REPORTS

Technical Report Writing

INTRODUCTION

- <u>Reports are a part of our lives—starting from school reports through news reports on TV and Radio to many kinds of reports we are required to submit in the course of our work</u>.

- From time to time, the Government sets up committees and commissions to report on various issues of social, political, and economic importance.

- Such committees meet from time to time, work out a detailed plan to conduct surveys and collect data from various sources, and finally submit their findings and recommendations in the form of a technical report.

INTRODUCTION

- But <u>what is a report</u>? <u>A report is a major form of technical/business/professional communication</u>.

- In writing a report, a person who possesses certain facts, ideas, or suggestions useful for courses of action transmits this information to another person who wants to use it.

- <u>A report can be the description of an event by a person who witnessed it to somebody else who was not actually present on the scene</u>.

- It can be the description of the conditions that did exist, that do exist, or that are likely to exist. In short, we can say that a report is usually a piece of factual writing, based on evidence, containing organized information on a particular topic and/or analysis of that particular topic.

- <u>It is formal in nature and is written for a specific purpose and audience</u>. It discusses the topic in depth and contains conclusions and recommendations if required.

OBJECTIVES

- The purposes for which reports are written vary widely. Given below are some important purposes of reports:
  - To <u>present a record</u> of accomplished work (Project report)
  - To <u>record an experiment</u> (primary research report/laboratory report)
  - To <u>record research findings</u> or technical specifications (a report on the details of a new product)
  - To document schedules, timetables, and milestones (a report on a long-term plan)
  - To document current status (an inspection report)
  - To record and clarify complex information for future reference (a report on policies and procedures)
  - To present information to a large number of people (annual report)
  - To recommend actions that can be considered in solving certain problems. (recommendatory report)

CHARACTERISTICS OF A REPORT

- **1. Precision**
  - Effective reports clearly reflect their purpose.
  - While putting together a report, your <u>investigation, analysis, and recommendations should be directed / this central purpose</u>.
  - <u>Precision gives unity and coherence</u> to your report and makes it a valuable document.

CHARACTERISTICS OF A REPORT

- **2. Factual Detail**
  - Your <u>report should be very detailed and factual</u>.
  - The point of your report is to go into details, the kind of details your specific audience needs.
  - The scientific accuracy of facts is very essential to a good report.
  - Since reports invariably lead to decision-making, <u>inaccurate facts may lead to disastrous decisions.</u>

CHARACTERISTICS OF A REPORT

- **3. Relevance**
  - The <u>facts presented in a report should be not only accurate but also relevant</u>.
  - While it is essential that every fact included in a report has a bearing on the central purpose, it is equally essential to see that no relevant information is excluded.
  - <u>Irrelevant facts make a report confusing; exclusion of relevant facts renders it incomplete and is likely to mislead.</u>

CHARACTERISTICS OF A REPORT

- **4. Reader-orientation**
  - A good report is always reader-oriented.
  - While drafting a report, <u>it is necessary to keep in mind the person(s) who is (are) going to read it</u>.
  - A report meant for the layman will be different from one meant for technical experts.

CHARACTERISTICS OF A REPORT

- **5. Objectivity of recommendations**
  - If recommendations are made at the end of a report, they must be impartial and objective.
  - They should come as a logical conclusion to investigation and analysis.
  - They must not reveal any self- interest on the part of the writer.

CHARACTERISTICS OF A REPORT

- **6. Simple and unambiguous language**

- <u>A good report is written in simple, unambiguous (clear) language</u>.

- It is a document of practical utility; hence it should be <u>free from various forms of poetic embellishment</u> such as figures of speech.

- It should be clear, brief, and grammatically accurate.

CHARACTERISTICS OF A REPORT

- **7. Special format**
  - The technical report uses a rather involved format <u>including cover, title page, table of contents, list of illustrations, letter of transmittal, and appendices</u>.
  - These have to be prepared according to a set standard, which will be presented later in this chapter.

CHARACTERISTICS OF A REPORT

- **8. Illustrations**
  - Most technical reports contain illustrations, which may be <u>tables, graphs, maps, drawings, charts, or photographs</u>.
- **9. Homogeneity**
  - Your report should deal with <u>one topic</u> at a time. All the sections of your report should focus on that topic.
- **10. Documentation**
  - Technical reports acquire more value when adequately documented by <u>acknowledging sources of information in an appropriate style</u>.

TYPES OF REPORTS

- On the basis of purpose, frequency or mode of reporting, reports can be classified as follows:

    - Oral, Written (Mode of presentation)
    - Periodic, Special (Frequency)
    - Informative, Analytical (Purpose)

TYPES OF REPORTS

- **Oral and Written Reports**
- Reports can be oral or written depending upon the mode of presentation.
- <u>When you rejoin duty after attending an international seminar; you meet your officer and report about the deliberations of the seminar</u>.
- This type of reporting comes under <u>oral reporting</u>.
- An oral report is simple and easy to present.
- It may communicate an impression or an observation. While oral reports are useful, written reports are always preferred as they enjoy several advantages over the oral ones.
- Table 14.2 shows the varying advantages and disadvantages of oral and written reports.

TYPES OF REPORTS

- **Periodic and Special Reports**
- <u>Periodic or routine reports are either informational or analytical in their purpose</u>. As they are prepared and presented at regular prescribed intervals in the usual routine of business they are called periodic or routine reports. <u>They may be submitted annually, semi-annually, quarterly, monthly, fortnightly, weekly, or even daily</u>.
- Generally such reports contain a mere statement of facts in detail, in summarized form, or in the layout of a prescribed form, <u>without an opinion or recommendation</u>. Progress reports of various kinds, inspection reports, annual reports, and sales reports all come under this category.
- At times the routine reports can be analytical or interpretative. For example, when the heads of various divisions in an organization submit annual assessment reports of their employees to the higher authorities, they assess the data and give their recommendations so as to enable their superiors to take certain decisions.
- <u>Special reports are related to a single occasion or situation</u>. A report on the feasibility of opening a new branch, on the unrest among staff in a particular branch, or the causes behind the recent fire incidents in a factory are special reports. Special reports deal with non-recurrent problems.

TYPES OF REPORTS

- **Informative Reports**
  - An informative report, as the name suggests, <u>entails provision of all details and facts pertaining to the problem</u>.
  - For instance, it could be a report that attempts to trace the growth of Company X in the automobile industry.
  - In a report of this kind, the presentation of all details that led to the growth of Company X should be listed in a chronological order.

TYPES OF REPORTS

- **Informative Reports**
- Structural Organization
  - As the presentation of information is the basic purpose of the report, details are worked out in a <u>systematic and coherent manner</u>. The structural orientation and its significance in an informational report should be clearly evident to the reader.
  - In a report of this kind, the various sections are simple and self-explanatory The <u>introduction</u> is followed by a presentation of information or <u>facts</u> and a <u>conclusion</u> thereafter, where all the details are collated in brief as a recap of earlier sections. <u>Recommendations do not arise in this type of report</u>.
  - <u>The main purpose of an informational report is to present the information in an objective, factual, and organized manner.</u> It presents the situation simply as it is. To write an informational report, all you need is to collect data, arrange it in an appropriate order and present it in a style appropriate to technical writing.

TYPES OF REPORTS

- **Analytical Reports**
  - An analytical report is also known as interpretative or investigative report. If a report merely presents facts pertinent to an issue or a situation, it is informative, On the other hand, if it analyses the facts, draws conclusions, and makes recommendations, it is described as analytical report. For instance, a report which presents production figures for a particular period is informative. But if it goes into the causes of lower production in that period, it becomes analytical, interpretative, or investigative.
  - The analytical report comprises stages in which there is a proper identification of the problem, analysis, and subsequent interpretation. Recommendations or suggestions are then incorporated in the report, depending upon what is required by the report writer. Thus, in a problem-solving method, the steps observed are as follows:
    - Drafting problem statement
    - Evolving criteria
    - Suggesting alternatives and evaluation
    - Drawing conclusion(s) and making recommendations

TYPES OF REPORTS

- **Analytical Reports** – Patterns
- The structure of an analytical report may follow any of two patterns—inductive or deductive (Table 14.1).
- **Inductive Methodology:** An inductive ordering follows a simple, logical arrangement in which you proceed from the sensible singular to the universal or simply from the known to the unknown.
- <u>There are two premises or syllogisms</u> (crafty argument, deductive reasoning)<u>that conjoin to yield a final conclusion</u>, e.g., Syllogism 1 This fire warms
- Syllogism 2 And this fire warms Syllogism 3 And this fire warms Syllogism n Also this fire warms Conclusion Therefore every fire warms

TYPES OF REPORTS

- **Analytical Reports** – Patterns
- One could formulate umpteen number of syllogisms to reach a final conclusion which is always based on the number of experiments conducted or factors observed.
- Certain disciplines, <u>in which experiments are carried out and surveys are conducted, naturally follow this pattern. Here, the progression is always in the nature of working on the known elements to arrive at an unknown conclusion</u>.
- However, inductive patterning, while normally followed for organization-based studies and experiments, suffers from a major <u>drawback</u>.
- As it is not based on any universal truth, it holds valid only up to the point where there is discovery of an issue that proves contrary to the findings in the report. It is by nature only relevant in the present and no universal claims to the same can be made.

TYPES OF REPORTS

- **Analytical Reports** – Patterns
- **Deductive Methodology:** <u>On the other hand, a deductive ordering proceeds from the unknown to the known</u>. Universal truths are taken as the formulation point for the problem. The various alternatives are suggested, evaluated, and conclusions drawn, keeping in mind the original problem stated. To understand the manner of approach in deductive methodology, let us take an example.
- Conclusion   Every fire warms
- Syllogism 1   This fire warms
- Syllogism 2   And this fire warms
- Syllogism 3   And this fire warms
- Syllogism n   Also this fire warms

TYPES OF REPORTS

- **Analytical Reports** - Structural Organization
- <u>While in an inductive method the pattern of the report would normally follow the sequence of introduction, text, and terminal section, in the deductive method, the structure could be slightly different</u>.
- It could begin by <u>stating conclusions and recommendations which are then followed by an introduction and the text section</u>.
- This pattern would be observed if the report is of extreme importance and the receiver does not have the time to browse through the entire report.
- Merely a glance at the initial pages would enable the reader to assess the contents. Such readership would only be concerned with the conclusions and recommendations! suggestions or plan of action.

THE IMPORTANCE OF REPORTS

- A report is a basic management tool used in decision making.
- Hence it is extremely important for organizations of all types. Reports are vital, especially for large- scale organizations that are engaged in multifarious activities handled by different departments.
- Their top executives cannot keep a personal watch over all these activities. So they have to base their decisions on the reports they get from the heads of various departments.
- For large organizations, reports are indispensable.
- Reports bear a lot of significance both to the organizations in which they arise and to the organizations they are submitted to.
- The following list will give you an idea of how important reports and report writing are to the organizations and the individuals.

THE IMPORTANCE OF REPORTS

- <u>A report is the only tangible (concrete) product of a professional</u>
  - All the efforts of engineers, academicians, and researchers culminate in reports which convey to others the efficiency with which they carried out their assignments.
- <u>Reports enable decision making and problem solving in organizations</u>
  - Based on the information presented, analysis discussed, or the suggestions rendered, administrators can make important decisions and solve problems of serious concern.

THE IMPORTANCE OF REPORTS

- <u>Reports help the authorities in planning new ventures and in evaluating men and material</u>
  - If an organization wants to open a new branch in a nearby locaιit it can plan for the same more effectively after going through the feasibility report prepared for this purpose.
  - Similarly if the organization wants to assess the qualities and capabilities of a person, it can do so by going through the annual assessment form submitted by that person. It can also evaluate a newly introduced machine or product by listening to or reading the report prepared for this purpose.

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THE IMPORTANCE OF REPORTS

- <u>Reports are an important means of information dissemination within and outside the organization.</u>
  - Many of the routine reports such as inspection reports, inventory reports, or annual reports transmit information across and outside the organization.

- <u>Reports serve as a measure of the growth, progress, or success of an organization.</u>
  - The progress of any organization depends on the quality and quantity of information flown through its personnel in the form of oral or written reports. For instance, an organization focussing on research can bring out reports from time to time to provide information on the progress being made.

THE IMPORTANCE OF REPORTS

- <u>Reports serve as a valuable repository of information.</u>
  - Organizations of various kinds preserve reports of importance and value for a long time so that they can refer to these reports whenever needed.
  - For example, an academic institution can refer to the previous assessment reports it had received from some committee in order to improve its performance.

THE IMPORTANCE OF REPORTS

- <u>Reports reveal gaps in thinking</u>.
  - When a report is read and comprehended, the recipient comes to know whether the report writer had thought and proceeded logically and whether he/she had conducted an in-depth study of the topic.
  - If there is some lacuna (missing part) in logical reasoning or thinking on the part of the writer, reports are sure to reveal them.

THE IMPORTANCE OF REPORTS

- <u>Reports develop certain skills in the writer.</u>
  - Reports not only help organizations but also help the writer to develop certain skills, such as the ability to organize, to evaluate, and to communicate with greater accuracy.

Note:

Remember that all reports carry legal responsibility. They can be used as legal instruments. Your activities as an employee, and your competence at work are reflected through reports.

FORMATS

- Your report may have any one of the following formats:
  - Manuscript
  - Letter
  - Memo
  - Pre-printed form

FORMATS

- **Manuscript format:**
  - This is the <u>most commonly used format</u> for reports and is generally used for reports that are formal.
  - The length of such reports can range from a few pages to several hundred.
  - Further, manuscript form can be used for all types of reports—informational, analytical, or routine.
  - As the length increases, these reports include more elements such as abstract, summary appendix, glossary and so on.

FORMATS

- **Memo format:**

  - <u>A report you send to somebody within your organization will be in a memo format</u>.

  - Your <u>analysis, conclusions, and recommendations are included in the main text part of the memorandum</u>, the other parts being the same as the inter-office memorandum discussed in Lecture 5.

  - A <u>memorandum report, commonly known as memo report, is mainly used for internal communication</u>, that is, within the organization.

  - It is used to handle routine business matters like passing information, making changes, alerting employees, solving a problem, etc.

FORMATS

- **Memo format:**
  - A memo report is a permanent record of the internal operations of an organization and is quite similar to a letter report.

  - But it differs in structure and is more informal than the letter or manuscript report because of its circulation within the organization. Generally, a memo report is short and adopts a matter-of-fact style.

  - Inside address or salutations are not required.

  - The main body of the memo report includes headings appropriate to the discussed matter.

  - Although there is no complimentary close or signature, sometimes the memo report is signed or initialled at the end. Most organizations have a printed format for memos in which a memo report can be submitted.

FORMATS

- **Letter format:**

  - <u>When you send, short reports of a few pages to outsiders, you can opt for a letter format</u>.

  - Besides all the routine parts of a letter, these reports may include headings, illustrations, and footnotes.

  - Letter reports are important written documents that present technical/business information as well as problems in the format of business letters. The only difference between business letters and letter reports is in organization of content and in writing style.

FORMATS

- **Letter format:**
  - Subject headings in the main text of the letter report serve as a guide, which lets the reader know what follows, thus conserving his or her time. Tables and figures, if any, should be numbered, titled, indented, and spaced away from text.
  - The concluding parts of the letter report are the same as those of a business letter—complimentary close, signature, and the name of the sender.

Letter format

- The first paragraph in a letter report mentions the purpose of the survey and introduces the subject of the report.

- It catches the reader's interest because he/she is affected by the problem.

- The next two sections of the report present the important results of the survey and their analysis from the reader's view point.

- Emphasis here is placed on the way the results affect the reader. The survey findings convince the reader that he/she should follow the suggested policy given at the end—that of maintaining fully stocked shelves.

- The report also accomplishes its major purpose. This report follows the simple organizational pattern of beginning with the introduction, presenting facts, interpreting facts, and ending with a recommendation—a pattern used generally in short, informal reports.

FORMATS

- **Letter format:**
  - Another commonly used organizational pattern follows these five steps:
    - 1. Authorization
    - 2. Statement of problem
    - 3. Summary of findings
    - 4. Development of the report
    - 5. Conclusions and recommendations

FORMATS

- **Printed form:**
  - Reports containing routine matter and which are periodical in nature may be written in a form prescribed by the organization.

Note:

Planning for a report is as important as the process of writing itself

PREWRITING

- <u>Before actually beginning to draft a report, you need to undertake various tasks, which may be referred to as the preliminary steps to writing a report</u>.

- The effectiveness with which you carry out the tasks involved in these steps decides the effectiveness of your technical report.

- In fact, the planning stage is the most crucial one.

- Spend as much time as possible in collecting material, synchronizing details, and ensuring that nothing has been left out.

PREWRITING

- If the planning is done in a detailed manner, there are very few chances of errors creeping in at the final stage.

- In fact, planning for a report is as important as the process of writing itself

- The various <u>steps</u> involved in report planning are as follows:

  - Understanding the purpose and scope
  - Analysing the audience
  - Investigating the sources of information
  - Organizing the material
  - Making an outline

Purpose and Scope

- Purpose: The objective of your study

- Scope : Extent of coverage

    - Assume that you, as the senior engineer of an organization, have been asked by your department head to study why the recently constructed flyover did not receive the anticipated feedback from the users. You are also required to suggest some measures to modify the same.

    - Unless you are clear with the objectives of your task that your report involves, for example, (i) identifying the causes of dissatisfaction and (ii) suggesting remedial measures, you will not be able to proceed in the right direction.

    - It is the purpose of the report that enables you to decide the amount or method of data to be collected, the quality and quantity of the information to be included in the report, and also the methodology to be adopted in analysing the situation and arriving at a solution.

Purpose and Scope

- Further, it is essential to understand the nature of the report— whether it is informative or analytical.

- In an informative report, you may stress factors contributing to collation of information at the time of stating the purpose.

- However, in an analytical report the writer would need to prepare a problem statement, the analysis of which becomes the thrust area of the report.

- Depending on the type of report to be written, there is bound to be a difference in the definition of the problem and purpose.

Purpose and Scope

- In most of the reports required by government organizations, the objectives are clearly stated as terms of reference. These terms are specific instructions given to the report writer as to what objectives are to be achieved through the report. See the sample given below:

  - *You are directed*

  - 1. *to identify the causes behind the recent fire incidents*

  - 2. *to analyse the existing fire fighting facilities*

  - 3. *to suggest some preventive measures to stop the recurrence of such incidents*

  - Whenever the terms of reference are clearly specified you need to include them as they are, while stating the purpose of undertaking the task which your report involves.

Audience

- The audience for a technical report—or any piece of writing for that matter—is the intended or potential reader.

- For most technical writers, this is the most important consideration in planning, writing, and reviewing a document.

- You 'adapt' your writing to meet the needs, interests, and background of the readers who will be reading your writing.

- Lack of audience analysis and adaptation is one of the root causes of most of the problems you find in professional, technical documents—particularly while writing instructions, where inadequacies surface most glaringly.

- One of the first things to do when you analyse an audience is to identify its type (or types—it is rarely just one type).

- In general, the audience can be categorized into <u>three types</u> as discussed below:

Audience

- **Experts** <u>are the people who know the theory and the product inside and out</u>.

- They designed it, they tested it, they know everything about it.

- Often, they have advanced degrees and operate in academic settings, or in research and development areas of the government and business worlds.

- The non-specialist reader is least likely to understand what these people are saying—but also has the least reason to try.

- More often, the communication challenge faced by the expert is communicating to the technician and the executive.

Audience

- **Executives** <u>are the people who make business, economic, administrative, legal, governmental, and political decisions on the matter that the experts and technicians work with</u>.

- If it is a new product, they decide whether to produce and market it.

- If it is a new power technology they decide whether the city should implement it.

- Executives may sometimes have as little technical knowledge about the subject as non-specialists.

Audience

- **Non-specialists** have the least technical knowledge of all.

  - Their interest may be as practical as technicians', but in a different way.

  - They want to use the new pro duct to accomplish their tasks; they want to understand the new power techno logy enough to know whether to vote for or against it in the upcoming union election.

  - Or, they may just be curious about a specific technical matter and want to learn about it—but for no specific, practical reason.

- It is important to analyse the audience in terms of characteristics such as the following.

Audience

- **Background—Knowledge, Experience, and Training**

- <u>One of your most important concerns is just how much knowledge, experience, or training you can expect in your readers. If you expect some of your readers to lack certain background, do you automatically supply it in your document?</u>

- For example, imagine you are writing a guide to using a software product that runs under Microsoft Windows.

- How much can you expect your readers to know about Windows? If some are likely to know little about Windows, should you provide that information? If you say no, then you run the risk of customers getting frustrated with your product.

- If you say yes to adding background information on Windows, you increase your work effort and add to the page count of the document (and thus to the cost).

- Obviously, there is no easy answer to this question—part of the answer may involve just how small a segment of the audience needs that background information.

Audience

- **Needs and Interests**

- <u>To plan your document, you need to know what your audience is going to expect from that document. Imagine how readers will want to use your document; what will they demand from it</u>.

- For example, imagine you are writing a manual on how to use a new microwave oven—what are your readers going to expect to find in it?

- Imagine you are under contract to write a background report on global warming for a national real estate association—what do they want to read about, and, equally important, what do they not want to read about?

If you write to the lowest common denominator of reader, you're likely to end up with a cumbersome, tedious book-like thing that will turn off the majority of readers. But if you don't write to that lowest level, you lose that segment of your readers. What to do?

Audience

- **Other Demographic Characteristics**

- There are many characteristics about your readers that might have an influence on how you should design and write your document—for example, age groups, type of residence, area of residence, sex, political preferences, and so on.

- Audience analysis can get complicated by at least two other factors: <u>mixed audience types for one document</u>, wide variability within an audience, and unknown audiences.

Audience

- **More than One Audience** You are likely to find that your report is for more than one audience.

- For example, it may be seen by technical people (experts and technicians) and administrative people (executives). What can you do?

- <u>You can either write all the sections so that all the audiences of your document can understand them</u>.

- <u>Or you can write each section strictly for the audience that would be interested in it</u>, then use headings and section introductions to alert your audience about where to go and what to stay out of in your report.

Audience

- **Wide Variability in an Audience** <u>You may realize that, although you have an audience that fits into only one category there is a wide variability in its back ground</u>.

- This is a tough one—if you write to the lowest common denominator of readers, you are likely to end up with a cumbersome, tedious book-like thing that will turn off the majority of readers.

- But if you do not write to that lowest level, you lose that segment of your readers. What to do? <u>Most writers go for the majority of readers and sacrifice the minority that needs more help</u>.

- <u>Others put the supplementary information in appendices or insert cross-references to beginners' books</u>.

Audience

Use the following guidelines to make your report comprehensible to the non-specialist reader:

- Add information readers need to be able to understand your document.
- Omit information your readers do not need.
- Add examples to help readers understand.
- Change the level of your examples.
- Change the organization of your information.
- Use more or different graphics.
- Add cross-references to important information.

Investigating the Sources of Information

- The important means of collecting data for your report are:
  - searching library material, internal records, or databases
  - personal observation
  - conducting personal interviews or telephone interviews
  - preparing and circulating questionnaires

Investigating the Sources of Information

To evaluate and finalize your sources, ask yourself the following questions:

- Does the source have a reputation for honesty and reliability?
- Is the source potentially biased?
- What is the purpose of the material?
- Is the author credible?
- Where did the source get its information?
- Can you verify the material independently?
- Is the material current?
- Is the material complete?
- Do the claims of the source stand up to scrutiny?

Investigating the Sources of Information

- **Library Search**

- In reports on subjects of a general nature, library research may be found useful. This includes reference to standard reference books and past as well as current issues of newspapers, trade publications, research journals, and magazines.

- Examples: Report on the analysis of online marketing strategies Report on recent trends in software industry

Investigating the Sources of Information

- **Library Search**

- When reading to secure information for your report, you may find the following suggestions helpful:

  - Visualize the facts. Connect words to the facts to which they refer.

  - Understand the dictionary meanings and connotations of the words.

  - Examine factual statements and figures for their accuracy and logic.

  - Distinguish between vague and definite statements, between hasty generalizations and careful judgments, between opinion and fact.

  - Scan the material for important points found in topic sentences.

Investigating the Sources of Information

- **Internal Records**

- Most of the relevant information is already contained in the old files of the institution. Sometimes there are precedents, and old findings and recommendations may be of considerable help. So it is very important to go through the old files of the organization. Declining sales or rising cost of production are recurring phenomena. And their causes are also usually similar. In such cases, old files may provide some valuable information.

- Examples: Report on the history and growth of XYZ Institute

- Report on the admission pattern adopted by ABC University

Investigating the Sources of Information

- **Database Search** You can collect data for your report by surfing various data bases, the addresses of which are obtained through Internet search. But if you are not effective and efficient in your searching, you may end up with information overload or wastage of time. The following guidelines will enable you to carry out a quick and purposeful database search:

  - Choose appropriate databases: You may want a good technical/business! academic database. However, journals on your topic may be in a database that also includes journals on other subjects.

  - Use multiple search engines: Do not limit yourself to a single search engine, especially if you are looking for less popular topics. Try your research on several engines by using '*Metacrawlers'*, special engines that search several search engines at once.

Investigating the Sources of Information

- Use keywords and phrases: For instance, if you want to write a report on 'Importance of artificial intelligence in decision making', you would select the keywords or phrases such as artificial intelligence, decision making, management, and corporations. Use synonyms or word equivalents whenever possible, and use quotation marks around phrases to look for the entire phrase instead of separate words.

- Use appropriate order: Search engines look for the words exactly as you key them in. If the words occur, but not in the same order, you may miss relevant hints.

- Avoid stop-words: Stop-words are those words the computer disregards and will not search for. Common ones are: a, an, the, of, by, with, for, and to.

- Use variations of your terms: Use abbreviations (MD, CEO) , synonyms (primary major), related terms (group, team, collaboration), different spellings (fiber, fibre), singular and plural forms (analysis, analyses), and nouns and adjectives (environment, environmental).

- Use appropriate search operators: Narrow or broaden your search by including AND, OR, AND NO1 WITHIN, NEAR, or ADJ. They can help you create complex, precise search strategies. (Examples: poverty AND crime AND gender; radiation NOT nuclear; endangered ADJ species; orchids AND growing OR planning.)

- Refine your search if necessary: If you end up with more than 60 or 100 links to sort through, refine your search. If your first page of results does not have some thing of interest, you have entered inadequate or too few words. Also, pay attention to whether you are searching in the title, subject, or document of the database. Each will fetch you different results.

Personal Observation

- Observation is seeing with a purpose. Personal observation is used as a method of data collection for securing first-hand information for your reports. It is based on your sensory perception and memory and often combined with other methods of data collections

- While observing personally, you not only observe but also form a mental impression of what you had perceived. In other words, your observation appeals to your senses. For example when you conduct an experiment in a laboratory, you use this method to collect data for your lab report.

- Examples: All laboratory reports

- Report on fire incidents

- The two kinds of observation are (i) controlled observation and (ii) uncontrolled observation.

- The former is generally used in scientific research where scientists carry on an experiment and record findings. Scientists, for example, may conduct a particular experiment under specific conditions of temperature and pressure. They set the stage and then observe.

Personal Observation

- On the other hand, in uncontrolled observation, the observer views things as they are. For instance, you would resort to un-controlled observation when you collect data for writing a report on the working conditions prevalent in a particular factory.

- Given below are some tips for successful personal observation:

  - Be focused on what to observe.

  - Be objective and unbiased in your observation.

  - Do not rely entirely on your memory.

  - Carry paper and a pen to make notes.

  - Note down all observations on the spot.

  - Make a clear distinction between what you have seen and what you have felt.

  - Check the accuracy of facts.

Questionnaires

- One of the best methods of collecting primary information is to ask people with relevant experience and opinions (known as survey).

- When prepared and conducted properly, surveys can tell you what a cross-section of people think about a given topic.

- A survey is reliable if it produces identical results when repeated.

- A survey is valid if it measures what it is intended to measure.

- Surveys are generally conducted for the following purposes:

  - to collect data from a large number of people scattered over a wide geographical area

  - to secure information on behavior characteristics

  - to gather opinions on attitudes

  - to obtain facts

Questionnaires

- One of the most crucial elements of a survey is the questionnaire. To develop questionnaires, begin by making a list of points you need to determine.

- Then break these points into specific questions, choosing an appropriate type of question for each point. The following guidelines will help you produce results that are both valid and reliable.

  - Ask only those questions relevant to your study.

  - Provide clear instructions on how to fill out the questionnaire.

  - Keep the questionnaire short and easy to answer.

  - Formulate questions that provide easily tabulated or analyzed answers.

  - Avoid leading questions.

  - Ask only one thing at a time (avoid double-barreled questions).

  - Pre-test the questionnaire.

Questionnaires

Question Types

- ***Open-ended*** questions elicit (draw) descriptive answers. To enable the respondent to write his answer, provide adequate space.

  - Example: What is your opinion on establishing a gymnasium in our campus?

- ***Close-ended*** questions require a definite answer such as yes/no, adequate/inadequate, satisfactory/unsatisfactory sufficient/insufficient, etc. as framed in the question.

  - Example: What do you feel about the availability of space for establishing a gymnasium in our campus? (Adequate/inadequate)

- ***Multiple Choice*** type questions require the respondents to choose an option from the given choices.

  - Example: Which of the following time slots do you feel would be appropriate for the new gymnasium? (Choose the best option)

THE END