correlations between each canonical variable and the variables in its set) so that each of our canonical variates represents some **underlying dimension** (that is causing the variance in the observed variables of its set). We may also think of a canonical variate as a **superordinate variable**, made up of the more molecular variables in its set. After constructing the first pair of canonical variates we attempt to construct a second pair that will explain as much as possible of the (residual) variance in the observed variables, variance not explained by the first pair of canonical variates. Thus, each canonical variate of the X's is **orthogonal** to (independent of) each of the other canonical variates of the X's and each canonical variate of the Y's is **orthogonal** to each of the other canonical variates of the Y's. Construction of canonical variates continues until you can no longer extract a pair of canonical variates that accounts for a significant proportion of the variance. The maximum number of pairs possible is the smaller of the number of X variables or number of Y variables.

In the Patel et al. study both of the canonical correlations were significant. The first canonical correlation indicated that high scores on the SBS and the IAH were associated with stereotypical masculinity (low Scale 5), frankness (low Scale K), impulsivity (high Scale 9), and general social maladjustment and hostility (high Scale 4). The second canonical correlation indicated that having a low IAH but high SBS (not being homophobic but nevertheless aggressing against gays) was associated with being high on Scales 5 (not being stereotypically masculine) and 9 (impulsivity). The second canonical variate of the homonegativity variables seems to reflect a general (not directed towards homosexuals) aggressiveness.

Principal Components and Factor Analysis

Here we start out with one set of variables. The variables are generally correlated with one another. We wish to reduce the (large) number of variables to a smaller number of **components or factors** (I'll explain the difference between components and factors when we study this in detail) that capture most of the variance in the observed variables. Each factor (or component) is estimated as being a linear (weighted) combination of the observed variables. We could extract as many factors as there are variables, but generally most of them would contribute little, so we try to get a few factors that capture most of the variance. Our initial extraction generally includes the restriction that the factors be orthogonal, independent of one another.

Consider the analysis reported by Chia, Wuensch, Childers, Chuang, Cheng, Cesar-Romero, & Nava in the *Journal of Social Behavior and Personality*, 1994, *9*, 249-258. College students in Mexico, Taiwan, and the US completed a 45 item Cultural Values Survey. A principal components analysis produced seven components (each a linear combination of the 45 items) which explained in the aggregate 51% of the variance in the 45 items. We could have explained 100% of the variance with 45 components, but the purpose of the PCA is to explain much of the variance with relatively few components. Imagine a **plot in seven dimensional space** with seven perpendicular (orthogonal) axes. Each axis represents one component. For each variable I plot a point that represents its loading (correlation) with each component. With luck I'll have seven "clusters" of dots in this hyperspace (one for each component). I may be able to improve my solution by rotating the axes so that each one more nearly passes through one of the clusters. I may do this by an **orthogonal rotation** (keeping the axes perpendicular to one another) or by an **oblique rotation**. In the latter case I allow the axes to vary from perpendicular, and as a result, the components obtained are no longer independent of one another. This may be quite reasonable if I believe the underlying dimensions (that correspond to the extracted components) are correlated with one another.

With luck (or after having tried many different extractions/rotations), I'll come up with a set of loadings that can be interpreted sensibly (that may mean finding what I expected to find). From consideration of which items loaded well on which components, I named the components Family Solidarity (respect for the family), Executive Male (men make decisions, women are homemakers), Conscience (important for family to conform to social and moral standards), Equality of the Sexes (minimizing sexual stereotyping), Temporal Farsightedness (interest in the future and the past), Independence (desire for material possessions and freedom), and Spousal Employment (each spouse should make decisions about his/her own job). Now, using weighting coefficients obtained with the analysis, I computed for each subject a score that estimated how much of each of the seven dimensions e had. These **component scores** were then used as dependent variables in 3 x 2 x 2, Culture x Sex x Age (under 20 vs. over 20) ANOVAs. US students (especially the women) stood out as being sexually egalitarian, wanting independence, and, among the younger students, placing little importance on family solidarity. The Taiwanese students were distinguished by scoring very high on the temporal farsightedness component but low on the conscience component. Among Taiwanese students the men were more sexually egalitarian than the women and the women more concerned with independence than were the men. The Mexican students were like the Taiwanese in being concerned with family solidarity but not with sexual egalitarianism and independence, but like the US students in attaching more importance to conscience and less to temporal farsightedness. Among the Mexican students the men attached more importance to independence than did the women.

Factor analysis also plays a prominent role in **test construction**. For example, I factor analyzed subjects' scores on the 21 items in Patel's SBS discussed earlier. Although the instrument was designed to measure a single dimension, my analysis indicated that three dimensions were being measured. The first factor, on which 13 of the items loaded well, seemed to reflect avoidance behaviors (such as moving away from a gay, staring to communicate disapproval of proximity, and warning gays to keep away). The second factor (six

items) reflected aggression from a distance (writing anti-gay graffiti, damaging a gay's property, making harassing phone calls). The third factor (two items) reflected up-close aggression (physical fighting). Despite this evidence of three factors, item analysis indicated that the instrument performed well as a measure of a single dimension. **Item-total correlations** were good for all but two items. **Cronbach's alpha** was .91, a value which could not be increased by deleting from the scale any of the items. Cronbach's alpha is considered a measure of the **reliability or internal consistency** of an instrument. It can be thought of as the mean of all possible **split-half** reliability coefficients (correlations between scores on half of the items vs. the other half of the items, with the items randomly split into halves) with the Spearman-Brown correction (a correction for the reduction in the correlation due to having only half as many items contributing to each score used in the split-half reliability correlation coefficient—reliability tends to be higher with more items, *ceteris paribus*). Please read the document Cronbach's Alpha and Maximized Lambda4. Follow the instructions there to conduct an item analysis with SAS and with SPSS. Bring your output to class for discussion.

Multiple Regression

In a standard multiple regression we have one continuous Y variable and two or more continuous X variables. Actually, the X variables may include dichotomous variables and/or categorical variables that have been "dummy coded" into dichotomous variables. The goal is to construct a linear model that minimizes error in predicting Y. That is, we wish to create a linear combination of the X variables that is maximally correlated with the Y variable. We obtain standardized regression coefficients (**β weights** $\Rightarrow$ $\hat{Z}_Y = \beta_1 Z_1 + \beta_2 Z_2 + \cdots + \beta_p Z_p$**)** that represent how large an "effect" each X has on Y above and beyond the effect of the other X's in the model. We may use some a priori **hierarchical** structure to build the model (enter first X_1, then X_2, then X_3, etc., each time seeing how much adding the new X improves the model, or, start with all X's, then first delete X_1, then delete X_2, etc., each time seeing how much deletion of an X affects the model). We may just use a statistical algorithm (one of several sorts of

stepwise selection) to build what we hope is the "best" model using some subset of the total number of X variables available.

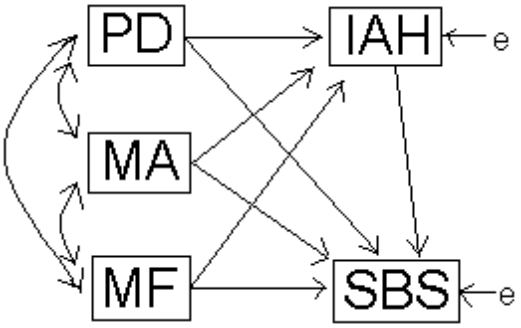
For example, I may wish to predict college GPA from high school grades, SATV, SATQ, score on a "why I want to go to college" essay, and quantified results of an interview with an admissions officer. Since some of these measures are less expensive than others, I may wish to give them priority for entry into the model. I might also give more "theoretically important" variables priority. I might also include sex and race as predictors. I can also enter interactions between variables as predictors, for example, SATM x SEX, which would be literally represented by an X that equals the subject's SATM score times e's sex code (typically 0 vs. 1 or 1 vs. 2). I may fit nonlinear models by entering transformed variables such as LOG(SATM) or SAT^2. We shall explore lots of such fun stuff later.

As an example of a multiple regression analysis, consider the research reported by McCammon, Golden, and Wuensch in the *Journal of Research in Science Teaching*, 1988, *25*, 501-510. Subjects were students in freshman and sophomore level Physics courses (only those courses that were designed for science majors, no general education <football physics> courses). The mission was to develop a model to predict performance in the course. The predictor variables were CT (the Watson-Glaser Critical Thinking Appraisal), PMA (Thurstone's Primary Mental Abilities Test), ARI (the College Entrance Exam Board's Arithmetic Skills Test), ALG (the College Entrance Exam Board's Elementary Algebra Skills Test), and ANX (the Mathematics Anxiety Rating Scale). The criterion variable was subjects' scores on course examinations. All of the predictor variables were significantly correlated with one another and with the criterion variable. A simultaneous multiple regression yielded a **multiple *R*** of .40 (which is more impressive if you consider that the data were collected across several sections of different courses with different instructors). Only ALG and CT had significant **semipartial correlations** (indicating that they explained variance in the criterion that was not explained by any of the other predictors). Both **forward and backwards selection** analyses produced a

model containing only ALG and CT as predictors. At Susan McCammon's insistence, I also separately analyzed the data from female and male students. Much to my surprise I found a remarkable sex difference. Among female students every one of the predictors was significantly related to the criterion, among male students none of the predictors was. There were only small differences between the sexes on variance in the predictors or the criterion, so it was not a case of there not being sufficient variability among the men to support covariance between their grades and their scores on the predictor variables. A posteriori searching of the literature revealed that Anastasi (*Psychological Testing*, 1982) had noted a relatively consistent finding of sex differences in the predictability of academic grades, possibly due to women being more conforming and more accepting of academic standards (better students), so that women put maximal effort into their studies, whether or not they like the course, and according they work up to their potential. Men, on the other hand, may be more fickle, putting forth maximum effort only if they like the course, thus making it difficult to predict their performance solely from measures of ability.

Structural Equation Modeling (SEM)

This is a special form of hierarchical multiple regression analysis in which the researcher specifies a particular **causal model** in which each variable affects one or more of the other variables both directly and through its effects upon intervening variables. The less complex models use only **unidirectional paths** (if X_1 has an effect on X_2, then X_2 cannot have an effect on X_1) and include only **measured variables**. Such an analysis is referred to as a **path analysis**.



Patel's data, discussed earlier, were originally analyzed (in her thesis) with a path analysis. The model was that the MMPI scales were noncausally correlated with one another but had direct causal effects on both IAH and SBS, with IAH having a direct causal effect on SBS. The path analysis was not well

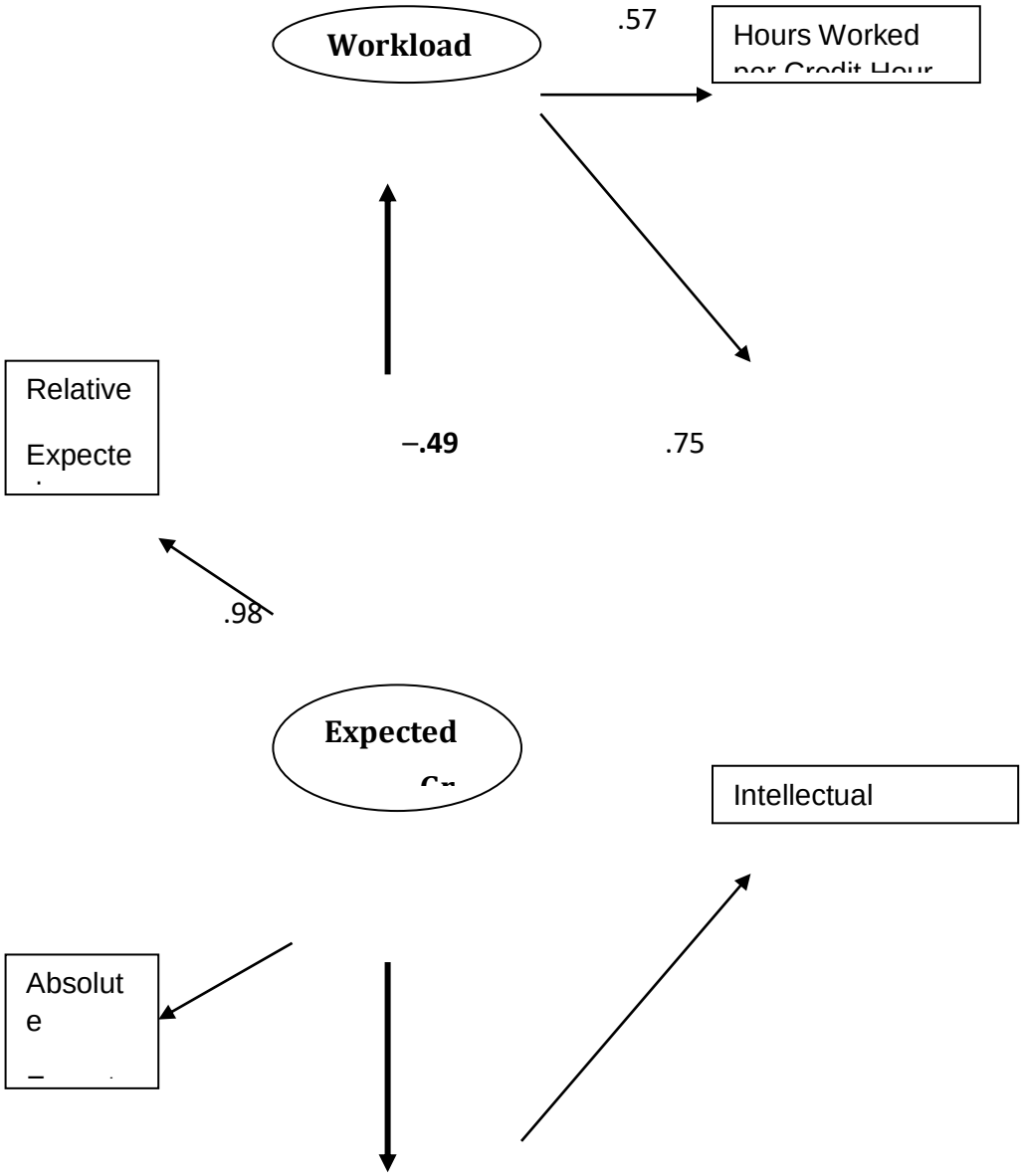
received by reviewers the first journal to which we sent the manuscript, so we reanalyzed the data with the atheoretical canonical correlation/regression analysis presented earlier and submitted it elsewhere. Reviewers of that revised manuscript asked that we supplement the canonical correlation/regression analysis with a hierarchical multiple regression analysis (essentially a path analysis).

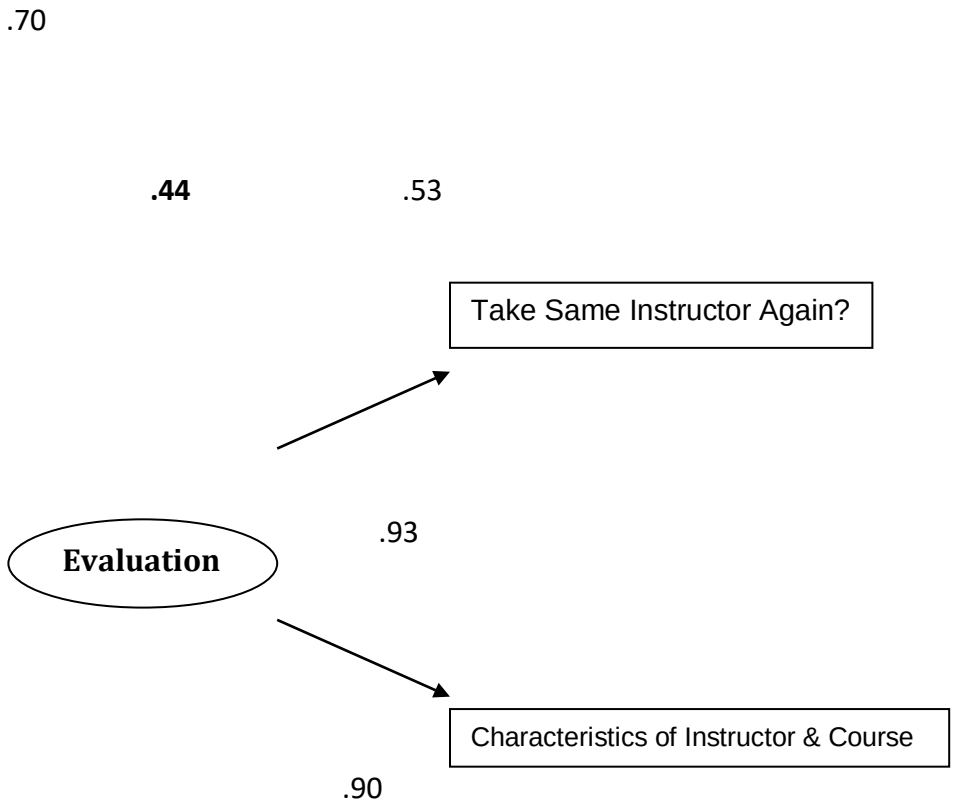
In a path analysis one obtains **path coefficients**, measuring the strength of each path (each causal or noncausal link between one variable and another) and one assesses how well the model fits the data. The arrows from 'e' represent error variance (the effect of variables not included in the model). One can compare two different models and determine which one better fits the data. Our analysis indicated that the only significant paths were from MF to IAH (–.40) and from MA (.25) and IAH (.4) to SBS.

SEM can include **latent variables (factors)**, constructs that are not directly measured but rather are inferred from measured variables (**indicators**). **Confirmatory factor analysis** can be considered a special case of SEM. In confirmatory factor analysis the focus is on testing an a priori model of the factor structure of a group of measured variables. Tabachnick and Fidell (5th edition) present an example (pages 732 - 749) in which the tested model hypothesizes that intelligence in learning disabled children, as estimated by the WISC, can be represented by two factors (possibly correlated with one another) with a particular simple structure (relationship between the indicator variables and the factors).

The relationships between latent variables are referred to as the structural part of a model (as opposed to the measurement part, which is the relationship between latent variables and measured variables). As an example of SEM including latent variables, consider the research by Greenwald and Gillmore (*Journal of Educational Psychology*, 1997, *89*, 743-751) on the validity of student ratings of instruction. Their analysis indicated that when students expect

to get better grades in a class they work less on that class and evaluate the course and the instructor more favorably. The indicators (measured variables) for the Workload latent variable were questions about how much time the students spent on the course and how challenging it was. Relative expected grade (comparing the grade expected in the rated course with that the student usually got in other courses) was a more important indicator of the Expected Grade latent variable than was absolute expected grade. The Evaluation latent variable was indicated by questions about challenge, whether or not the student would take this course with the same instructor if e had it to do all over again, and assorted items about desirable characteristics of the instructor and course.





Greenwald's research suggests that instructors who have lenient grading policies will get good evaluations but will not motivate their students to work hard enough to learn as much as they do with instructors whose less lenient grading policies lead to more work but less favorable evaluations.

Discriminant Function Analysis

This is essentially a multiple regression where the Y variable is a categorical variable. You wish to develop a set of **discriminant functions** (weighted combinations of the predictors) that will enable you to **predict** into which **group** (level of the categorical variable) a subject falls, based on e's scores on the X variables (several continuous variables, maybe with some dichotomous and/or dummy coded variables). The total possible number of discriminant functions is one less than the number of groups, or the number of predictor variables, whichever is less. Generally only a few of the functions will do a good job of discriminating group membership. The second function, orthogonal to the first, uses variance not already used by the first, the third uses the residuals from the first and second, etc. One may think of the resulting functions as dimensions on which the groups differ, but one must remember that the weights are chosen to **maximize the discrimination among groups**, not to make sense to you. **Standardized discriminant function coefficients** (weights) and **loadings** (correlations between discriminant functions and predictor variables) may be used to label the functions. One might also determine how well a function separates each group from all the rest to help label the function. It is possible to do hierarchical/stepwise analysis and factorial (more than one grouping variable) analysis.

As a rather nasty example, consider what the IRS does with the data they collect from "random audits" of taxpayers. From each taxpayer they collect data on a number of predictor variables (gross income, number of exemptions, amount of deductions, age, occupation, etc.) and one classification variable, is the taxpayer a cheater (underpaid e's taxes) or honest. From these data they develop a discriminant function model to predict whether or not a return is likely fraudulent. Next year their computers automatically test every return, and if yours fits the profile of a cheater's you are called up for a "discriminant analysis" audit. Of course, the details of the model are a closely guarded secret, since if a cheater knew the discriminant function e could prepare his return with the maximum amount of cheating that would result in e's (barely) not being classified as a cheater.

As another example, consider the research done by Poulson, Braithwaite, Brondino, and Wuensch (1997, *Journal of Social Behavior and Personality*, *12*, 743-758). Subjects watched a simulated trial in which the defendant was accused of murder and was pleading insanity. There was so little doubt about his having killed the victim that none of the jurors voted for a verdict of not guilty. Aside from not guilty, their verdict options were Guilty, NGRI (not guilty by reason of insanity), and GBMI (guilty but mentally ill). Each mock juror filled out a questionnaire, answering 21 questions (from which 8 predictor variables were constructed) about e's attitudes about crime control, the insanity defense, the death penalty, the attorneys, and e's assessment of the expert testimony, the defendant's mental status, and the possibility that the defendant could be rehabilitated. To avoid problems associated with **multicollinearity** among the 8 predictor variables (they were very highly correlated with one another, and such multicollinearity can cause problems in a multivariate analysis), the scores on the 8 predictor variables were subjected to a principal components analysis, with the resulting orthogonal components used as predictors in a discriminant analysis. The verdict choice (Guilty, NGRI, or GBMI) was the criterion variable.

Both of the discriminant functions were significant. The **first function** discriminated between jurors choosing a guilty verdict and subjects choosing a NGRI verdict. Believing that the defendant was mentally ill, believing the defense's expert testimony more than the prosecution's, being receptive to the insanity defense, opposing the death penalty, believing that the defendant could be rehabilitated, and favoring lenient treatment were associated with rendering a NGRI verdict. Conversely, the opposite orientation on these factors was associated with rendering a guilty verdict. The **second function** separated those who rendered a GBMI verdict from those choosing Guilty or NGRI. Distrusting the attorneys (especially the prosecution attorney), thinking rehabilitation likely, opposing lenient treatment, not being receptive to the insanity defense, and favoring the death penalty were associated with rendering a GBMI verdict rather than a guilty or NGRI verdict.

Multiple Analysis Of Variance, MANOVA

This is essentially a DFA turned around. You have two or more continuous Y's and one or more categorical X's. You may also throw in some continuous X's (covariates, giving you a MANCOVA, multiple analysis of covariance). The most common application of MANOVA in psychology is as a device to guard against inflation of **familywise alpha** when there are **multiple dependent variables**. The logic is the same as that of the protected *t*-test, where an omnibus ANOVA on your *K*-level categorical X must be significant before you make pairwise comparisons among your *K* groups' means on Y. You do a MANOVA on your multiple Y's. If it is significant, you may go on and do univariate ANOVAs (one on each Y), if not, you stop. In a factorial analysis, you may follow-up any effect which is significant in the MANOVA by doing univariate analyses for each such effect.

As an example, consider the MANOVA I did with data from a simulated jury trial with Taiwanese subjects (see Wuensch, Chia, Castellow, Chuang, & Cheng, *Journal of Cross-Cultural Psychology*, 1993, *24*, 414-427). The same experiment had earlier been done with American subjects. X's consisted of whether or not the defendant was physically attractive, sex of the defendant, type of alleged crime (swindle or burglary), culture of the defendant (American or Chinese), and sex of subject (juror). Y's consisted of length of sentence given the defendant, rated seriousness of the crime, and ratings on 12 attributes of the defendant. I did two MANOVAs, one with length of sentence and rated seriousness of the crime as Y's, one with ratings on the 12 attributes as Y's. On each I first inspected the MANOVA. For each effect (main effect or interaction) that was significant on the MANOVA, I inspected the univariate

analyses to determine which Y's were significantly associated with that effect. For those that were significant, I conducted follow-up analyses such as simple interaction analyses and simple main effects analyses. A brief summary of the results follows: Female subjects gave longer sentences for the crime of burglary, but only when the defendant was American; attractiveness was associated with lenient sentencing for American burglars but with stringent sentencing for American swindlers (perhaps subjects thought that physically attractive swindlers had used their attractiveness in the commission of the crime and thus were especially deserving of punishment); female jurors gave more lenient sentences to female defendants than to male defendants; American defendants were rated more favorably (exciting, happy, intelligent, sociable, strong) than were Chinese defendants; physically attractive defendants were rated more favorably (attractive, calm, exciting, happy, intelligent, warm) than were physically unattractive defendants; and the swindler was rated more favorably (attractive, calm, exciting, independent, intelligent, sociable, warm) than the burglar.

In MANOVA the Y's are weighted to maximize the correlation between their linear combination and the X's. A different linear combination (**canonical variate**) is formed **for each** effect (main effect or interaction—in fact, a different linear combination is formed for each **treatment *df***—thus, if an independent variable consists of four groups, three *df*, there are three different linear combinations constructed to represent that effect, each orthogonal to the others). **Standardized discriminant function coefficients** (weights for predicting X from the Y's) and **loadings** (for each linear combination of Y's, the correlations between the linear combination and the Y's themselves) may be used better to define the effects of the factors and their interactions. One may also do a "stepdown analysis" where one enters the Y's in an a priori order of importance (or based solely on statistical criteria, as in stepwise multiple regression). At each step one evaluates the contribution of the newly added Y, above and beyond that of the Y's already entered.

As an example of an analysis which uses more of the multivariate output than was used with the example two paragraphs above, consider again the research done by Moore, Wuensch, Hedges, and Castellow (1994, discussed earlier under the topic of log-linear analysis). Recall that we manipulated the physical attractiveness and social desirability of the litigants in a civil case involving sexual harassment. In each of the experiments in that study we had subjects fill out a rating scale, describing the litigant (defendant or plaintiff) whose attributes we had manipulated. This analysis was essentially a manipulation check, to verify that our manipulations were effective. The rating scales were nine-point scales, for example,

Awkward								Poised
1	2	3	4	5	6	7	8	9

There were 19 attributes measured for each litigant. The data from the 19 variables were used as dependent variables in a three-way MANOVA (social desirability manipulation, physical attractiveness manipulation, gender of subject). In the first experiment, in which the physical attractiveness and social desirability of the defendant were manipulated, the MANOVA produced significant effects for the social desirability manipulation and the physical attractiveness manipulation, but no other significant effects. The canonical variate maximizing the effect of the <u>social desirability</u> manipulation loaded most heavily ($r > .45$) on the ratings of sociability ($r = .68$), intelligence ($r = .66$), warmth ($r = .61$), sensitivity ($r = .50$), and kindness ($r = .49$). Univariate analyses indicated that compared to the socially undesirable defendant, the socially desirable defendant was rated significantly more poised, modest, strong, interesting, sociable, independent, warm, genuine, kind, exciting, sexually warm, secure, sensitive, calm, intelligent, sophisticated, and happy. Clearly the social desirability manipulation was effective.

The canonical variate that maximized the effect of the physical attractiveness manipulation loaded heavily only on the physical attractiveness ratings (r = .95), all the other loadings being less than .35. The mean physical attractiveness ratings were 7.12 for the physically attractive defendant and 2.25 for the physically unattractive defendant. Clearly the physical attractiveness manipulation was effective. Univariate analyses indicated that this manipulation had significant effects on several of the ratings variables. Compared to the physically unattractive defendant, the physically attractive defendant was rated significantly more poised, strong, interesting, sociable, physically attractive, warm, exciting, sexually warm, secure, sophisticated, and happy.

In the second experiment, in which the physical attractiveness and social desirability of the plaintiff were manipulated, similar results were obtained. The canonical variate maximizing the effect of the social desirability manipulation loaded most heavily (r > .45) on the ratings of intelligence (r = .73), poise (r = .68), sensitivity (r = .63), kindness (r = .62), genuineness (r = .56), warmth (r = .54), and sociability (r = .53). Univariate analyses indicated that compared to the socially undesirable plaintiff the socially desirable plaintiff was rated significantly more favorably on all nineteen of the adjective scale ratings.

The canonical variate that maximized the effect of the physical attractiveness manipulation loaded heavily only on the physical attractiveness ratings (r = .84), all the other loadings being less than .40. The mean physical attractiveness ratings were 7.52 for the physically attractive plaintiff and 3.16 for the physically unattractive plaintiff. Univariate analyses indicated that this manipulation had significant effects on several of the ratings variables. Compared to the physically unattractive plaintiff the physically attractive plaintiff was rated significantly more poised, interesting, sociable, physically attractive, warm, exciting, sexually warm, secure, sophisticated, and happy.

Logistic Regression

Logistic regression is used to predict a categorical (usually dichotomous) variable from a set of predictor variables. With a categorical dependent variable, discriminant function analysis is usually employed if all of the predictors are continuous and nicely distributed; logit analysis is usually employed if all of the predictors are categorical; and logistic regression is often chosen if the predictor variables are a mix of continuous and categorical variables and/or if they are not nicely distributed (logistic regression makes no assumptions about the distributions of the predictor variables). Logistic regression has been especially popular with medical research in which the dependent variable is whether or not a patient has a disease.

For a logistic regression, the predicted dependent variable is the estimated probability that a particular subject will be in one of the categories (for example, the probability that Suzie Cue has the disease, given her set of scores on the predictor variables).

As an example of the use of logistic regression in psychological research, consider the research done by Wuensch and Poteat and published in the *Journal of Social Behavior and Personality*, 1998, *13*, 139-150. College students (N = 315) were asked to pretend that they were serving on a university research committee hearing a complaint against animal research being conducted by a member of the university faculty. Five different research scenarios were used: Testing cosmetics, basic psychological theory testing, agricultural (meat production) research, veterinary research, and medical research. Participants were asked to decide whether or not the research should be halted. An ethical inventory was used to measure participants' idealism (persons who score high on idealism believe that ethical behavior will always lead only to good consequences, never to bad consequences, and never to a mixture of good and bad consequences) and relativism (persons who score high on relativism reject the notion of universal moral principles, preferring personal and situational analysis of behavior).

Since the dependent variable was dichotomous (whether or not the respondent decided to halt the research) and the predictors were a mixture of continuous and categorical variables (idealism score, relativism score, participant's gender, and the scenario given), logistic regression was employed. The scenario variable was represented by $k-1$ dichotomous dummy variables, each representing the contrast between the medical scenario and one of the other scenarios. Idealism was negatively associated and relativism positively associated with support for animal research. Women were much less accepting of animal research than were men. Support for the theoretical and agricultural research projects was significantly less than that for the medical research.

In a logistic regression, **odds ratios** are commonly employed to measure the strength of the partial relationship between one predictor and the dependent variable (in the context of the other predictor variables). It may be helpful to consider a simple univariate odds ratio first. Among the male respondents, 68 approved continuing the research, 47 voted to stop it, yielding odds of 68 / 47. That is, approval was 1.45 times more likely than nonapproval. Among female respondents, the odds were 60 / 140. That is, approval was only .43 times as likely as was nonapproval. Inverting these odds (odds less than one are difficult for some people to comprehend), among female respondents nonapproval was 2.33 times as likely as approval. The ratio of these odds, $\frac{68 \div 47}{60 \div 140} = 3.38$, indicates that a man was 3.38 times more likely to approve the research than was a woman.

The odds ratios provided with the output from a logistic regression are for partial effects, that is, the effect of one predictor holding constant the other predictors. For our example research, the odds ratio for gender was 3.51. That is, holding constant the effects of

all other predictors, men were 3.51 times more likely to approve the research than were women.

The odds ratio for idealism was 0.50. Inverting this odds ratio for easier interpretation, for each one point increase on the idealism scale there was a doubling of the odds that the respondent would not approve the research. The effect of relativism was much smaller than that of idealism, with a one point increase on the nine-point relativism scale being associated with the odds of approving the research increasing by a multiplicative factor of 1.39. Inverted odds ratios for the dummy variables coding the effect of the scenario variable indicated that the odds of approval for the medical scenario were 2.38 times higher than for the meat scenario and 3.22 times higher than for the theory scenario.

Classification: The results of a logistic regression can be used to predict into which group a subject will fall, given the subject's scores on the predictor variables. For a set of scores on the predictor variables, the model gives you the estimated probability that a subject will be in group 1 rather than in group 2. You need a **decision rule** to determine into which group to classify a subject given that estimated probability. While the most obvious decision rule would be to classify the subject into group 1 if $p > .5$ and into group 2 if $p < .5$, you may well want to choose a different decision rule given the relative seriousness of making one sort of error (for example, declaring a patient to have the disease when she does not) or the other sort of error (declaring the patient not to have the disease when she does). For a given decision rule (for example, classify into group 1 if $p > .7$) you can compute several measures of how effective the classification procedure is. The **Percent Correct** is based on the number of correct classifications divided by the total number of classifications. The **Sensitivity** is the percentage of occurrences correctly predicted (for example, of all who actually have the disease, what percentage were correctly predicted to have the disease). The **Specificity** is the percentage of nonoccurrences correctly predicted (of all who actually are free of the disease, what percentage were correctly predicted not to have the disease). Focusing on error rates, the **False Positive** rate is the percentage of predicted occurrences which are incorrect (of all who were predicted to have the disease, what percentage actually did not have the disease), and the **False Negative** rate is the

percentage of predicted nonoccurrences which are incorrect (of all who were predicted not to have the disease, what percentage actually did have the disease). For a screening test to detect a potentially deadly disease (such as breast cancer), you might be quite willing to use a decision rule that makes false positives fairly likely, but false negatives very unlikely. I understand that the false positive rate with mammograms is rather high. That is to be expected in an initial screening test, where the more serious error is the false negative. Although a false positive on a mammogram can certainly cause a woman some harm (anxiety, cost and suffering associated with additional testing), it may be justified by making it less likely that tumors will go undetected. Of course, a positive on a screening test is followed by additional testing, usually more expensive and more invasive, such as collecting tissue for biopsy.

For our example research, the overall percentage correctly classified is 69% with a decision rule being "if $p > .5$, predict the respondent will support the research." A slightly higher overall percentage correct (71%) would be obtained with the rule "if $p > .4$, predict support" (73% sensitivity, 70% specificity) or with the rule "if $p > .54$, predict support" (52% sensitivity, 84% specificity).

Least Squares ANOVA

An ANOVA may be done as a multiple regression, with the categorical X's coded as "dummy variables." A *K*-level X is represented by ***K*-1 dichotomous dummy variables**. An **interaction** between two X's is represented by **products** of the main effects X's. For example, were factors A and B both dichotomous, we could code A with X_1 (0 or 1), B with X_2 (0 or 1), and A x B with X_3, where X_3 equals X_1 times X_2. Were A dichotomous and B had three levels, the main effect of B would require two dummy variables, X_2 and X_3, and the A x B interaction would require two more dummy variables, X_4 (the product of X_1 and X_2) and X_5 (the product of X_1 and X_3). [Each effect will require as many dummy variables as the *df* it has.] In the multiple regression the *SS* due to X_1 would be the SS_A, the SS_B would be the combined *SS* for X_2 and X_3, and the interaction *SS* would be the combined *SS* for X_4 and X_5. There are various ways we can partition the *SS*, but we shall generally want to use **Overall and Spiegel's Method I**, where each

effect is partialled for all other effects. That is, for example, SS_A is the *SS* that is due solely to A (the increase in the SS_{reg} when we added A's dummy variable(s) to a model that already includes all other effects). Any variance in Y that is ambiguous (could be assigned to more than one effect) is disregarded. There will, of course, be such ambiguous variance only when the independent variables are nonorthogonal (correlated, as indicated by the unequal cell sizes). Overall and Spiegel's Method I least-squares ANOVA is the method that is approximated by the "by hand" unweighted means ANOVA that you learned earlier.

ANCOVA

In the analysis of covariance you enter one or more **covariates** (usually continuous, but may be dummy coded categorical variables) into the multiple correlation before you enter the primary independent variable(s). This essentially **adjusts the Y-scores** to what they would be (based on the correlation between Y and the covariates) if all subjects had the same score on the covariate(s). This statistically removes (some of) the variance in Y due to the covariate(s). Since that variance would otherwise go into the error term, **power** should be increased. Again, the effect of each factor or interaction is the increase in the SS_{reg} when that factor is added to a model that already contains all of the other factors and interactions and all of the covariates. Let me remind you again that **if your factors are correlated with the covariate(s)**, which is quite likely if the factors are nonexperimental (not manipulated) or if the covariates are measured after the manipulations of the factors are accomplished (and those manipulations change subjects' scores on the covariates), then removing the effects of the covariates may also remove some of the effects of the factors, which may not be what you wanted to do.

Typically the psychologist considers the continuous covariates to be nuisance variables, whose effects are to be removed prior to considering the effects of categorical "independent" variables. But the same model can be used to predict scores on a continuous dependent variable from a mixture of continuous and categorical predictor variables, even when the

researcher does not consider the continuous "covariates" to be nuisance variables. For example, consider the study by Wuensch and Poteat discussed earlier as an example of logistic regression. A second dependent variable was respondents' scores on a justification variable (after reading the case materials, each participant was asked to rate on a 9-point scale how justified the research was, from "not at all" to "completely"). We used an ANCOV model to predict justification scores from idealism, relativism, gender, and scenario. Although the first two predictors were continuous ("covariates"), we did not consider them to be nuisance variables, we had a genuine interest in their relationship with the dependent variable. A brief description of the results of the ANCOV follows:

There were no significant interactions between predictors, but each predictor had a significant main effect. Idealism was negatively associated with justification, $\beta = -0.32$, $r = -0.36$, $F(1, 303) = 40.93$, $p < .001$, relativism was positively associated with justification, $\beta = .20$, $r = .22$, $F(1, 303) = 15.39$, $p < .001$, mean justification was higher for men ($M = 5.30$, $SD = 2.25$) than for women ($M = 4.28$, $SD = 2.21$), $F(1, 303) = 13.24$, $p < .001$, and scenario had a significant omnibus effect, $F(4, 303) = 3.61$, $p = .007$. Using the medical scenario as the reference group, the cosmetic and the theory scenarios were found to be significantly less justified.

Multivariate Approach to Repeated Measures: MANOVA

Analyses of variance which have one or more repeated measures (within-subjects, correlated samples) factors have a **sphericity assumption**: the standard error of the difference between pairs of means is constant across all pairs of means. That is, for comparing the mean at any one level of the repeated factor versus any other level of the repeated factor, the σ_{diff} is the same as it would be for any other pair of levels of the repeated factor. Howell (page 443 of the 6th edition of *Statistical Methods for Psychology*) discusses **compound symmetry**, a somewhat more restrictive assumption. There are adjustments (of degrees of freedom) to correct for violation of the sphericity assumption, but at a cost of lower power. A better

solution might be a multivariate approach to repeated measures designs, which does not have such a sphericity assumption. In the multivariate approach the effect of a repeated measures dimension (for example, whether this score represents Suzie Cue's headache duration during the first, second, or third week of treatment) is coded by computing $k-1$ difference scores (one for each degree of freedom for the repeated factor) and then treating those difference scores as dependent variables in a MANOVA.

You are already familiar with the basic concepts of main effects, interactions, and simple effects from our study of independent samples ANOVA. We remain interested in these same sorts of effects in ANOVA with repeated measures, but we must do the analysis differently. While it might be reasonable to conduct such an analysis by hand when the design is quite simple, typically computer analysis will be employed.

If your ANOVA design has one or more repeated factors and multiple dependent variables, then you can do a **doubly multivariate analysis**, with the effect of the repeated factor being represented by a set of $k-1$ difference scores for each of the two or more dependent variables. For example, consider my study on the effects of cross-species rearing of house mice (*Animal Learning & Behavior*, 1992, *20*, 253-258). Subjects were house mice that had been reared by house mice, deer mice, or Norway rats. The species of the foster mother was a between-subjects (independent samples) factor. I tested them in an apparatus where they could visit four tunnels: One scented with clean pine shavings, one scented with the smell of house mice, one scented with the smell of deer mice, and one scented with the smell of rats. The scent of the tunnel was a within-subjects factor, so I had a mixed factorial design (one or more between-subjects factor, one or more within-subjects factor). I had three dependent variables: The latency until the subject first entered each tunnel, how many visits the subject made to each tunnel, and how much time each subject spent in each tunnel. Since the doubly multivariate analysis indicated significant effects (interaction between species of the foster

mother and scent of the tunnel, as well as significant main effects of each factor), **singly multivariate ANOVA** (that is, on one dependent variable at a time, but using the multivariate approach to code the repeated factor) was conducted on each dependent variable (latency, visits, and time). The interaction was significant for each dependent variable, so simple main effects analyses were conducted. The basic finding (somewhat simplified here) was that with respect to the rat-scented tunnel, those subjects who had been reared by a rat had shorter latencies to visit the tunnel, visited that tunnel more often, and spent more time in that tunnel. If you consider that rats will eat house mice, it makes good sense for a house mouse to be disposed not to enter tunnels that smell like rats. Of course, my rat-reared mice may have learned to associate the smell of rat with obtaining food (nursing from their rat foster mother) rather than being food!

Cluster Analysis

In a cluster analysis the goal is to cluster cases (research units) into groups that share similar characteristics. Contrast this goal with the goal of principal components and factor analysis, where one groups variables into components or factors based on their having similar relationships with with latent variables. While cluster analysis can also be used to group variables rather than cases, I have no familiarity with that application.

I have never had a set of research data for which I though cluster analysis appropriate, but I wanted to play around with it, so I obtained, from online sources, data on faculty in my department: Salaries, academic rank, course load, experience, and number of published articles. I instructed SPSS to group the cases (faculty members) based on those variables. I asked SPSS to **standardize** all of the variables to *z* scores. This results in each variable being measured on the same scale and the variables being equally weighted. I had SPSS use

agglomerative hierarchical clustering. With this procedure each case initially is a cluster of its own. SPSS compares the distance between each case and the next and then clusters together the two cases which are closest. I had SPSS use the **squared Euclidian distance** between cases as the measure of distance. This is quite simply $\sum_{i=1}^{v}\left(X_i - Y_i\right)^2$, the sum across variables (from *i* = 1 to *v*) of the squared difference between the score on variable *i* for the one case (X_i) and the score on variable *i* for the other case (Y_i). At the next step SPSS recomputes all the distances between entities (cases and clusters) and then groups together the two with the smallest distance. When one or both of the entities is a cluster, SPSS computes the averaged squared Euclidian distance between members of the one entity and members of the other entity. This continues until all cases have been grouped into one giant cluster. It is up to the researcher to decide when to stop this procedure and accept a solution with *k* clusters. *K* can be any number from 1 to the number of cases.

SPSS produces both tables and graphics that help the analyst follow the process and decide which solution to accept I obtained 2, 3, and 4 cluster solutions. In the *k* = 2 solution the one cluster consisted of all the adjunct faculty (excepting one) and the second cluster consisted of everybody else. I compared the two clusters (using *t* tests) and found compared to the regular faculty the adjuncts had significantly lower salary, experience, course load, rank, and number of publications.

In the *k* = 3 solution the group of regular faculty was split into two groups, with one group consisting of senior faculty (those who have been in the profession long enough to get a decent salary and lots of publications) and the other group consisting of junior faculty (and a few older faculty who just never did the things that gets one merit pay increases). I used plots of means to show that the senior faculty had greater salary, experience, rank, and number of publications than did the junior faculty.

In the k = 4 solution the group of senior faculty was split into two clusters. One cluster consisted of the acting chair of the department (who had a salary and a number of publications considerably higher than the others) and the other cluster consisting of the remaining senior faculty (excepting those few who had been clustered with the junior faculty).

There are other ways of measuring the distance between clusters and other methods of doing the clustering. For example, one can do divisive hierarchical clustering, in which one starts out with all cases in one big cluster and then splits off cases into new clusters until every case is a cluster all by itself.

Aziz and Zickar (2006: A cluster analysis investigation of workaholism as a syndrome, *Journal of Occupational Health Psychology*, *11*, 52-62) is a good example of the use of cluster analysis with psychological data. Some have defined workaholism as being high in work involvement, high in drive to work, and low in work enjoyment. Aziz and Zickar obtained measures of work involvement, drive to work, and work enjoyment and conducted a cluster analysis. One of the clusters in the three-cluster solution did look like workaholics – high in work involvement and drive to work but low in work enjoyment. A second cluster consisted of positively engaged workers (high on work involvement and work enjoyment) and a third consisted of unengaged workers (low in involvement, drive, and enjoyment).

There are numerous other multivariate techniques and various modifications of those I have briefly described here. I have, however, covered those you are most likely to encounter in psychology. We are now ready to go into each of these in greater detail. The general Gestalt you obtain from studying these techniques should enable you to learn other multivariate techniques that you may encounter as you zoom through the hyperspace of multivariate research.

Summary

Multivariate analysis (MVA) is based on the statistical principle of multivariate statistics, which involves observation and analysis of more than one statistical outcome variable at a time. In design and analysis, the technique is used to perform trade studies across multiple dimensions while taking into account the effects of all variables on the responses of interest. Uses for multivariate analysis include Design for capability (also known as capability-based design), Inverse design, where any variable can be treated as an independent variable, Analysis of Alternatives (AoA), the selection of concepts to fulfill a customer need, Analysis of concepts with respect to changing scenarios and Identification of critical design drivers and correlations across hierarchical levels.

Glossary

Analysis of variance: Statistical test to determine the probability (likelihood) that the values of a quantifiable data variable for three or more independent samples or groups are different. The test assesses the likelihood of any difference between these groups occurring by chance alone.

Durbin–Watson statistic: Statistical test to measure the extent to which the value of a dependent variable at time *t* is related to its value at the previous time period, *t*_1 (autocorrelation). The statistic ranges in value from zero to four. A value of two indicates no autocorrelation. A value of towards zero indicates positive autocorrelation. A value towards four indicates negative autocorrelation.

Multicollinearity: Correlation between two or more independent variables.

Multiple regression analysis: The process of calculating a coefficient of multiple determination and regression equation using two or more independent variables and one dependent variable. For data collected from a sample, there is also a need to calculate the probability of the regression coefficient having occurred by chance alone.

Suggested Readings

Practical Research Methods, Dawson, Catherine, UBS Publishers' Distributors, New Delhi, 2002.

Business Research Methods, Donald R. Cooper, Pamela S. Schindler, 8/e, Tata McGraw-Hill Co. Ltd., 2006.

Research Methods, Donald H. McBurney, 5th Edition, Thomson Learning, ISBN:81-315-0047-0,2006.

Terminal and Model Questions

1. Write short note on the following.

    nn) Discriminant Analysis

    oo) MANOVA

    pp) Structural Equation Model

    qq) Factor Analysis

    rr) Cluster Analysis

2. Differentiate between univariate, bivariate and multivariate analysis.

3. Write down various types of multivariate analysis.

4. Briefly describe the different steps involved in factor analysis.

5. What do you mean by MANOVA? How is it different from ANCOVA and ANOVA.

RESEARCH REPORT WRITING

Structure

10.1 Learning Objectives

10.2 Introduction

10.3 Definition of Report

10.4 Business Report

10.5 The Importance of Reports

10.6 Characteristics of Report

10.7 Essential Qualities of a Good Report

10.8 Objectives or Purposes of Reports

10.9 Types of Business Reports

10.10 Selecting a Suitable Type of Report

10.11 Steps of Writing a Report (The Development Process)

10.12 Organization or Structure of a Report

10.13 Some Important Contents of Reports

10.14 Application of Reports

10.15 Contributions of a Good Report

10.16 Effects of a Wrong or Incorrect and Uncompleted Report

10.17 Summary

10.18 Glossary

10.19 Suggested Readings

10.20 Terminal and Model Questions

Learning Objectives

- To understand the concept of research report.
- To know various types of report.

- To learn about some qualities of good report.
- To understand various essential contents of a research report.

Introduction

Organizations are becoming complex day by day. To survive in this modern age of globalization there is no alternative of an effective communication skill. Communication skill is one of the key managerial skills. As the business environment grows in its complexity, the importance of skillful communication becomes essential in the pursuit of organizational goals. Reports are one of the important forms of written communication frequently used in decision-making and in other organizational activities. In writing, a report is a document characterized by information or other content, consisted of inquiry or investigation, modified to the context of a given situation and audience. Reports are a highly structured form of writing often following conventions that have been laid down to produce a common format. The purpose of reports is usually to inform. However, reports may include persuasive elements, such as recommendations, suggestions, or other motivating conclusions that indicate possible future actions the report reader might take.

Reports can be public or private, and often address questions posed by individuals in government, business, education, and science. Reports often take the structure of scientific investigation: Introduction, Methods, Results, and Discussion (IMRD). They may also follow a problem-solution structure based on the audience's questions or concerns. As for format, reports range from a simpler format with headings to indicate topics, to more complex formats including charts, tables, figures, pictures, tables of contents, abstracts, summaries, appendices, footnotes, hyperlinks, and references. An effective report can lead an organization to the tip of success. On the other hand, an ineffective report can lead an organization to the darkness of failure. In every organization, whatever it is a business firm or a nonprofit making charitable trust, a government agency or a hospital, a university or a crime investigating organization, all of them constantly needs and uses different types of reports every day.

In general, in an organization, the superiors ask the subordinates to write reports for different purposes. The task of report writing is often assigned on the executives. Therefore, to know the essential qualities of a good report, the process, the methodology and the purpose of report writing is very important for

executives as well as the students of Business Administration because the students of this discipline are considered as the future executives.

Definition of Report

The word **'report'** is originated from the Latin word '*reportare*', which means *to carry back* ('*re*' means *back* and '*portare*' means *to carry*). Many scholars have attempted to define reports. Some of these are as follows:

> A report is a statement of the results of an investigation or of any matter on which definite information is required.[ii]

> A report is an orderly and objective presentation of information that assists in decision-making and problem solving.[iii]

> A report may be defined as an organized statement of facts relating to a particular subject prepared after an investigation and presented to the interested persons with or without recommendations. It is a summary of the facts and findings about an activity or event presented to facilitate the evaluation of progress and decision-making.[iv]

> A report is a communication from someone who has some information to someone who wants to use that information.[v]

In the light of the above definitions, a report is, "a form of written communication, that is, a collection or a record of data, information, statistics, researches, investigations, analysis and studies of facts, situations, potentialities, consistencies, opportunities and threats, designed in a formal and structured piece of writing that usually presents the findings of some research or an enquiry or an information gathering process for interested persons or audiences, which aids in decision making and achieving individual and organizational goals, and is prepared by surveying, field working, estimating and auditing, which requires effective communication and design skill and often a group or team work".

A report is a basic management tool used in decision-making. We see many reports, long or short, formal or informal, crucial or ordinary, special or routine everyday. A common example is the news published in daily newspapers. Some reports may not be in written form for example, a bureau report, a report on war, a report on the conference of the Ministry presented by a T.V. news channel. Reports are often thought of as being mainly scientific and technical, but they can be produced in any subject area, for example, to give the results of a survey in the social sciences, or to describe a review of the literature in an arts topic.

Communication through reports in business or in an organization depends on the nature of the business or the organization. Reports are vital to the communication needs of all large organizations. The larger the organization, the greater the need for reports is likely to be. Also, the more technical and complex the work within the organization, the more likely it is that reports will be needed.

Business Report

A business report is an orderly, objective communication of factual information that serves some business purpose.[vi]

Careful examination of this definition reveals the following identifying characteristics of the business report:

- As an ***orderly*** communication, a report is given some care in preparation, which distinguishes it from the casual, routine exchanges of information that continually occur in business.[vii]
- The ***objective*** quality of a report is its unbiased approach to the facts presented. The report seeks truth, regardless or the consequences.[viii]
- The word ***communication*** is broad by definition; it covers all the ways of transmitting meaning (speaking, writing, drawing, gesturing, etc.).[ix]

- The basic ingredient of the report is ***factual information***- events, records, and the various forms of data that are communicated in the conduct of business.[x]

Not all reports are business reports. Research scientists, physicians, ministers, students, and many other write reports. To be classified as a "business report", a report must *serve some business purpose*.[xi]

A business report conveys information to assist in business decision-making. The business report is the medium in which to present this information. Some reports might present the actual solution to solve a business problem; other reports might record past business information that is used toward future business planning. More traditional reports, such as Business Plans, serve to communicate the Business Concept, business management model, commercial objectives, operational procedures and the perceived viability of the enterprise. Many people consider business reports as dry, uninteresting documents, which take a great deal of time and effort to prepare. The reality is that they are an essential part of doing business and one's ability to be proficient in this area is critical to the ability to pursuer commercial success.

The Importance of Reports

Decision Making Tool

Today's complex business organizations feed on information. Reports convey the needed information. A large number of important decisions in business or any other area are taken on the basis of information presented or recommendations made in the reports.[xii] For example, a decision to produce a new product needs a report on the customer's need, want and demand for that product, the quality and price of the product that customers are expecting, the opportunities and threats of the company's marketing environment, the availability of the raw materials etc.

Investigation

Whenever a complex problem develops in the organization, and invites investigation and needs interpretation of the situation, a committee, or commission or a study group is engaged to enquire into the problems and to present its findings with or without recommendations in the form of a report.[xiii] For example, we suppose that in a cement factory the machines have suddenly stopped working and the production is stopped eventually. Then the top management invites a group of factory engineers to investigate the problem and to make a report of their investigation. This report will help the top management to make plans for the later actions.

Planning and Evaluating

It is said that a business executive who cannot write effective reports for his boss and get his subordinates to write good reports for himself is almost totally ineffective. A report helps an executive to perform his function of planning and evaluating men and material resources efficiently.[xiv]

Critical Evaluation

Critical Evaluation of performance has become essential not only for mere survival but also for growth and progress of the organization. Thus continuous efforts are needed to improve the working through analyzing its production, distribution, etc. and comparing them with similar organizations. This needs a report.[xv]

Quick Location

Executives are often busy. Because of their pressure for time in business they need quick and easy communication of messages. The busy executives can quickly locate the needed information from the report, as it is orderly and logically arranged there.[xvi]

Development of Skill

Report writing skill develops the power of differentiation, organization judgment and communication. Because of this attraction, many progressive companies are specially designing intensive programs in report writing for the benefit of their employees.[xvii]

Career Development

Research shows that the business writing, particularly report writing is at or near the top of the business subjects, which are most significant in training for career in business.

Professional Advancement

Reports also play a major role in professional advancement. For promotion to the rank and file position, satisfactory job performance is enough. But for promotion to high-level position, the intellectual ability to communicate is expected. This ability may be made known to the higher authority through the reports.

Characteristics of Report

Factual Information

A report contains factual information. Events, records etc. and other data are the basic elements of this factual information and its content is never fictional. There is no place for personal opinion, belief, judgments or comments in the report content except in those rare cases when in the absence of facts, authoritative opinions are the best information available.

Objectivity

Objectivity means presenting material free from personal feelings or prejudice. Reports seek truth. If any nonobjective material is included, the reporter should make that known.

Systematic Presentation

Logical and systematical order is one of the characteristics of reports. This characteristic of report distinguishes it from other informal and routine exchange of information. The logical organization helps the reader locate the needed information quickly.

Specific Audience

Reports alignment with the intended audience. Reports usually have a number of different audience groups to reach so a report will often have a hierarchical structure to support different levels of detail. Many people may be involved in a decision-making process and they will have different levels of information requirements to support their decisions making process. In designing the report format and style the following target audience characteristics should be considered:

- Their need for the report (that is, finance approval, operational planning, resource allocation),
- Education level (that is, their ability to understand and rationalize the document),
- Position it the organization (that is, authority for information contained in the document),
- Knowledge of the report's topic (that is, purposes),
- Responsibility or authority to make decisions based on the report, and
- Personal demographics, that is, age, biases, alliances, attitudes.

To avoid making false assumptions about the target audience the author should compile a list of all the intended readers and develop a profile of them. Audiences are basically of three kinds:

- **Primary Audience:** People who have to make decisions on the basis of the business report,
- **Secondary Audience:** People who are affected by the actions the primary audiences would take in response to the position of the business report, and
- **Immediate Audience:** People responsible for examining the business report, weighing its viability and distributing the report to a broader audience.

Upward Direction

In general, a report moves upward in the organizational hierarchy because it is written after being requested by the higher authority and is submitted to the higher authority.

Joint Effort

Report writing often becomes difficult to complete solitarily. Short and informal reports usually involve one-person or individual effort. But complex and sophisticated reports require the participation and contribution of many people. Because in preparing a report the writer may require vast knowledge of any subject which is relevant to the report. But one person cannot be an expert in all subjects. So he needs different people, who are specialists in different subjects and they will help him to collect required information for completing the report. Thus report writing is a multi-person or collaborative effort.

Methodology

A report mentions the procedure of collecting data, sources and the significance of such data.[xviii]

Conventional Form

A report is presented in a more or less conventional form. This means that one has no option to write a report in any way he likes.[xix]

Conclusion and Recommendation

A report contains conclusions, which are in general the summary of the entire report focusing its objectives and planning as well as the steps necessary to be taken later. Reports often include recommendations. This characteristic of report is found mainly in analytical reports.

Essential Qualities of a Good Report

Factual Accuracy

Accuracy in a business report includes accuracy of information and accuracy of writing. Since the information is a business report is used to make decisions, inaccurate information can lead to inaccurate decisions. The accuracy of any report depends upon the correctness of the data that was gathered to prepare it.

Precision

In a good report the writer is very clear about the exact purpose of writing it.[xx] It means that the report must contain those things, which the writer is willing to describe. A report becomes a valuable document when it is precise. Precision brings harmony and consistency to a report.

Relevance

A good report should contain only those informations, which are related to the objectives of making the report. Irrelevant information confuses and misleads the reader. Thus to be a good report, relevance of facts and information are inevitable.

Conciseness

A good report is one that transmits maximum information with minimum words. It avoids unnecessary details and round about expressions.[xxi] Reports should be as brief as possible. But it does not mean that a report must be very short excluding necessary information. Too short description of facts creates problem in understanding and frustration of the reader and very large description annoys the reader.

Reader Orientation

A good report takes into account the levels of knowledge and needs of the reader. The report writer must ensure that the readers will understand the terms used in the report and will have interest in it.[xxii]

Specific Structure

The report should have standard formats. An effective report follows a standard layout that is, the specific design of the contents, introductions, abstracts, acknowledgements, references, and conclusions etc. of the report.

Simple and Unambiguous Language

Use of a simple and unambiguous language is one of the key aspects of a good report. The writer has to choose the appropriate language, which the reader understands. He should not use any word that the reader may not understand. If any technical term is used then it should be explained briefly and abbreviations should be elaborated. For example, a report contains the term PERT. The writer should elaborate the term (that is, Program Evaluation and Review Technique)[xxiii] and briefly describe it because the reader may not have any idea about it. Again the language of the report should not be influenced by the emotions of the writer.

Completeness

An effective report must have all the features that are needed. A report, which is finished suddenly without completing the required writing, is not a good report. Partial or incomplete reports do not help achieve objectives and often create problems and confusions.

Clarity

A good report is absolutely clear. Clarity depends on proper arrangement of facts. The writer should make his purpose clear, define his sources, state his findings and finally make necessary recommendations. He should divide his report into short paragraphs giving them headings, and insert other suitable signposts to achieve greater clarity.[xxiv]

Grammatical Accuracy

A good report is free from grammatical errors. The wrong structure of sentences makes the report vague. Errors in punctuation often convert the meaning of a sentence. In report writing, if not necessary the use of passive voices should be avoided and sentences should be kept as simple as possible.

Neutrality

A report is good when it presents the truth regardless of its consequences. A report writer simply presents the facts, which have been collected through investigation.[xxv] To be effective a report should not have reflection of the partiality of the writer.

Conclusions and Recommendations

A good report should have logical conclusions, which should be drawn through analyzing the investigated data. If the report is analytical, there must be recommendations. The recommendations must be impartial and objective, and they are made at the end of a report.[xxvi]

Objectives or Purposes of Reports

Informing

- To present information facts and events surrounding a particular situation
- To convey information needed to conduct business properly
- To gather information needed to identify and solve problems
- To provide necessary information for planning and decision making
- To collect required information for investigating and research

Analyzing

Analyzing the information and data is another purpose of report. The collected data by themselves may not be useful unless they are put into interpretation. A report includes an analysis of its data and interprets the meaning of the data so that these data can be used to make decisions.

Investigating

- To find out the source of the problem
- To indicate the factors that are responsible for the problem

Meeting a Specific Need

A report is written to meet a specific need. For example, the need to find out the reason behind the failure of marketing a product requires a report, which will specify the factors that were responsible for the problem.

Recording

A report records the information that was found from investigation or research so as to this information can be used again and again to meet the need.

Recommending

Reports also do the task of recommending a specific course of action to solve a problem.

Types of Business Reports

Reports may be classified according to the following basis:

According to Function

The following reports are classified by what they do:

1. **Informational Report**[xxvii]

   Informational reports objectively present the facts and events surrounding a particular situation. They have no analysis and interpretation nor any conclusion or recommendation. For example

- Company annual reports,
- Monthly financial statements,
- Employee absenteeism and turnover

2. **Interpretational Report**[xxviii]

   In the preparation of this type of report, a report writer in addition to the presentation of the facts analyzes and interprets the problems.

3. **Analytical Report**[xxix]

   Analytical reports attempt to solve problems. So it analyzes the fact, draws conclusions from the data and makes recommendations for specific courses of actions. For example:

   - Reports of scientific research,
   - Feasibility reports by consulting firms

A. According to Formalities and Styles

This classification is made by legal formalities to be complied with and styles to be followed.

1. **Formal Report**[xxx]

   A report, which is prepared in a prescribed form and presented to a concerned authority in accordance in accordance with the established procedure, is called a formal report. Important features of this report are:

   - It is carefully structured
   - It stresses objectivity and organization
   - It contains much detail and hence it is usually longer

- In style it is relatively impersonal and restricted. The writer's personal pronouns (I or We) are avoided. Instead, in writing a report third person references such as the "reporter", the "investigator" or "it has been investigated", etc. are used.

A formal report includes usually cover, title page, contents, abstracts, introduction, transmittal, main body, sub-headings, notes, statistics, charts, indexes, appendices, date and signature of the writer. It is primarily of two types:

a) ***Statutory Report***

A report prepared and submitted as per provisions of company law is known as statutory report. For example

- A report submitted at the statutory meeting
- Director's report
- Annual return of the company
- Auditor's report
- Inspector's report

b) ***Non-Statutory Report***

A formal report, which does not require the compliance of legal provisions, is known as non-statutory report. For example

- Manager's report
- Secretary's report,
- Other officer's reports
- Share allotment committee's report

2. **Informal Report**[xxxi]

An informal report is one, which does not follow the rules and procedures prescribed by the organization for its preparation and presentation. It may range in length from one sentence to several pages. It does not contain any supplements (abstracts, title page, appendix, etc.). It may take either an oral or a written form and it is written in the first person (I or We). For example:

- A progress report on specific job performance
- Inspection report of a site,
- A record of the minutes of a meeting,
- An hourly or daily account of one's activities

B. According to Subject Matter

This classification is made on the basis of nature of the report content.

1. **Financial Report**[xxxii]

A report containing financial information is known as a financial report. In the case of a company such a report is prepared on the basis of a balance sheet of the company.

2. **Technical Report**[xxxiii]

A technical report is a written statement of the facts of a situation, project, process or test, how these facts were ascertained, their significance, the conclusions that have been drawn from them, the recommendations that are being made. For example

- Weather report
- Laboratory report
- Process report

3. **Geological Report**[xxxiv]

A report, which supplies information not on a particular subject but on many subjects, in general is a geological report. It conveys information relating to overall conditions of the organization.

C. According to Time Interval

This is classified on the basis of how frequently reports are prepared

1. **Periodic Report**[xxxv]

   A report prepared and issued at regular intervals in usual routine business is known as periodic report. This report is generally upward directed. Such reports may be issued daily, weekly, fortnightly, monthly, quarterly, semi-annually or annually. Some common types of periodic routine reports are:

   a) ***Progress Report***
   b) ***Routine Report***
   c) ***Inspection Report***
   d) ***Inventory Report***
   e) ***Annual Confidential Report (ACR)***

2. **Special or Situational Report**[xxxvi]

   Special reports are related to a single occasion or situation. Reports on the desirability of opening a new branch or on the unrest among staff in a particular branch are special reports.

D. According to the Status of Authorship

This is classified by the authorship status.

1. **Private Report**[xxxvii]

   A report prepared by a private business organization is referred to as a private report.

2. **Public or Governmental Report**[xxxviii]

Reports originating through employees of public institutions (government groups, professional societies, and such) are known as public reports. Pay commission's (government body) report is an example of a government report.

3. **Independent Report**[xxxix]

   A report initiated by an individual without the authorization of any public or private body is known as an independent report. For example, if any person conducts a research work on his own authority and submits his findings to the appropriate authority, it constitutes an independent report.

E. According to Geography

This is classified by the distance between the reader and the writer.

1. **Internal or Administrative Report**[xl]

   Internal reports move within the organization. They are written to facilitate business operations as well as administration. Hence these reports are also known as administrative reports.

2. **External or Professional Report**[xli]

External reports are prepared for distribution among the outsiders who are related to the company. Annual reports of companies prepared for distribution among the shareholders or reports prepared for the government or lenders are the examples of external reports.

F. According to Length

This is classified by length and physical make up of reports

1. **Memorandum Report**[xlii]

   Memorandum reports are most widely used reports in business. They are internal messages; that is, they are, written by one person in an organization to another person in the organization. Memorandum reports are written informally.

2. **Letter Report**[xliii]

   The reports, which are formatted as letters, are called letter reports.

3. **Short Report**[xliv]

   Reports containing topics of medium or moderate length and having no great need for formal presentation are classified as short reports. Short report writing is usually completed in a page or two. Memorandum reports and letter reports are also short reports.

4. **Long Report**[xlv]

   A long report is never possible to be completed in a page or two. It is usually concerned with major investigation. It deals with large and complicated problems.

G. According to Direction

This classification is based on the direction a report travels.

1. **Vertical Report**[xlvi]

   Reports moving upward and downward in an organization are known as vertical reports. They contribute to management control.

2. **Lateral Report**[xlvii]

Lateral reports travel between units of the same organization level. These reports are needed to achieve co-ordination among the different departments of the same organizations.

Selecting a Suitable Type of Report

A report writer is expected to consider the following guidelines while selecting a particular type of report:

1. ***Kind of Report***[xlviii]

   At the very beginning, a report writer must decide what kinds of report will he prepare- a formal or an informal. Or if it is a formal report, whether it is a statutory or non-statutory report. This decision is needed because he is to plan accordingly the content, form and style of the report. Of course, if the report writer has been instructed to prepare a specific kind of report, he would write that report accordingly.

2. ***Time Allowed***[xlix]

   All reports do not require equal amount of time. For example, if time allowed is very short, a long analytical report cannot be prepared.

3. ***Purpose of Report***[l]

   The purpose of the report must be given due emphasis before selecting a particular type of report, because it dictates whether the report will be short or long, formal or informal.

4. ***Content of Report***[li]

   The report writer must also be aware of what exactly is to be studied and examined.

5. ***Pertinent Information***

   The report writer must identify the relevant information and must be clear about the facts that are to be included in his report.

6. ***The Reader***[lii]

   The reporter is expected to prepare the report so as to meet the desire of the reader. For example, if the reader is Research Director, the report should contain a detailed, step-by-step account of the investigations. So a long formal report is needed.

Steps of Writing a Report (The Development Process)

1. **Recognizing and defining a problem**[liii]

   A problem in a research study is a sort of question proposed for the solution. By answering the following questions, the problem can be more clearly defined.

   - What: (What to study?)
   - Why: (To determine the opinions)
   - When: (Current)
   - Where: (Place of investigation)
   - Who: (Persons to be investigated)

2. **Defining purpose and scope**[liv]

   The purpose of the study is the why of the study. It may have much to do with determining what elements to consider at arriving at the solution.

3. **Developing hypothesis**[lv]

For problem solving research, a researcher should develop some hypotheses. A hypothesis is a tentative explanation of some problems. Such explanation is to be approved or disapproved through some types of research.

4. **Defining terms clearly**[lvi]

   All the terms in the report should define clearly and apparently. Vague terms contribute to faulty communication.

5. **Determining the audience**

   Reports are written for reader's use. Many people may be involved in a decision-making process and they will have different levels of information requirements to support their decisions making process. So before preparing reports the determination of the target audiences and their need is necessary.

6. **Selecting a method of solution (Collecting data)**

   Once the problems, purposes and scopes, and developing hypothesis and determination of the audience are completed, the next step is to collect the relevant data. A report writer can choose one or a combination of he following recognized research methods to collect necessary data.

   a) Organizational records research
   b) Observational research
   c) Experimental research
   d) Survey research

   These are used for collecting primary data.

   e) Library research (used for collecting secondary data)

7. **Organizing, analyzing and interpreting the data**[lvii]

   Organizing and analyzing data mean editing the data for accuracy and completeness, and evaluating the data initially to see if they solve the problem. A report writer is all the time

interpreting data throughout the process of preparing a report. The procedure of interpreting is as follows:

- To relate information to the problem
- To do all practical interpretation
- To reevaluation of interpretation
- To select interpretation with most merit
- To derive conclusions from the interpretation

8. **Making the report outline**[lviii]

A formal outline is in fact a report in a skeletal form. It shows the arrangement of words, phrases, or sentences that indicate the nature and sequence of topics and subtopics to be discussed in the report. The purpose of the report outline is to guide the report writer how to structure the report logically and efficiently.

9. **Writing the final report**[lix]

This is the last step of writing the report in the final form. The writing process includes:

- Objectivity
- Use of transitional sentences
- Defining technical terms
- Use of simple sentences
- Use of active voice
- Use of proper tense

To write an effective report a writer should proceed through rough drafting. Once the writer has prepared a rough draft of the report, he can refine it into the most effective document. This

needs revision. Revising means modifying a document to increase its effectiveness. The writer must revise the draft of the report several times before writing the final report.

Organization or Structure of a Report

A skeletal design of a report is given below:

A. Preliminaries

1. Cover or Title Fly
2. Title page
3. Copyright notice
4. Authorization
5. Transmittal
6. Terms of reference, including scope of report
7. Acknowledgement
8. Executive Summary
9. Table of Contents
10. List of tables and diagrams

B. Main part or the Report Text

1. Abstract
2. Introduction
3. Methodology
4. Findings or results
5. Summary
6. Discussion
7. Conclusions and recommendations

C. Supplementary or Addendum

1. References or bibliography
2. Appendices
3. Glossary
4. Index

Some Important Contents of Reports

1. Abstract

An Abstract is a self-contained summary of the entire report. It should therefore be limited to one paragraph (approximately 150 words). It should contain:

- An outline of investigation (as stated in title)
- Why the writer chose to look at that particular area with brief reference to prior research done in the field
- Experimental hypothesis (prediction of what the results will show)
- A brief summary of methodology
- Main findings and how these relate to the hypothesis
- A conclusion, which may include a suggestion for further research.

2. Objectives

The specific objectives of the report need to be set forth clearly. The reader must know exactly what the report covers. If the particular project is part of a large problem, it is desirable to state the overall problem and the problem solution process.[lx] Thus objectives mean the actual purpose for which the report will be made.

3. *Methodology*[lxi]

The purpose of the methodology section is to describe the research procedure. This includes the overall *research design*, *the sampling procedures*, *the data-collection method*, *the field methods*, and *analysis procedures*.

- ***Research Design***

  A description of the research design should make it clear whether the study is exploratory or conclusive in nature and whether it is case, statistical, or experimental in design.

- ***Data-Collection Method***

  In this section the writer should state how he carried out his enquiry, what form did the enquiry take, did he carry out interviews or questionnaires, how did he collect his data, what measurements did he make, how did he choose the subjects for his interviews. These should be logically and concisely presented in the appendix, where they will not break the continuity of the report.

- ***Sampling***

  In describing the sampling procedure, it is first necessary to indicate the nature of the universe studied. The exact sampling units, such as stores, consumers, or business executives, must be defined and the geographical limits specified. Next, the writer should describe the size of the overall sample and of each sub sample and should explain the reasons for their sizes.

- ***Fieldwork***

  In describing fieldwork methods, the writer needs to tell readers enough to give some idea of the accuracy with which the work was done. This will usually include a description of he number and type of field-workers used; how they were selected, trained, and supervised; and how their work was verified.

- ***Analysis***

  A report includes an analysis of its data and interprets the meaning of the data so that these data can be used to make decisions. If any special, statistical techniques have been used, they should be mentioned.

- ***Appendices***

Appendix contains supplementary information needed to support the main body of the reports but the information is too voluminous and at the same time not important enough to be included in the report itself. Statistical data, charts and diagrams, questionnaires, cover letters, supplementary tables, complicated statistical procedures, working papers, copies of secondary research, legal documents and so on that are not incorporated in the main body of the report in order to keep the main line of argument free from being entangled are put at the end in the form of appendices.

4. References

Here the writer must give details of work by all other authors, which includes

- Author's name and initials
- Date of publication
- Title of the book, paper or journal
- Publisher
- Place of publication
- Page numbers
- Details of the journal volume in which the article has appeared.

5. Bibliography[lxii]

A bibliography is a list of books and journals prepared by a particular author. It may also include a list of publications recommended for additional reading.

6. Glossary[lxiii]

A glossary is a list of some technical or special words used in the report with their explanation.

7. *Index*[lxiv]

An index is an alphabetical list of subject of the report. Page numbers on which the subject appears are mentioned against it, because of its alphabetical order of arrangement. It facilitates the reader to locate easily and quickly the topic, subtopic or important aspect of the contents.

8. Footnote

Footnote is the method of including the references or bibliographies at the bottom of the page. When in a writing consists of quotes and sentences from different books of different authors, then the name of the book and the author as well as the name of publisher, edition and the page number from which the text was taken, are included at the bottom-left of the page. A number or an asterisk (*) mark is attached with the text, which is taken from the other sources in superscript form and in the footnote the name of reference is added with that number or the mark.

Application of Reports

In Business

- In planning and decision making,
- To develop new strategies,
- To ascertain the financial position of the company through its financial reports (financial statements such as income statement and balance sheet),
- To analyze the capital market and *investment decisions*,
- For SWOT analysis, that is, the analysis of the strengths and weaknesses of the firm and the opportunities and threats in its environment,
- For business and marketing research,
- For environmental analysis and diagnosis,
- To know about the marketing environment (both micro and macro),
- For market segmentation and determining the target market,
- To know the consumers' needs, wants and demands,
- Development of a new product,
- Determination of matters concerning employee grievances or labor relations,
- Design modifications,
- Evaluation of the organization's past performance and preparation of its plan accordingly,

- To identify the problems inside the organization,
- To evaluate the performance of the other business firms,
- To analyze and monitor the competition,
- To analyze the opportunities of entering into a foreign market.

In Government Sector

- To prepare annual budget,
- To prepare economic scrutiny,
- To monitor and control law and order situation,
- For census,
- For development,
- To evaluate taxation,
- To analyze the foreign investment,
- To amend constitution and acts.

In Mass Media

- T.V. news channels broadcast news to inform people about the events, incidents, information and situation of the entire world through making news reports, staff reports, sports reports, bureau reports, crime reports, business reports, weather reports etc.,
- The print media uses and makes reports to publish news. All the news we read in the newspapers, magazines and journals are full of different types of reports.

Educational Institutions

- To prepare new curriculum,
- To prepare new syllabus,
- To modify educational system,
- To make decisions of constructing new educational institutions,
- To know the problems and limitations of educational system,

- To monitor the performance of particular institutions,
- To amend the rules and regulations related to education system.

In Research

- To identify the problem,
- To design research process,
- To analyze the opportunities and probabilities,
- To gather required information,
- To analyze the information,
- To collect data,
- To analyze the data,
- To evaluate the implementation of research plan,
- To make recommendations.

Miscellaneous

- A psychiatrist uses the report of his patient's past life for diagnosis of mental diseases,
- The Anti Corruption Commission uses the reports of corrupting activities of people of different organizations,
- The police and detectives frequently use reports of criminals for investigation of crimes and to arrest criminals.

Contributions of a Good Report

Contribution to the report writer

- Increases communication skills of the writer,
- Improves writing skills,
- Increases the reputation of the writer,
- Enhances the writer's analytical skill,
- Increases possibilities of the writer's promotion to the higher position in the organization,
- Increases the writer's efficiency of working.

Contribution to the Reader or to whom the report is submitted

- Helps in decision making,
- Helps in identification of the problem,
- Helps in taking required course of action,
- Helps in research and development.

Contribution to the organization or the business

- Helps in creating plans, objectives, and strategies,
- Helps to implement and evaluation of strategies,
- Increases Company's reputation,
- Helps in management and marketing,
- Ascertains the situation and the position of the company,
- Aids in finding the problems and inconsistencies inside the organization,
- Assists in increasing production, research and development,
- Helps in employee motivation,
- Aids in catching the desired group of customers,
- Helps in international trade.

Effects of a Wrong or Incorrect and Uncompleted Report

- Decreases Company reputation,
- Restrains in achieving organizational goals,
- Decreases the reputation of the report writer,
- Creates dilemma in decision making,
- Employees fail to submit their requirements and grievances because of a wrong or uncompleted report,
- Affects the smooth functioning of an organization,
- Decreases the intimacy in the relationship between owners and managers,
- Wrong reports can mislead the top management and the entire organization,
- A company may lose its marketing opportunities because of an improper report on marketing research,

- A company may lose its shareholders and investors because of the wrong financial report of the company, which does not show actual financial position,
- Wrong reports about the debtors of a bank are sometime responsible for creating loan defaulters,
- The effect of an incorrect report is often very expensive,
- Wrong, inconsistent and partial reports create misconceptions, misunderstanding, disappointment, chaos and confusion,
- An incorrect report can create mass destruction. For example, the wrong report of the FBI (Federal Bureau of Investigation) of United States about the potentiality of highly destructive weapons in Iraq, was responsible for the USA's attack in Iraq in 2003 and the current Iraq situation,
- Correcting of a wrong report fully kills valuable time because it has to be started from the beginning,
- Incorrect and partial reports about accused persons often give the opportunity to the accused persons to escape through the gaps of the law and thus many culprits get bailment from the courts.

Summary

A research report can be based on practical work, research by reading or a study of an organization or industrial/workplace situation. Preparation of a comprehensive written research report is an essential part of a valid research experience, and the student should be aware of this requirement at the outset of the project. It may be expected that concrete outcomes of any research project would be student presentation of research results at a professional meeting and/or co-authorship on a journal publication. However, while this is a most desirable outcome, it is not a substitute for a well-written comprehensive report, produced by the student with substantive critique and correction by the faculty mentor, which demonstrates that the student has a full grasp of the scope of the problem, the techniques/instrumental methods used, and the ramifications of the results generated. It is of paramount importance that any undergraduate research project culminates in a thorough well-documented written report.

Glossary

Dissertation: The usual name for research projects undertaken as part of undergraduate and taught masters degrees. Dissertations are usually written for an academic audience.

Management report: Abbreviated version of the project report, usually written for a practitioner audience. Normally includes a brief account of objectives, method, findings, conclusions and recommendations.

Project report: The term used in this book to refer generally to dissertations, theses and management reports.

Suggested Readings

Research Methodology – Methods & Techniques, 2nd edition, Kothari C. R. –New Age Publications – New Delhi 2004.

An Introduction to Research Procedure in Social Sciences – Gopal, M. A. – Asia Publishing House – Bombay, 2000.

Research Methodology-A Beginners,(2nd.ed.), Kumar, Ranjit, Singapore, Pearson Education. 2005.

Terminal and Model Questions

1. Write short note on the following.

    a) Business Report
    b) Objectivity in Report

c) Interpretational Report

d) Lateral Report

e) Analytical Report

2. Briefly describe different types of a report.

3. What do you mean by report? Explain its important contents.

4. Explain characteristics and essentials of a good report.

5. Write down various steps in writing a report.

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[vi] Lesiker, Raymond V. et al. *Basic Business Communication.* Homewood Ill: Rchard D. Irwin Inc. 1996, p.400.
[vii] *Ibid*., p. 400.
[viii] *Ibid*., p. 400.
[ix] *Ibid*., p. 400.
[x] *Ibid*., p. 400.
[xi] *Ibid*., p. 400.
[xii] M. Omar Ali, *Business Communication: Theory and Application*, 2003, p. 282-283.
[xiii] *Ibid*., p. 283.
[xiv] *Ibid*., p. 283.
[xv] *Ibid*., p. 283.
[xvi] *Ibid*., p. 283.
[xvii] *Ibid*., p. 283.
[xviii] *Ibid*., p. 282.
[xix] *Ibid*., p. 282.
[xx] Pal, Rajendra and J.S. Korlahalli. *Essentials of Business Communication*. New Delhi: Sultan Chand & Sons. 2004, p. WC-4.
[xxi] M. Omar Ali, *Business Communication: Theory and Application*, 2003, p. 284.
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[xxiv] Pal, Rajendra and J.S. Korlahalli. *Essentials of Business Communication*. New Delhi: Sultan Chand & Sons. 2004, p. WC-4.
[xxv] M. Omar Ali, *Business Communication: Theory and Application*, 2003, p. 284.
[xxvi] *Ibid*., p. 284.
[xxvii] *Ibid*., p. 286.
[xxviii] *Ibid*., p. 286.
[xxix] *Ibid*., p. 286.

[xxx] *Ibid*., p. 286.
[xxxi] *Ibid*., p. 286-287.
[xxxii] *Ibid*., p. 287.
[xxxiii] *Ibid*., p. 287.
[xxxiv] *Ibid*., p. 287.
[xxxv] *Ibid*., p. 287.
[xxxvi] *Ibid*., p. 287.
[xxxvii] *Ibid*., p. 287.
[xxxviii] *Ibid*., p. 287.
[xxxix] *Ibid*., p. 288.
[xl] *Ibid*., p. 288.
[xli] *Ibid*., p. 288.
[xlii] *Ibid*., p. 288.
[xliii] *Ibid*., p. 288.
[xliv] *Ibid*., p. 288.
[xlv] *Ibid*., p. 289.
[xlvi] *Ibid*., p. 289.
[xlvii] *Ibid*., p. 289.
[xlviii] *Ibid*., p. 291.
[xlix] *Ibid*., p. 291.
[l] *Ibid*., p. 291.
[li] *Ibid*., p. 291.
[lii] *Ibid*., p. 291.
[liii] *Ibid*., p. 292.
[liv] *Ibid*., p. 293.
[lv] *Ibid*., p. 293.
[lvi] *Ibid*., p. 294.
[lvii] *Ibid*., p. 307-308.
[lviii] *Ibid*., p. 312.
[lix] *Ibid*., p. 316.
[lx] Harper W. Boyd, Jr., Ralph Westfall, Stanley F. Stasch, *Marketing Research: Text and Cases*, seventh edition, Richard D. Irwin, Inc. 1999, p. 661.
[lxi] *Ibid*., p. 661.
[lxii] M. Omar Ali, *Business Communication: Theory and Application*, 2003, p. 326.
[lxiii] *Ibid*., p. 326.
[lxiv] *Ibid*., p. 326.