

University of Management and Technology (UNIMTECH)

RESEARCH METHODOLOGY

Engineering Research methods

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COURSE OBJECTIVES

- Develop a basic understanding of research and its methodologies
- Identify appropriate research topics
- Select and define appropriate research problem
- Prepare a project proposal
- Organise and conduct research
- Write a research report and thesis

1) SOME DEFINITIONS OF RESEARCH

- SEARCH FOR KNOWLEDGE
- IT IS A SYSTEMATIC AND SCIENTIFIC SEARCH FOR PERTINENT/RELEVANT INFORMATION ON A SPECIFIC TOPIC
- A SYSTEMATISED EFFORT TO GAIN NEW KNOWLEDGE; A MOVEMENT FROM THE KNOWN TO THE UNKNOWN

DEFINITION (cont.)

- **THE WORD RESEARCH IS COMPOSED OF TWO SYLLABLES, RE AND SEARCH. THE DICTIONARY DEFINES THE FORMER AS A PREFIX MEANING AGAIN, A NEW, OR OVER AGAIN AND THE LATTER AS A VERB MEANING TO EXAMINE CLOSELY AND CAREFULLY, TO TEST AND TRY, OR TO PROBE. TOGETHER THEY FORM A NOUN DESCRIBING A CAREFUL, SYSTEMATIC, PATIENT STUDY AND INVESTIGATION IN SOME FIELD OF KNOWLEDGE, UNDERTAKEN TO ESTABLISH FACTS OR PRINCIPLES.**

(Grinnel 1993: 4)

2) SOME TERMINOLOGIES

- *Methodology – refers to the methods, techniques, and procedures that are employed in implementing your research plan (design)*

RESEARCH METHODS OR TECHNIQUES

- **Research methods or techniques** refer to all the methods the researchers use in performing research operations (see research instruments / research tools

RESEARCH METHODOLOGY

- A science of studying how research is carried scientifically
- A way to systematically solve the research problem by logically adopting various steps

3) TYPES OF RESEARCH

- Research can be classified from three perspectives:
- I. **Application** of the research study
- II. **Objectives**
- III. **Inquiry mode employed**

I. APPLICATION

- If you examine a research from the perspective of its application, there are two broad categories:
 - A). **Pure research**
 - B). **Applied research**

A) PURE RESEARCH

According to Bailey (1978:17):

Pure research involves developing and testing theories and hypotheses that are intellectually challenging to the researcher but may or may not have practical application at the present time or in the future. Thus such work often involves the testing of hypotheses containing very abstract and specialised concepts.

B) APPLIED

- Most of the research undertaken in the social sciences is **applied**, the findings being designed either for use in understanding a phenomena/issue or to bring a change in a program/situation.

II. OBJECTIVES

A research study can be carried out with **four objectives**:

- **1. Descriptive**
- **2. Correlational**
- **3. Explanatory**
- **4. Exploratory**

TYPES OF RESEARCH

- **1. Descriptive:**

The main purpose of such studies is to describe what is prevalent with respect to the issue/ problem under study. The main characteristic of descriptive research is that the researcher has no control over the variables; he can only report what has happened or what is happening.

The term **Ex post facto (after the fact)** research for descriptive research is used mainly in social science and business research

DESCRIPTIVE RESEARCH

- Some examples:
 - ✓ Attitudes of students towards quality teaching
 - ✓ Strategies put in place by a company to increase workers' productivity
 - ✓ Effects of living in a house with domestic violence

TYPES OF RESEARCH (cont.)

- 2. Correlational**

Aims at discovering or establishing the existence of a relationship/ association/ interdependence between two or more aspects of a situation

For instance, the effect of the home environment on education

CORRELATIONAL RESEARCH

- Some examples
- ✓ Relationship between stressful living and incidence of heart attacks
- ✓ Impact of technology on the language classroom
- ✓ Impact of domestic violence on adolescents

TYPES OF RESEARCH

- **3. Explanatory:**

Attempts to clarify why and how there is a relationship between two aspects of a situation or phenomenon. This type of research will try to explain, for example, how the home environment affects children level of academic achievement.

EXPLANATORY RESEARCH

- **Some examples:**
- ✓ How does domestic violence impact adolescents learners ?
- ✓ Why do some schools adopt a program while others do not?
- ✓ How does technology facilitate learning?

TYPES OF RESEARCH

- **4. Exploratory:**

This is when a study is undertaken with the objective either to explore an area where little is known or to investigate the possibilities of undertaking a particular research study. When a study is carried out to determine its feasibility it is also called a **feasibility** study or a **pilot** study

3. INQUIRY MODE

- From the point of view of inquiry , there are two types of research:
 - **1. The structured approach**
 - **2. The unstructured approach**

1.THE STRUCTURED APPROACH

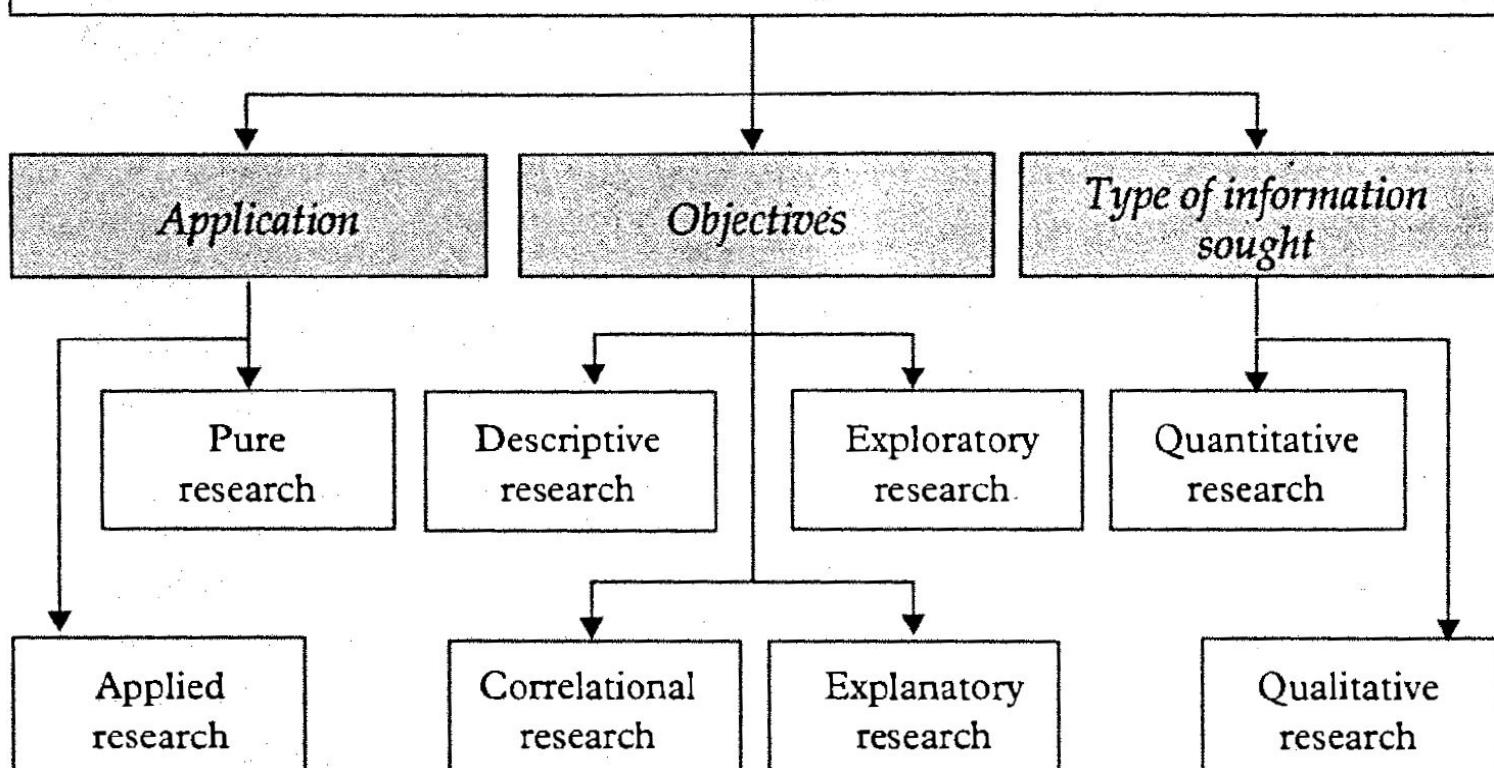
- This is usually classified as **quantitative research**
- quantitative studies often use standardized measures, numerical values, have larger sample sizes, and analyze data using statistical programs. A study is classified as quantitative if the researcher seeks to quantify the variation in a phenomenon and if information is gathered using quantitative variables.

2. THE UNSTRUCTURED APPROACH

- The unstructured approach to inquiry is usually classified as **qualitative**
- A study is classified as qualitative if the purpose is primarily to describe a situation, phenomenon, problem or event; the information is gathered through the use of variables or measured on qualitative measurement scales, and if analysis is done to establish the variation in the situation or problem without quantifying it. Qualitative studies tend to be more “in-depth”, focusing on a smaller population but probing deeper into a given problem.

Types of research

From the viewpoint of



4.QUALITIES OF A GOOD RESEARCH

- Research must address an important and relevant issue. This means that:
 - it is undertaken to increase knowledge and have some beneficial implications
 - it will also have relevance to the time, place, and population of the study.

QUALITIES OF A GOOD RESEARCH

- Research is a process of **collecting, analyzing** and **interpreting** information to answer questions. But to qualify as research, the process must have certain characteristics: it must, as far as possible, be:
 - Logical
 - Rigorous
 - Systematic
 - Valid and verifiable
 - Empirical
 - Critical

QUALITIES OF GOOD RESEARCH (cont.)

- Good research is **logical**: this implies that research is guided by the rules of logical reasoning ,and the logical process of induction and deduction is essential in carrying out research.

QUALITIES OF GOOD RESEARCH (cont.)

- **Rigorous**-you must be scrupulous (careful) in ensuring that the procedures followed to find answers to questions are relevant, appropriate and justified. Again, the degree of rigor (strict) varies markedly between the physical and social sciences and within the social sciences.

QUALITIES OF GOOD RESEARCH (cont.)

- Good research is **systematic**: this implies that the procedure adopted to undertake an investigation follow a certain logical sequence. The different steps cannot be taken in a haphazard way. Some procedures must follow others. The systematic characteristic of research rejects the use of guessing and intuition in arriving at conclusions.

SYSTEMATICNESS

- Good research is systematic as it follows certain steps. **These steps are:**
 - Problem identification
 - Reviewing the literature
 - Collecting data
 - Analysing data
 - Drawing conclusions and making generalisations

QUALITIES OF GOOD RESEARCH (cont.)

- **-Valid and verifiable**-this concept implies that whatever you conclude on the basis of your findings is correct and can be verified by you and others.
- **-Empirical**-this means that any conclusion drawn are based upon hard evidence gathered from information collected from real life experiences or observations.

QUALITIES OF GOOD RESEARCH(cont.)

- **Critical-critical** scrutiny (examination) of the procedures used and the methods employed is crucial to a research enquiry. The process of investigation must be foolproof and free from drawbacks. The process adopted and the procedures used must be able to withstand critical scrutiny.

5)THE RESEARCH PROCESS: AN EIGHT – STEP MODEL

A) 5 STEPS IN PLANNING A RESEARCH STUDY

- **Step 1:** Formulating a research problem
- **Step 2:** Conceptualising a research design
- **Step 3:** Constructing an instrument for data collection
- **Step 4:** Selecting a sample
- **Step 5:** Writing a research proposal

THE RESEARCH PROCESS:

B) **3 STEPS IN CONDUCTING A STUDY**

- **Step 6:** Collecting data
- **Step 7:** Processing data
- **Step 8:** Writing a research report

The research process: an eight-step model

the model developed here is generic in nature and can be applied to a number of disciplines in the social sciences. It is based upon a practical and step-by-step approach to a research inquiry and each step provides a smorgasbord of methods, models and procedures.

‘Although the basic logic of scientific methodology is the same in all fields, its specific techniques and approaches will vary, depending upon the subject matter’

Step I: formulating a research problem

Formulating a research problem is the first and most important step in the research process. A research problem identifies your destination: it should tell you, your research supervisor and your readers *what* you intend to research. The more specific and clear you are the better, as everything that follows in the research process—study design, measurement procedures, sampling strategy, frame of analysis and the style of writing of your dissertation or report—is greatly influenced by the way in which you formulate your research problem.

Step II: conceptualising a research design

past errors and limitations. The validity of *what* you find largely rests on *how* it was found. The main function of a research design is to explain how you will find answers to your research questions. The research design sets out the logic of your inquiry. A research design should include the following: the study design *per se* and the logistical arrangements that you propose to undertake, the measurement procedures, the sampling strategy, the frame of analysis and the time-frame. For any investigation, the selection of an appropriate research design is crucial in enabling you to arrive at valid findings, comparisons and conclusions. A faulty design results in misleading findings and is therefore tantamount to wasting human and financial resources.

Step III: constructing an instrument for data collection

Anything that becomes a means of collecting information for your study is called a ‘research tool’ or a ‘research instrument’. For example, observation forms, interview schedules, questionnaires, and interview guides are all classified as research tools.

The construction of a research tool is the first ‘practical’ step in carrying out a study. You will need to decide how you are going to collect data for the proposed study and then construct a research instrument for data collection.

If you are planning to collect data specifically for your study (primary data), you need to either construct a research instrument or select an already constructed one.

Step IV: selecting a sample

The accuracy of your estimates largely depends upon the way you select your sample. The basic objective of any sampling design is to minimise, within the limitation of cost, the gap between the values obtained from your sample and those prevalent in the population.

The underlying premise in sampling is that, if a relatively small number of units is scientifically selected, it can provide—with a sufficiently high degree of probability—a fairly true reflection of the sampling population that is being studied.

Step V: writing a research proposal

Now, step-by-step, you have done all the preparatory work. Next put everything together in a way that provides adequate information, for your research supervisor and others, about your research study. This overall plan tells a reader about your research problem and how you are planning to

investigate, and is called a *research proposal*. Broadly, a research proposal's main function is to detail the operational plan for obtaining answers to your research questions. In doing so it ensures—and reassures the readers of—the validity of the methodology to obtain answers accurately and objectively.

Step VI: collecting data

Having formulated a research problem, developed a study design, constructed a research instrument and selected a sample, you then collect the data from which you will draw inferences and conclusions for your study.

Many methods could be used to gather the required information. As a part of the research design, you decided upon the procedure you wanted to adopt to collect your data. *At this stage you actually collect the data.* For example, depending upon your plans, you might commence interviews, mail out a questionnaire, conduct nominal/focused group discussions, or make observations.

Step VII: processing data

The way you analyse the information you collected largely depends upon two things:

- 1 the type of information—descriptive, quantitative, qualitative or attitudinal; and
- 2 the way you want to write your dissertation/report.

There are two broad categories of report: quantitative and qualitative. As mentioned earlier, the distinction is more academic than real as in most studies you need to combine quantitative and qualitative skills.

Step VIII: writing a research report

Writing the report is the last and, for many, the most difficult step of the research process. This report informs the world of what you have done, what have you discovered and what conclusions you have drawn from your findings. If you are clear about the whole process, you will also be clear about the way you want to write your report. Your report should be written in an academic style and be divided into different chapters and/or sections based upon the main themes of your study.

6. HOW TO SELECT A RESEARCH PROBLEM

An ‘angle’ for your research can come from insights stemming from:

- personal experience
- theory
- observations
- contemporary issues
- engagement with the literature

What is a research problem?!

- A research problem, in general, refers to some difficulty which a researcher experiences in the context of either a **theoretical** or **practical** situation and wants to obtain a solution for the same. The research problem undertaken for study must be carefully selected. The task is a difficult one, although it may not appear to be so. Help may be taken from a research guide in this connection. Nevertheless, every researcher must find out his own salvation for research problems cannot be borrowed.

Why are research questions important?

“Well-crafted questions guide the systematic planning of research. Formulating your questions precisely enables you to design a study with a good chance of answering them.”

-- Light, Singer, Willett, By Design (1990)

STATEMENT OF PROBLEM

- After selecting a problem, it should be stated carefully by the researcher to delimit his task and isolate a specific problem before he can proceed with active planning of the study. This type of decision is culminated in the problem statement.
- Kerlinger (1964) has identified three criteria of good Problem Statements.
 1. A problem should be concerned with relation between two or more variables. (eg, age, sexetc)
 2. It should be stated “clearly and unambiguously in question form.
 3. It should be amenable to empirical testing.

7. Considerations in selecting a good research problem

- **1. Interest:** a research endeavour (*attempt*) is usually time consuming, and involves hard work and possibly unforeseen problems. One should select topic of great interest to sustain the required motivation.
- **2. Magnitude(manageability):** It is extremely important to select a topic that you can manage within the time and resources at your disposal. Narrow the topic down to something manageable, specific and clear.

- **3. Measurement of concepts:** Make sure that you are clear about the indicators and measurement of concepts (if used) in your study. Do not use in your research problem concepts that you are not sure how to measure.
- **4. Level of expertise:** Make sure that you have adequate level of expertise (*know how / knowledge*) for the task you are proposing since you need to do the work yourself.

- **5.Relevance:** Ensure that your study adds to the existing body of knowledge, bridges current gaps and is useful in policy formulation. This will help you to sustain interest in the study.
- **6. Availability of data:** Before finalizing the topic, make sure that data are available.
- **7. Ethical issues:** How ethical issues can affect the study population and how ethical problems can be overcome should be thoroughly examined at the problem formulating stage.

8.The Foundation of Hypotheses

- The second step in the research process of social study is to formulate hypotheses. The hypothesis is a tentative solution of a problem. The research activities are planned to verify the hypothesis and not to find out the solution of the problem or to seek an answer of a question. It is very essential to a research worker to understand the meaning and nature of hypothesis. The researcher always plan or formulate a hypothesis in the beginning of the problem.

MEANING OF HYPOTHESIS

- The word hypothesis is made up of two Greek roots : Hypo + thesis = Hypothesis
- ‘Hypo’ means tentative or subject to the verification and ‘Thesis’ means statement about solution of a problem.
- The world meaning of the term hypothesis is a tentative statement about the solution of the problem. Hypothesis offers a solution of the problem that is to be verified empirically and based on some rationale.

- Hypotheses are designed to express relationships between variables. If this is the nature of your question, a hypothesis can add to your research
- If your question is more descriptive or explorative, generating a hypothesis may not be appropriate

9.The formulation of objectives:

Objectives are the goals you set out to attain in your study.

- -They inform a reader what you want to attain through the study.
- -It is extremely important to word them clearly and specifically.
- Objectives should be listed under two headings:
 - a) **main objectives** (aims);
 - b) **sub-objectives**.

- The ***main objective*** is an overall statement of the thrust of your study.
- It is also a statement of the main associations and relationships that you seek to discover or establish.
- The ***sub-objectives*** are the specific aspects of the topic that you want to investigate within the main framework of your study.

The research objectives

- -They should be numerically listed.
- -Wording should clearly, completely and specifically communicate to your readers your intention.
- -Each objective should contain only one aspect of the Study.
- -Use action oriented words or verbs when writing objectives.

The objectives should start with words such as:

- ‘to determine’, ‘to find out’,‘to ascertain’,
‘to measure’,‘to explore’ etc.
- The wording of objectives determines the
type of research (*descriptive, correlational
and experimental*) and the type of research
design you need to adopt to achieve them.

Examples

Descriptive studies:

- *-To describe the types of incentives provides by Hotel XYZ to employees in Algeria.*
- *-To find out the opinion of the employees about the medical facilities provided by five star hotels in Algeria.*

Correlational studies:

- *-To ascertain the impact of training on employee retention.*
- *-To compare the effectiveness of different loyalty programmes on repeat clientele.*

Hypothesis –testing studies:

- *-To ascertain if an increase in working hours will increase the incidence of drug/alcohol abuse.*
- *-To demonstrate that the provision of company accommodation to employees in Algiers hotels will reduce staff turnover.*

10.WHAT IS A LITERATURE REVIEW?

The phrase '**review of literature**' consists of two words: Review and Literature.

- The word '**literature**' in research methodology refers to the knowledge of a particular area of investigation of any discipline which includes theoretical, practical and its research studies.
- The term '**review**' means to organize the knowledge of the specific area of research to evolve an edifice of knowledge to show that his study would be an addition to this field.

Review of literature

- The term ‘review of literature’ has been defined in the following ways:

According to W.R. Borg

“The literature in any field forms the foundation upon which all future work will be built. If we fail to build the foundation of knowledge provided by the review of literature our work is likely to be shallow and naive and will often duplicate work that has already been done better by some one else.”

Some definitions of L.R:

- According to John W. Best

“Practically all human knowledge can be found in books and libraries. Unlike other animals that must start a new with each generation, man builds upon the accumulated and recorded knowledge of the past. His constant adding to the vast store of knowledge makes possible progress in all areas of human endeavour.”

FUNCTIONS OF THE LITERATURE REVIEW

- a. Bring clarity and focus to your research problem;
 - b. Improve your methodology;
 - c. Broaden your knowledge;
 - d. Contextualise your findings.
-

a. Bring clarity and focus to your research problem;

- The process of reviewing the literature helps you to understand the subject area better and thus helps you to conceptualise your research problem clearly and precisely. It also helps you to understand the relationship between your research problem and the body of knowledge in the area.

b. Improve your methodology:

- A literature review tells you if others have used procedures and methods similar to the ones that you are proposing, which procedures and methods have worked well for them, and what problems they have faced with them. Thus you will be better positioned to select a methodology that is capable of providing valid answer to your research questions.

c. Broaden your knowledge base in your research area:

It ensures you to read widely around the subject area in which you intend to conduct your research study. As you are expected to be an expert in your area of study, it helps fulfill this expectation. It also helps you to understand how the findings of your study fit into the existing body of knowledge.

d. Contextualise your findings:

- How do answers to your research questions compare with what others have found? What contribution have you been able to make in to the existing body of knowledge? How are your findings different from those of others? For you to be able to answer these questions, you need to go back to your literature review. It is important to place your findings in the context of what is already known in your field of enquiry.

STEPS IN CONDUCTING A LITERATURE REVIEW

- Search for existing literature in your area of study
- Review the literature selected
- Develop a theoretical framework
- Develop a conceptual framework
- Write your literature review

REVIEWING THE LITERATURE

- Read critically the contents of books and articles and look for the following things:
 - The **claims** and **theories** put forward.
 - The **criticisms** of these and their basis.
 - The **methodologies** adopted, and the criticisms about them.
 - The **conclusions** and **findings** advanced
 - **Disagreements** about the constructs you are investigating
 - The **gaps** you notice in the literature

DEVELOPING A THEORETICAL FRAMEWORK

- The information obtained from books and journals now needs to be sorted under main themes and theories, agreements and disagreements among authors, and other aspects related to your research topic; all this needs to be arranged so as each element will fit in a slot of the theoretical framework

DEVELOPING A CONCEPTUAL FRAMEWORK

The conceptual framework stems from the theoretical framework and concentrates, usually, on one section of that theoretical framework. The latter consists of the theories or issues in which your study is embedded whereas the former describes the aspects you selected from the theoretical framework to become the basis of your study. The conceptual framework is the basis of your research problem. For instance, in the example cited in

Writing Lit. Review – Logical Argument / A Critique

A was the earliest writers to discuss . . .

B made a valuable contribution to the discussion of this problem . . .

C argued that D had not used the appropriate methods . . .

In the 1990s E proposed a completely different approach. . .

The best study of this problem is perhaps by F . . .

WHERE TO FIND SOURCES FOR THE LITERATURE REVIEW

- BOOKS
- INTERNET
- JOURNALS
- ARCHIVES
- REPORTS
- OBSERVATIONS
- RECORDS...

PROBLEMS IDENTIFIED IN WRITING A LITERATURE REVIEW

- Some reviews consist of a largely unrelated annotated list of studies.
- Some reviews are not relevant to the investigation
- Theories in the review might be mentionned or described, but often without a clear, logical connection among the theories, or without showing the relevance of each description

ANSWERING SOME OF THE PROBLEMS RELATED TO THE L.R.

- The literature you decide to include must be relevant to the area of your investigation
- The pieces of literature you decide to include must be logically connected to each other

BOOKS

- Use books first as they gather a lot of information on a topic
- They also provide a good background information on a topic
- They also offer interesting extensive bibliographies

JOURNAL ARTICLES

Look for journal articles second

- They discuss one perspective
- Each article makes a unique contribution
- They can supplement information from books
- They offer more up-to-date information

11. WHAT ARE DATA ?

- The term data refers to any kind of information researchers obtain on the subjects, respondents, or participants of the study. In research, data are collected and used to answer the research questions and objectives of the study

- Data collection is an extremely important part of any research because the conclusion of a study is based on what the data reveal. The choice of procedures usually depends on the objectives and design of the study

10.TYPES OF RESEARCH DATA

- Research data are generally classified either as **quantitative** or **qualitative**. Based on their sources, they fall under two categories:
 - **Primary data;**
 - **Secondary data**

QUANTITATIVE AND QUALITATIVE DATA

- **Quantitative data:**
These are information which can be counted or expressed in numerical values
e.g. nb of students, age, grades, test scores...
- **Qualitative data:**
These are descriptive information which has no numerical values.
e.g. A person's attitude, perception, or feelings

TYPES OF DATA:

- Primary data;
- Secondary data

Methods of data collection

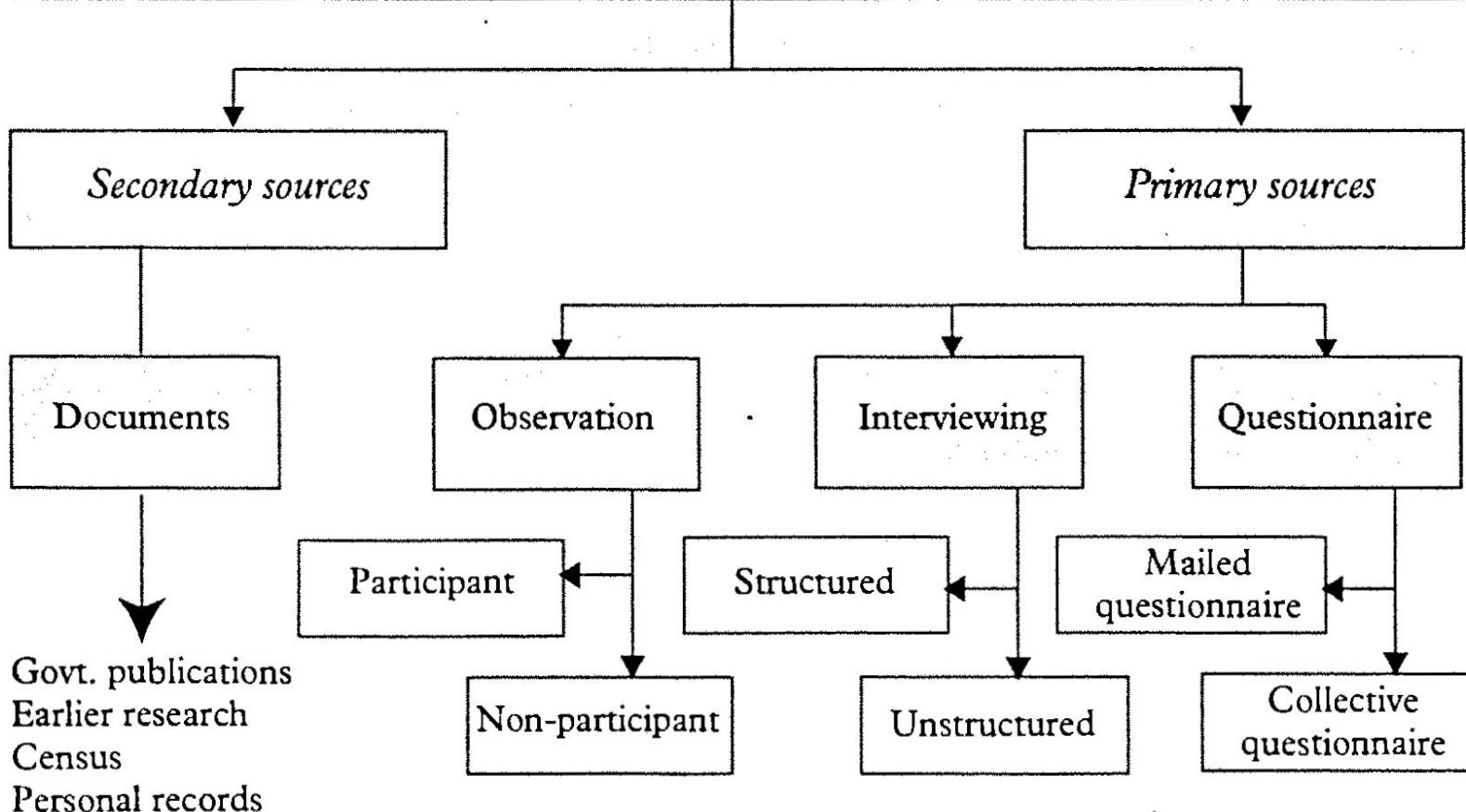


Figure 9.1 Methods of data collection

PRIMARY VS SECONDARY DATA

- **Primary data** are originated by a researcher for the specific purpose of addressing the problem at hand. They are collected directly from the subjects being studied.

PRIMARY VS SECONDARY DATA

- **Secondary data:**

These are information already available. They have been collected from other available sources (recent censuses and analysed by someone else for purposes other than the problem at hand. Secondary data may be published or unpublished.

11. COLLECTING DATA USING PRIMARY SOURCES

Research tools:

- 1. Questionnaires
- 2. Interview schedules
- 3. Observations

1. The questionnaire

- HOW TO CONSTRUCT A QUESTIONNAIRE
- Questionnaires must contain simple but straightforward directions for the respondents so that they may not feel any difficulty in answering the question.
- Do not use ambiguous questions or questions based on presumptions (supposition or guessing; : questions should be kept short and clear, free from guessing and interpretations.

HOW TO CONSTRUCT A QUESTIONNAIRE

- Do not ask leading questions): Don't lead the respondents to answer in a certain way.

Eg: How often do you wash your car?

Assumes that the respondent has a car and he washes it. Instead, ask a filter question to find if he has a car or not and then : " if you wash your car, how many times a year?"

- Double-barrelled questions should be avoided.i.e. two questions in one / asking two qustions rather than one.

Types of questionnaire:

- There are three basic types of questionnaire, they are classified according to the kind of questions they include:
 - 1. Closed-ended**
 - 2. Open- ended**
 - 3. Combination of both**

TYPES OF QUESTIONS IN A QUESTIONNAIRE

- **1. Closed format questions (closed-ended)**
closed- ended questions include all possible answers/ prewritten response categories, and respondents are asked to choose among them.
e.g. An example of a closed form questionnaire item follows:
If group tests are used in your school, by whom are they administered?
(a) *Administrators* (b) *Consellors*,
(c) *Psychologists*, (d) *Psychometricians*,
(e) *Teachers*, and (f) *Others*

TYPES OF QUESTIONS IN A QUESTIONNAIRE

- 2. Open format questions: (open-ended)**

Open- ended questions allow respondents to answer in their own words.

It doesn't contain boxes to tick but instead it leaves a blank for the respondent to write in an answer.

e.g. state your opinion about the quality of X products and services

TYPES OF QUESTIONS IN A QUESTIONNAIRE

3. Combination of both: this way, it is possible to find out how many people use a service and what they think of the service in the same form.

Begin with a series of closed-ended questions, with boxes to tick or scales to rank, and they finish with a section of open-ended questions or more detailed response.

Other types of questions :

- **4. Dichotomous questions:**

e.g. Do you like the products of X company?

yes no

- **5. Importance questions:**

e.g. Cost effective services are:

- a. extremely important b. very important.
- c. somewhat important d. not very important

- 6. Likert questions:
e.g. X Corporation products have to improve on quality.
 1. agree
 2. strongly agree
 3. neither agree nor disagree (undecided)
 4. disagree
 5. strongly disagree

- **7. Bipolar questions:**

e.g. How would you describe the services of X corporation?

efficient -----X----- inefficient

fast ----- -----X----- slow

reliable -----X----- unreliable

- **8. rating scales:**

e.g. How would you rate the services of
X corporation?

1. good
2. fair
3. poor
4. very poor

3. Observation

Observation

Observation is one way to collect primary data. Observation is a purposeful, systematic and selective way of watching and listening to an interaction or phenomenon as it takes place. There are many situations in which observation is the most appropriate method of data collection, for example, when you want to learn about the interaction in a group, study the dietary patterns of a population, ascertain the functions performed by a worker, or study the behaviour or personality traits of an individual. It is also appropriate in situations where full and/or accurate information cannot be elicited by questioning, because respondents either are not co-operative or are unaware of the answers because it is difficult for them to detach themselves from the

interaction. In summary, when you are more interested in the behaviour than in the perceptions of individuals, or when subjects are so involved in the interaction that they are unable to provide objective information about it, observation is the best approach to collect the required information.

Types of observation

There are two types of observation:

- participant observation; and
- non-participant observation.

Participant observation is when a researcher participates in the activities of the group being observed in the same manner as its members, with or without their knowing that they are being observed. For example, you might want to examine the reactions of the general population towards people in wheelchairs. You can study their reactions by sitting in a wheelchair yourself. Alternatively, you might want to study the life of prisoners and pretend to be a prisoner in order to do this.

Non-participant observation, on the other hand, is when the researcher does not get involved in the activities of the group but remains a passive observer, watching and listening to its activities and drawing conclusions from this. For example, you might want to study the functions carried out by nurses in a hospital. As an observer, watch, follow, and record the activities as they are performed. After making a number of observations, conclusions can be drawn about the functions nurses carry out in the hospital. Any occupational group in any setting can be observed in the same manner.

Classroom Observation worksheet (CAPES)

School: Date: Time: class: Nber of Sts:

Unit: Sequence:..... Today's lesson: Observed Teacher:

Criteria	Indicators	Mx M	Mn M	PM	NM
		3/3	2/3	1/3	0/3
Knowledge	1. has a good command of oral and written English. (Mastery of the sound system, mechanics of writing and grammar) 2. is familiar with the curriculum along with documents(support documents, teacher's guide and textbooks) 3. knows school regulations (rights & duties)				
Skills (know how to do)	1. plans learning (sets weeks of integration built upon learners' acquisitions) 2. elaborates learning situations (sets clearly the learning objectives, sets appropriate tasks and provides situations of evaluation along with the appropriate tools 3. sets remedial work for the slow learners and follow up for the advanced ones.				
Attitudes (know how to be)	1. demonstrates positive attitudes towards stakeholders (students, colleagues, administrative staff and parents) 2. demonstrates sense of responsibility (manages conflicts, participates in the school life. & keeps confidentiality). 3. demonstrates readiness for change and innovation				

*Excellence: creativity and originality

Mx M = Maximum Mastery - Mn M = Minimum Mastery - PM = Partial Mastery - NM = No Mastery

The recording of observation

There are many ways of recording observation. The selection of a method of recording depends upon the purpose of the observation. Keep in mind that each method has its advantages and disadvantages.

- **Narrative**—in this form of recording the researcher records a description of the interaction in his or her own words. Usually, s/he makes brief notes while observing the interaction and soon after the observation makes detailed notes in narrative form. In addition, some researchers may interpret the interaction and draw conclusions from it. The biggest advantage of narrative recording is that it provides a deeper **insight into the interaction**.

Scales—at times some observers may prefer to develop a scale in order to rate various aspects of the interaction or phenomenon. The recording is done on a scale developed by the observer/researcher. A scale may be one-, two- or three-directional, depending upon the purpose of the observation. For example, in the scale in Figure 9.2—designed to record the nature of the interaction within a group—there are three directions: positive, negative, and neutral.

A study of the nature of interaction in a group

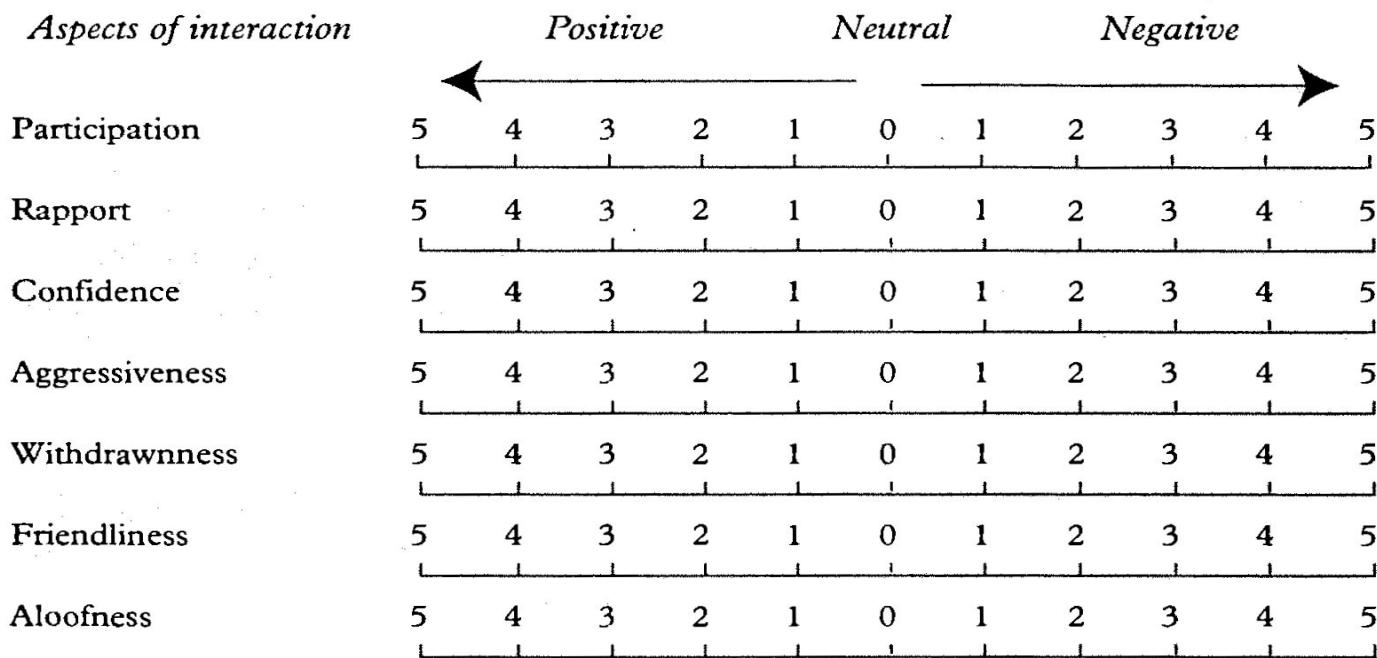


Figure 9.2 A three-directional rating scale

Categorical recording—sometimes an observer may decide to record her/his observation using categories. The type and number of categories depend upon the type of interaction and the observer's choice about how to classify the observation. For example: passive/active (two categories); introvert/extrovert (two categories); always/sometimes/never (three categories); strongly agree/agree/uncertain/disagree/strongly disagree (five categories). The use of categories to record an observation may suffer from the same problems as those associated with scales.

Recording on mechanical devices—observation can also be recorded on a video tape and then analysed. The advantage of taping the interaction is that the observer can see it a number of times before drawing any conclusions, and can invite other professionals to view the tape in order to arrive at more objective conclusions. However, one of the disadvantages is that some people may feel uncomfortable or may behave differently before a camera. Therefore the interaction may not be a true reflection of the situation.

The choice of a particular method for recording your observation is dependent upon the purpose of the observation, the complexity of the interaction and the type of population being observed. It is important to consider these factors before deciding upon the method for recording your observation.

2. Interview

- 2.1. What is an interview ?
 - a) A structured set of questions designed to obtain information from a sample.
 - b) *Oxford Dictionary definition* : a meeting at which a journalist / interviewer asks somebody questions to find out his/her opinion ,etc (often shown on television or printed in newspaper).

- **2.2.Why is it important ?**

It is very useful for getting the story behind a participant's experience. The interviewer can follow in-depth information around a topic. Interviews usually follow up certain respondents' questionnaires to further investigate their responses. Usually open-ended questions are asked during interviews.

- **2.3. Some Guidelines for Conducting Interviews**

Before starting to design the interview questions and process, the researcher should clearly articulate to himself what problem or need is to be addressed using the information to be gathered by the interviews. This helps him to keep clear focus on the aim of each question.

2.4. Preparation for Interview

- 1. Choose a setting with little distraction.** Avoid loud lights or noises, ensure the interviewee is comfortable. (Often, interviewees may feel more comfortable at their own places of work or homes.)
- 2. Explain the purpose of the interview.**
- 3. Address terms of confidentiality.** Note any terms of confidentiality. Explain who will get access to their answers and how they will be analyzed. If their comments are to be used as quotes, get their written permission to do so.

- 4. Explain the format of the interview.** Explain the type of interview you are conducting and its nature
- 5. Indicate how long the interview usually takes.**
- 6.Tell them how to get in touch with you later if they want to.**
- 7. Ask them if they have any questions** before you both get started with the interview.
- 8. Don't count on your memory to recall their answers.** Ask for permission to record the interview or bring along someone to take notes.

2.5. Types of Topics in Questions

- A specialist in the field called Patton notes **six kinds of questions**. One can ask questions about:
 - a. Behaviours** - about what a person has done or is doing
 - b. Opinions/values** - about what a person thinks about a topic
 - c. Feelings** - note that respondents sometimes respond with "I think ..." so be careful to note that you're looking for feelings.
 - d. Knowledge** - to get facts about a topic
 - e. Sensory** - about what people have seen, touched, heard, tasted or smelled
 - f. Background/demographics** - standard background questions, such as age, education, etc.

2.6. Wording of Questions

- **Wording should be open-ended.** Respondents should be able to choose their own terms when answering questions.
- **Questions should be as neutral as possible.** Avoid wording that might influence answers, e.g., evocative, judgmental wording.
- **Questions should be asked one at a time.**
- **Questions should be worded clearly.** This includes knowing any terms particular to the program or the respondents' culture.
- **Be careful asking "why" questions.** This type of question infers a cause-effect relationship that may not truly exist. These questions may also cause respondents to feel defensive, e.g., that they have to justify their response, which may inhibit their responses to this and future questions.

2.7. Conducting Interviews

- 1.Occasionally verify the tape recorder (if used) when working.**
- 2.Ask one question at a time.**
- 3.Attempt to remain as neutral as possible.** That is, don't show strong emotional reactions to their responses. Patton suggests to act as if "you've heard it all before."
- 4.Encourage responses** with occasional nods of the head, "uh huh"s, etc.

5. Be careful about the appearance when note taking.

That is, if you jump to take a note, it may appear as if you're surprised or very pleased about an answer, which may influence answers to future questions.

6. Provide transition between major topics, e.g., "we've been talking about (some topic) and now I'd like to move on to (another topic)."

7. Don't lose control of the interview. This can occur when respondents talk about a different topic, take a long time to answer and time is running out , or even begin asking questions to the interviewer.

COMPREHENSION QUESTIONS

- What question is addressed by this research? Explain the relevant past research and the ideas that led to this question.
- What hypothesis was investigated in this study? Explain how it is related to the research question you discussed in #1 above.
- How was the study set up? Explain why it was set up this way.
- What data were collected? Explain why the authors chose these particular data to collect.
- What were the results?
- Explain how well the results do (or do not) support the hypothesis.
- Explain any alternative explanations for the findings (your own ideas and/or the authors').
- What further research does this study suggest (to you and/or the author)? Explain why it should be conducted.

HOW TO READ A RESEARCH PAPER: A FOUR- STEP GUIDE

- the four steps: Skimming, vocabulary, comprehension, and analysis.
 1. Skimming. Skim the paper quickly, noting basics like headings, figures and the like.
 2. Vocabulary. Go through the paper word by word and line by line, underlining or highlighting **every word and phrase** you don't understand.

HOW TO READ A RESEARCH PAPER: A FOUR- STEP GUIDE

- 3. Comprehension, section by section. Try to deal with all the words and phrases, although a few technical terms in the Methods section might remain. Now go back and read the whole paper, section by section, for comprehension.

Here are some qqs. that you might use to help you better understand the article.

HOW TO READ A RESEARCH PAPER: A FOUR- STEP GUIDE

- 4. Analysis. After you understand the article and can summarize it, then you can return to broader questions and draw your own conclusions.

ANALYSING RESEARCH PAPERS

- Here are some questions that may be useful in analysing research papers:
- **Introduction:**
- What is the overall purpose of the research?
- How does the research fit into the context of its field? Is it, for example, attempting to show the effectiveness of a program? show the validity of a new technique? open up a new field of inquiry?
- Do you agree with the author's rationale for studying the question with this particular methodology?

ANALYSING RESEARCH PAPERS (QQS.)

- **Methods:**
- Were the measurements appropriate for the questions the researcher was approaching?
- How is the study controlled? are there control groups? If so, are they exactly comparable to the experimental groups?
- Were the measures in this research clearly related to the variables in which the researchers (or you) were interested?
- If human subjects were studied, did they accurately represent the populations under study?

ANALYSING RESEARCH PAPERS (QQS.)

- **Results**
- • What is the one major finding?
- • Were enough of the data presented so that you feel you can judge for yourself how the experiment turned out?
- • Did you see patterns or trends in the data that the author did not mention? Were there problems in data interpretation that were not addressed

ANALYSING RESEARCH PAPERS (QQS.)

- **Discussion**
- • Do you agree with the conclusions drawn from the data?
- • Are these conclusions over-generalized or appropriately careful?
- • Are there alternative interpretations of the data?
- • What further experiments can you think of, to continue the research or to answer remaining questions ?

CONCEPTUALING A RESEARCH DESIGN

- A research design is a procedural **plan** that is adopted by the researcher to answer questions validly, objectively, accurately and economically

References (Bibliography): How to cite the references

- You need to be aware that there are different conventions for listing different types of sources, such as books, journals, conference proceedings, and websites. The format for referencing each of these sources is given below. In the demonstrations below, the generic format for the specific type of source is first given, followed by examples. Note that for book referencing, the title of the book is *italicized*, whereas for a journal it is the name of the journal that is in *italics*. Note below that the convention is to insert a full stop (.) after the author's name and year (e.g. 'Dreyfuss, H. L. (2001).'); however some publishers omit this convention, preferring to implement their own house style.

Rules to follow:

There are two rules to follow in the References section:
First, you should list only significant, published references.

References to unpublished data, abstracts, theses, and other secondary materials should not clutter up the References or Literature Cited section. If this reference seems to be essntial, you may add it parenthetically or as a foortnote in the etxt.

Second, make sure that all references cited in the text are indeed listed in the bibliography and that all the references listed under the bibliography are indeed cited somewhere in the text.

Most journals cite references in one of the three general ways that may be referred to as :

1. **Author and Year System:** often referred to as the Harvard system. It has been very popular for many years and is used in many journals and books.
Inside the text, you state only the AUTHORr+ YEAR either with a quotation or without. Full details of the source are given in a reference list (bibliography) at the end of the text. This allows the writer to acknowledge his/her sources without significantly interrupting the flow of the writing.

- You should always include the page number when you include a passage of direct quotation from another writer's work.

Eg. -The seminars.....employees.(Lyon,1992)

-Kneeper and Cropley (1991:p.44) believe that.....

- When a publication has several authors (more than two), it is advisable to give the surname of the first author followed by **et al** (an abbreviation of the Latin for « **and the others** ».)

Eg: Cohen **et al.** (2000). *Research Methods in Education*. 5th edition London: Routledge Falmer.

This is used only inside the paper. In the bibliography section, the names of the authors should be all mentioned.

2. Alphabet-Number System: Citation by numbers is a modification of the name and year system. Citation by numbers keeps printing expenses within bounds particularly if it is a long list. Some authors who have habitually used name and year tend to dislike the alphabet-number system, claiming that citation of numbers cheat the reader. The reader should be told, so the argument goes, the name of the person associated with the cited phenomenon; sometimes, the reader should also be told the date, on the grounds that an **1897** reference might be viewed differently than a **1997** reference.

Fortunately, these arguments can be overcome. As you cite references in the text, decide whether names and dates are important. If they are not, use only the reference number:

Eg: "Peretyrosine is quantitatively converted to phenylalanine under these conditions (13)." If you want to feature the name of the author, do it within the context of the sentence:

"The role of the carotid sinus in the regulation of respiration was discovered by **Heymans** (13)." If you want to feature the date, you can also do that within the sentence: " Streptomycin was first used in the treatment of tuberculosis in **1945** (13)."

- **3. Citation Order System:** It is simply a system of citing the references (by numbers) in the order they appear in the paper. This system avoids the substantial printing expense of the name and year system, and readers often like it because they can quickly refer to the references if they so desire in one-two-three order as they come to them in the text. It is a useful system for a journal that is basically a " note " journal, each paper containing only a few references. For long papers, with many references, citation order is probably not a good system.

Examples of different reference styles:

- **1.Author and Year System:**
- Day, R.A.1998. How to write and publish a scientific paper. 5th ed. Phoenix: Oryx Press.
- Hutch, E.J.1986. Guidelines on authorship of medical papers. Ann. Interm. Med. 104: 269-274.
- Sproul,J.,H.Klaaren, and F.Mannarino. 1993. Surgical treatment of Freiberg's infraction in athletes. Am. J. Sports Med. 21:381-384.

- **2. Alphabet-Number System:**
 1. Day, R.A.1998. How to write and publish a scientific paper. 5th ed. Phoenix: Oryx Press.
 2. Hutch, E.J.1986. Guidelines on authorship of medical papers. Ann. Interm. Med. 104: 269-274.
 3. Sproul,J.,H.Kllaaren, and F.Mannarino. 1993. Surgical treatment of Freiberg's infraction in athletes. Am. J. Sports Med. 21:381-384.

- **3. Citation Order System:**

1. Hutch EJ. Guidelines on authorship of medical papers. Ann. Intern. Med. 1986; 104: 269-274.
2. Sproul J, Kllaaren H, Mannarino F. Surgical treatment of Freiberg's infraction in athletes. Am J Sports Med 1993. 21:381-4.
3. Day RA. How to write and publish a scientific paper. 5th ed. Phoenix: Oryx Press, 1998.

Notice the differences between this system and the previous ones.

Book: Following the Author and Date system

- Author's surname, initials (year). *Title of book*, Place of publication: Publisher.

Examples:

- Dreyfus, H.L. (2001). *On the Internet*, London: Routledge.
- Davenport, T.H. and Prusak, L. (1998). *Working Knowledge*, Boston: Harvard Business School Press 4.

The title of the book should be formatted to distinguish it from other details.

Journal

- Author's surname, initials (year). 'Title of article', *Name of Journal*, volume number (issue number): page(s).

Examples:

- Burns, E. (1994). 'Information Assets, Technology and Organisation', *Management Science*, 40(12): 645–662.
- Tearle, P., Dillon, P. and Davies, N. (1999). 'Use of information technology by English university teachers. Developments and trends at the time of the National Inquiry into Higher Education', *Journal of Further and Higher Education*, 23(1): 5–15.

Newspaper

- Author's surname, initials (year). 'Title of article', *Name of Newspaper*, page(s).
- In other words, same format as for a journal citing, but without the need to provide an issue number.

Example:

- Riddell, P. and Webster, P. (2006). 'Support for Labour at lowest level since 1992', *The Times*, 9 May, p. 2.
- Where the author is not known:
The Indian Agra News (2007). 'Carbon footprints and economic globalisation', 18th April, p. 4.

Website

- Author's name, initials (year). 'Title of article' [online]. Available at: indicate website address. Last accessed: date.
Example:
- **Brender, A. (2004). 'Speakers Promote Distance Education to Audiences in Asia' [online]. Available at: www.chronicle.com. Last accessed: 12th November 2004.**
- For a website you might find that you have little information to write down, or that the article you once read is no longer there. Do not panic: the trick is to write down as much as you can. If there is no author for the web article/source, then record the name of the website instead, e.g. The eLearning Centre (2005). 'eLearning is taking giant steps!' [online], etc.

Thesis

- Author's name, initials (year). *Title of thesis*, Title of award, Institution: Place.

Fictitious examples follow:

Aitken, R. (2008). *Exploring the Role of Laughter in the Workplace*, PhD thesis, Inverclyde University: Glasgow.

- Or if it is an unpublished dissertation (e.g. an undergraduate dissertation):

Anderson, T. (2008). *Forecasting Economic Growth: Lessons from Abroad*, 3rd year Dissertation, BA Economics, Inverclyde University: Glasgow.

Conference Proceedings

- Author's surname, initials (year). 'Title of article', *Name of Conference Proceedings*, Place conference was held, page(s), include website address if taken from a website and indicate date when last accessed. **Example:**
- Conole, G., Oliver, M., Isroff, K. and Ravenscroft, A. (2004). 'Addressing Methodological Issues in e-Learning Research', in *Proceedings of the Networked Learning Conference 2004*, Sheffield. Available at:
www.sef.ac.uk/nlc/Proceedings/Symposia4.htm. Last accessed: 2nd October 2004.

Lectures/Seminars

- Lecture's name, initials, (year of lecture, seminar).
Title of lecture/seminar[Information about lecture/seminar]. Date of lecture/seminar.
- Biggam, J. (2008). *E-security in the Digital Age* [Lecture given to MSc E-Business students, Division of Business Information Management, Inverclyde University]. 3rd February.
- If the lecture/seminar material is available on a virtual learning environment (e.g. Blackboard) then you can append this information before the date above (Available: website details).

- To record the example where Barlow, in her **book written in 2007**, cites a journal **article written by MacFarlane in 2004**, and where you have also referred to MacFarlane in the body of your text (as described earlier), then you can note this information in your References section by first of all citing MacFarlane's journal article in the normal way, adding the phrase 'cited in' (or 'in'), then citing Barlow's book in the normal way, as follows:

MacFarlane, K. (2004). 'Alternative Approach to Cognitive Learning', *Organisational Learning*, 10(2): 23–45, cited in Barlow (2007). *Learning Again*, Milton Keynes: Open University Press, p. 634

- Suppose that you have read a book titled *Classic and Cavalier: Essays on Jonson and the Sons of Ben* and that is made up of chapters written by different authors and that you want to reference one of the chapters written by Martin Elsky. You reference the chapter first, then indicate the general book details, as shown in the example below:
- Elsky, M. (1982). 'Words, Things, and Names: Jonson's Poetry and Philosophical Grammar', in *Classic and Cavalier: Essays on Jonson and the Sons of Ben*, ed. by Summers, C. J. and Pebworth, T.-L., Pittsburgh: University of Pittsburgh Press, pp. 31–44.
- Remember, you can omit the 'pp.' if you wish, when indicating the chapter's page numbers.
- Citing sources is a laborious, mechanical process but it is a necessary part of being viewed as a competent researcher. The upside is that there are easy marks up for grabs.

Processing and Analysing data:

- **1) Introduction**

Processing and analyzing data involve a number of closely related operations which are performed with the purpose of summarizing the collected data and organizing these in a manner that they answer the research questions (objectives).

2) The Data Processing Operations

- 1. **Editing-** a process of examining the collected raw data to detect errors and omissions and to correct these when possible.
- 2. **Coding:** the process of translating information gathered from questionnaires or other sources into something that can be analyzed. It involves assigning a value to the information given—often value is given a label.

Coding can make data more consistent:

Example: Question = “Sex?”

Answers = Male, Female, M, or F, etc...

Coding will avoid such inconsistencies

- **Example:** variable EDUCATION, possible coding:

0 = Did not graduate from high school

1 = High school graduate

2 = Some college or post-high school education

3 = College graduate

3. Classification- a process of arranging data in groups or classes on the basis of common characteristics. Depending on the nature of phenomenon involved.

a) ***Classification according to attributes:*** here data is analysed on the basis of common characteristics which can either be:

- ***descriptive*** such as *literacy, sex, religion etc.* or
- ***numerical*** such as *weight, height, income etc.*

E.g. Table 1. Hotel Employees with MBA Degree

	YES	NO	TOTAL
MBA Degree	21	9	30

- b) *Classification according to class –intervals*: is done with data relating to **income, age, weight, tariff, production, occupancy** etc. Such quantitative data are known as the *statistics of variables* and are classified on the basis of class –intervals.

- **E.g.** persons whose income are within DA 20001 to DA 40000 can form one group or class, those with income within D 40001 to DA 60000 can form another group or class and so on. The number of items which fall in a given class is known as the frequency of the given class

Table 3. Salaries Received by Algerian Nurses

Income Range	Frequency	%
Ds.10001-20000	10	50
Ds.20001-30000	8	40
Ds.30001-40000	2	10
Total	20	100

- **4. Tabulation-** Tabulation is the process of summarizing raw data and displaying the same in compact form for further analysis. It is an orderly arrangement of data in columns and rows. Tabulation is essential because:
 - a) It conserves space and reduces explanatory and descriptive statement to a minimum.
 - b) It facilitates the process of comparison.
 - c) It facilitates the summation of items and the detection of errors and omissions.
 - d) It provides the basis for various statistical computations.

Analysing data

- Data can be analysed either manually or *with the help of a computer*.
- ***Manual Data Analysis:*** This can be done if the number of respondents is reasonably small. Manual data analysis is extremely time consuming.

- ***Data Analysis Using a Computer:*** If you want to analyse data using computer, you should be familiar with the appropriate program. In this area, knowledge of computer and statistics plays an important role. The most common software is **SPSS** (*Statistical Package for the Social Sciences*) for windows. **However**, data input can be long and laborious process, and if data is entered incorrectly, it will influence the final results.

- **3) Hypothesis-testing:** After analysing the data as stated above, the researcher is in a position to test the hypotheses. Do the facts support the hypotheses or they happen to be contrary? This is the usual question which should be answered while testing hypotheses.

4) Generalisations and interpretation: If a hypothesis is tested and confirmed several times, it may be possible for the researcher to arrive at generalisation, i.e., to build a theory. As a matter of fact, the real value of research lies in its ability to arrive at certain generalisations.

- **5) Preparation of the report or the thesis:**
Writing the report is the last, and for many, the most difficult step of the research process. The report informs the world what you have done, what you have discovered and what conclusions you have drawn from your findings. The report should be written in an academic style. Language should be formal and not journalistic.