

TECHNICAL REPORT WRITING

INTRODUCTION

**What is Technical Report
Writing?**

Activity: In your groups, discuss on the following issues.

1. What is Report?
2. Define technical report.
3. What is the purpose of technical report?
4. List down some examples of technical reports.
5. Mention some of the characteristics of technical report.
6. Discuss the significances of technical report in working fields.
7. What are the differences between technical and non-technical report writing?

What is Report?

- is a **piece of informative writing** that describes a set of actions and analyses any results in response to a specific brief. A quick definition might be: **"This is what I did and this is what it means."**
- **A good report** is easy to be familiar with an issue raised as a subject because:
 - its **title** is **precise** and **informative**,
 - its **layout** and **format** are **well organized**, and
 - Its **binding** is **easy to handle** and **opens flat** to **reveal both text** and **diagrams**.

What is technical Report?

- The term “**technical**” refers to **specific knowledge of specific area of study**. This is to mean “**technical**” refers **knowledge which is not widespread** or **worldwide**.
- Whenever you try to write or say anything about your field of specialization, you are engaged in technical communications.
- **Technical communication** is the **delivery of technical information to specific audiences**. The information should be of:
 - their needs,
 - level of understanding and
 - background or experience.

Technical Writing

- is **direct, informative, clear,** and **concise language** written specifically for an **identified audience**.
- The content must be **accurate** and **complete** with **no exaggerations**.
- To deliver the intended message, the text must be **objective** and **persuasive** without being argumentative.
- Technical Writing is a **broad term** that **encompasses a wide variety of documents** in **science, engineering,** and the skilled trades.

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- A **technical report** (also: scientific **report**) is a document that describes the **process, progress, or results of technical** or **scientific research** or the state of a **technical** or scientific research problem.
- It might also include **recommendations** and **conclusions** of the research.

The Purpose of Technical Report

- *To convey information as clearly and adequately as possible*

For Whom?

- Technical reports are prepared for **supervisors, subordinates, peers, customers, clients,** and **various government agencies.**
- **Typical technical reports include:**
 - Progress reports
 - Feasibility studies
 - Specifications
 - Proposals
 - Facilities descriptions
 - Manuals
 - Procedures
 - Planning documents
 - Environmental impact statements
 - Safety analysis reports

Who Writes Technical Report?

- Professionals like:
 - engineers,
 - scientists,
 - architects,
 - physicians,
 - lab technicians, and so forth.
- In the broadest sense, virtually any trade or profession can be considered to have a technical component, and its practitioners must prepare technical writings. Think about **doctors, nurses, farmers, lawyers, and experts** of all types. Every one of these persons will write in the **jargon** of their discipline - a kind of technical writing.

Characteristics of Technical Report

- A technical report differs from other compositions in as much **it is written in more or less conventional forms to meet a specific need or requirement.**
- It is not an **outburst/sudden occurrence of powerful feelings** or an expression of *recollected emotions*.
- The **conclusions** and **recommendations** are strictly **based on the facts** included in the report.
- As Shearring and Christian (1965: 131) once stated, **a report is like a bathing suit**: “It covers everything that has to be covered but nothing more...”
- It should place as **few hindrances** as possible between the mind of the writer and the mind of the reader.

Some general attributes of technical writing

1. It pertains to a **technical subject**.
2. It has a **purpose/ objective**. A technical document always is written for a reason, and the purpose of reports may be to explain :
 - what was done,
 - why it was done, and/or
 - the results of a study.
3. It conveys **information/facts/data**. A report without facts or scientific evidence to support an opinion also usually **lacks credibility**, and it is likely to be **unsuccessful** in achieving its purpose and objective.

The verbs that are probably associated with factual statements are:

- Determined
- Solved
- Built
- Accepted
- Rejected
- Completed
- Passed
- Failed
- Broke
- Approved
- Cancelled
- Invented
- Designed
- Developed
- Discovered
- Uncovered
- Deduced
- Studied

Cont'd

- Verbs that are often not associated with factual statements include words like the following:
 - Think
 - May be
 - Suggest
 - Appear
 - Suppose

4. It is **impersonal (Third Person) Voice**.

- The use of **first person pronouns** is usually discouraged in technical writing. Similarly, it is **inappropriate** to use **names of people** and/or **trade names** unless there is no other way to describe the item. If the **intent** of including **names is to give credit**, the correct placement of credits is **not** in the body of a report. Credits belong in end-of-document **acknowledgments**. **Personal pronouns** and **names** should be **omitted** because they are unnecessary.

5. It is **concise**. Technical reports are usually written for **business reasons**. They are **not** intended to **entertain**; they communicate information to an identified person or group.

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6. It is **directed**. Technical reports must be directed to a particular readership. The author is responsible for determining the specific individuals or parties who will receive a technical document. Directing a report determines the technical level of the writing.
7. It is performed **with a particular style** and **in a particular format**.
 - **Style** is the way that you write;
 - **Format** is the ordering and physical layout of a document.

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8. It is **archival**. An intrinsic part of the value of technical writing is that it is written in such a manner that it can be archived and *produce valuable* and *usable information* in the future.
9. It **cites contributions of others**. Formal technical reports and papers must show sources of information and recognize contributions of others.

Types of Reports

- Technical reports are so diverse that they may be categorized according to:
 - **their length** (short and long)
 - **their tone/style** (formal or informal),
 - their mode of delivery (oral and written),
 - their **form** (Printed, Letter, Memo and Manuscript Formats) or
 - **their purpose** (informational reports, analytical reports, persuasive reports)

Informal Reports

- Can be structured in any way.
- Use first- or second-person narrative.
- are shorter than formal reports.
- have no preliminary parts and supplementary parts.
- are concerned with everyday matters that require little background.
- *is generally in the form of a person to person communication.*

e.g *Sales report* for a specific period

internal proposal which analyzes an internal problem and recommend a solution, *laboratory reports, daily production reports, trip reports*

Types of informal reports

- Incident Reports
- Field Trip Reports
- Reporting Conference Attendance
- Inspection Reports
- Progress Reports

Formal Reports

- have a set structure.
- are long, analytical and impersonal.
- have a formal tone and use third-person narrative.
- analyze a specific topic in great detail.
- include citations for the sources.
- **Charts, graphs and statistical information** are also common components.

e.g *Annual Reports*,

- *reports of companies,*
- *project reports,*
- **external proposal** *and*
- *thesis*

Cont'd

- Our focus here is the classification based on the **general purpose** of the report. These are:
 1. INFORMATIONAL REPORTS
 2. ANALYTICAL REPORTS AND
 3. PERSUASIVE REPORTS

1. Informational Reports

- describe situations **without** any analyses, interpretation or recommendations.
- do not contain any **conclusions** or **recommendations**
- Readers can **agree** or **disagree** with, **like** or **dislike**, **oppose** or **advocate** based on their analysis of the report.
- Good informational report typically tells a reader *how* and *what*. It *doesn't* say *why*.
- Informational reports include:
 - Progress reports
 - Situation reports
 - Site reports
 - Instructional reports

1.1 Progress Report

- Progress report or *status report* is a time and task related report.
- Such type of reports want to answer the following questions:
 - **How much** work has been **accomplished**?
 - **What** work is currently being done?
 - How much work is **yet** to be done?
 - Is the project on the **schedule** and within **budget**?
- There are two types of progress reports:
 - **Occasional progress reports** -written at random intervals.
 - **Periodic progress reports** -written at regular intervals (usually, weekly, biweekly or monthly).

1.2 Situation Report

- **Situational** report or **occurrence** report is related to **events** or **conditions**.
- They present detail information on what has happened in a particular situation. Eg. an accident report
- Situation reports answer the following questions:
 - What was the **situation**?
 - What exactly **happened**?
 - **Who** was involved?
 - What was the specific **time**?
 - What was the **cause**?
 - What were the **consequences**?

1.3 Site Visit Report

- Site visit reports describe **visits, trips, observations** or **actions** taken at a location other than the writer's own work site.
- Site visit reports answer:
 - What site was visited?
 - When was it visited?
 - Why was the visit made?
 - Who was involved?
 - What was accomplished?

1.4 Instructional Report

- Such type of report tells readers **how** something **is done** or **how** to **perform** some actions.
- They present **how a procedure** is handled.
- Such reports answer the following questions:
 - What are the **instructions** used?
 - What **supplies** are needed?
 - What **expertise** is expected?
 - What is the **first, second, third...** stage?
 - How are the **problems** overcome?

2. Analytical Reports

- go one step beyond informational reports.
- describe and analyze situations.
- try to find **causes** and may show **long or short-range consequences**.
- includes an **evaluation** or **interpretation** or **analysis of data** and the **reporter's conclusions**.
- may have **recommendations** for action.
 - For example, why a system does not work, how a process can be improved, why an environment is changing, what the advantages are of maintaining, changing or selling a business.
- Analytical reports usually deal with **why something is so**. It includes:
 - **Evaluation report**
 - **Feasibility report**

2.1 Evaluation Report

- Presents **data** and the writer's **judgment** of that information. From the **facts**, the writer draws **inferences** and then presents **conclusions**.
- Evaluation report reviews and **judges**:
 - projects,
 - situations,
 - organizations and
 - equipments.
- Such report answers the questions:
 - Is the project meeting its objectives?
 - How well is it doing so?
 - What improvements are needed?
 - What are the influential factors?

2.2 Feasibility reports

- assess the **practicality** of a proposed project or change.
- assist readers whether something can **be done**, economically or technically likely to be succeed.
- The following question can be answered through feasibility report:
 - What is the **current situation**?
 - Is sufficient **capital available**?
 - What **legal concerns** must be considered?
 - Is the **technology available**?
 - Are appropriate **personnel available**?
 - What are the **costs**?

3. Persuasive Reports

- Its main purpose is *to conveys information* to the concerning body.
- Such kind of technical writing *influences direction* and *decisions*.
- They are *action-oriented*.
- They describe, analyze and present **clear recommendation** for readers to consider and to act upon.
- For example, by showing how a company or city can save money, what changes are necessary to improve a situation, what can be done to counteract or take advantage of certain trends or practices.
- The following are the specific *types* of persuasive reports:
 - Proposals
 - Responses to requests for proposal

3.1 Proposals

- Proposals propose a **change**, **solution** and/or **an action**. The writer wants something **to be done**. It shows *why, how, under what circumstances, with what results some actions should be undertaken*.
- Proposals are expected to answer the following questions:
 - **Why** is the proposal being made?
 - **What** is the current situation?
 - **How much financing** is involved?
 - How much **time** is required?
 - **How many people** are involved?
 - What **facilities** and equipments are required?

3.2 Responses to requests for proposal

- They indicate specifically **what** an entity can **do to** meet a stated need and specifically how it can do so.

The Role of Technical Writing in Working Fields

- Technical writing can be a very useful form of writing and communication for projects, lab reports, instructions, and many other forms of professional writing.
- It can be helpful to take a course in technical writing because it can help engineers:
 - To become much better at the skill,
 - To be able to better communicate with individuals about how to do something or explain what they are doing.

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- In general, technical report:

1. *constitutes an important part of the everyday workload in many different types of work*, . In a company, people write
 - to inform about a project or activity (progress reports),
 - to help managers in decision-making (recommendation reports),
 - to communicate within the organization (memos),
 - to ask questions (inquiry letters) and
 - to contact colleagues, distributors, and mates in the same workplace (email messages).

Cont'd

2. *TRs facilitate communication with co-workers, clients and supervisors, that is, inside and outside the workplace.*

Engineers and scientists must communicate effectively with the people whom they work. It is not enough for them to be technically good, they must be skilful in communicating what they are doing and why it is important.

Their technical and professional value will depend on their capacity to convince others of the importance of their work.

Cont'd

3. *TRs are necessary for a successful career.*

- Organizations know the **advantages** of a **well written document** since the way they construct their documents reflects their image.
- **Poorly written documents** will reveal **not only writers' inefficiency** but also **organizations' lack of seriousness.**
- Additionally, being good at written communication skills (in whatever language) is likely to act as an **added value** that enhances your CV and helps you stand out from other applicants in a job selection process.

4. *Writing skills contribute to saving time and money.*

- Good technical writing saves time and money. **For example**, if you create a report for your superior, which is clear and easy to understand, no time will be wasted on pondering the meaning.

What is Not Technical Report Writing?

- **TRW** is different from an essay because
 - **Essay**:
 - is **not as rigid** as technical report to reflect one's own personal opinions, biases and prejudices, and to do so in an entertaining way.
 - is internally generated to persuade others.
 - But **TR** presents **factual information** which is **free** from the influence of the writer's own personal attitude or opinion.
- **TRW** is also different from writing **themes** as **themes are more of academics.**

Cont'd

- **TR** is also different from **narrative fictions** since **fiction** focuses on **one's imagination** and **reflects drama** around one's life.
- In general, technical writing:
 - has a degree of formality,
 - focuses on a specific subject.
 - is written to share useful information and knowledge.
 - should have substance in every statement
 - has a style and structure that sets it apart from other types of writing.
 - should be objective and supported by facts and data.

Activity: Group the followings as **technical** or **non technical**.

1. **Instructions:** for use of a product or a process -written in a style.
2. **Advertising:** is not factual.
3. **Creative Writing** like **poetry**
4. **Opinion: Personal opinions**-on the editorial pages of newspapers.
 - **Business** and **finance publications**
5. **Information**
6. **Administrative**
7. **Entertainment**

Summary

Some factors to keep in mind about TRW are :

- communicates issues in engineering and the sciences.
- has form and style - definite elements.
- does not employ humor or slang.
- is objective-oriented.
- does not blame people.
- requires facts or data and never hides facts.
- deals with non-administrative issues.
- is never used as advertising copy.
- is impersonal- not use 1st person pronouns or name people who performed parts of the work.

Unit Two: THE STRUCTURE / SECTIONS/ LAYOUT OF A TECHNICAL REPORT

- Engineers write *technical reports* (also called *engineering reports*) to communicate **technical information** and **conclusions** about projects to customers, managers, legal authority figures, other engineers and other scientific community.
- A **TR** follows a **specific layout** and *format* as specified by the American National Standards Institute (ANSI).
- Layout and Format of **TR** includes:
 - Front matter
 - Text (Body)
 - Back matter

1. The *front matter*

- is used to help potential readers find the report.
- will help the reader to quickly decide whether or not the material contained within the report pertains to what they are investigating.
- The *front matter includes*:
 1. Cover*
 2. Label*
 3. Title Page
 4. Acknowledgements
 5. Table of Contents
 6. Lists of Figures and Tables
 7. Abstract

NB- 1&2 are optional

1.1 Cover*

- A *cover* and *label* are used if the report is over 10 pages long.
- The *cover* (front and back) provides **physical protection** for the printed report. Plastic spiral bindings and thick, card-stock paper are recommended.

1.2 A *label*

- A *label* is placed on the *cover* to identify:
 - Report title and subtitle (if a subtitle is appropriate)
 - Author's name
 - Publisher (optional)
 - Date of publication

Sample cover with a label



ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
ADDIS ABABA INSTITUTE OF TECHNOLOGY (AAiT)
ELECTRICAL AND COMPUTER ENGINEERING
DEPARTMENT

Adaptive Modulation-based MIMO Systems for Fading Channels in 3GPP LTE

By

Estifanos Yohannes

Advisor

Dr. - Ing. Dereje Hailemariam

A Thesis Submitted to the School of Graduate Studies of the Addis Ababa University
in Partial Fulfilment of the Requirements for the Degree of Masters of Science in
Electrical and Computer Engineering (Communication Engineering Stream)

September, 2012

Addis Ababa, Ethiopia

1.3 Title Page

- provides descriptive information that is used by organizations that provide access to information resources (i.e., library).
- duplicates the information found on the front cover (if one is used).
- has the following positive characteristics
 - It should be informative
 - Concise
 - Clear enough
 - Avoid vague and overly complex terms
 - Put it on new separated page if the report is more than five pages

Cont'd

- **The title page Contains:**
 - Title of the report
 - the name of the person, company, or organization for whom the report has been prepared
 - Your name and position(ID No.)
 - Your specific department's name in the organization
 - Date of submission
- The **title of the report** should indicate exactly what the report is about. The reader should know not only **the general topic**, but also **the aspect of the topic** contained in the report.

Cont...

- Compare the following pairs of titles:

Eg.1. Bridge Analysis

Vs

Analysis of a Pre-stressed Concrete Bridge

Eg.2. Internet-based ATIS

Vs

An Evaluation of Internet-based Automated Traveler
Information Systems

1.4 Acknowledgement

- Unless you have given credit elsewhere, mention diligently the names of persons and organizations that have helped you in the production of the report.
- When you include published material and the list of sources is very long, use a separate page for the purpose.
- Clearly indicate that permission has been taken for the reproduction of copyright material, if any.

1.5 Table of contents

The *table of contents* lists the title and beginning page number of each major section within the report.

Contents	Page
Chapter One.....	1
1. Introduction.....	1
1.1. Background and Motivation	1
1.2. Problem Statement	2
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1.3.1. General Objective.....	3
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2.1. Introduction to Wireless Channel	9
2.2. Overview of MIMO System	12
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2.4. Space-Time Coding	18
2.4.1. Alamouti Code	19
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2.5. MIMO Detection Techniques	21
2.5.1. Linear Detection Techniques	22
2.5.2. Non-Linear Detection Schemes	24
2.6. Capacity of MIMO System	27
Chapter Three	32
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Cont...

- The contents page sets out the **sections and subsections** of the report and their corresponding **page numbers**.
- It should clearly show the **structural relationship** between the sections and subsections.

Examples for sections and subsections

1. Title of first main section (usually Introduction)
 - 1.1 First subheading
 - 1.2 Second subheading
2. Title of second main section
 - 2.1 First subheading
 - 2.2 Second subheading
 - 2.2.1 First division in the second subheading
 - 2.2.2 Second division in the second subheading
3. Title of third main section

Cont...

- Number all the preliminary **pages** in **lower-case Roman numerals** (i, ii, iii, iv,).
- **Preliminary pages** are any which come before the introduction, including the summary and, where applicable, acknowledgements.
- Number all the remaining pages of your report with **Arabic numerals** (1, 2, 3, 4,). Thus the report proper begins on page 1 with your introduction.
- Provide a **title** in your table of contents to describe the contents of each **appendix** (Note: one *appendix*, two or more *appendices*).
- **Don't** just call them Appendix 1 or Appendix 2. Include its name.
Eg. Appendix 1: Sample Calculations

1.6 List of Figures and Tables*

A *list of figures and tables* helps the reader **to locate** illustrations, drawings, photographs, graphs, charts, and tables of information contained in the report.

*May be an optional element

LIST OF FIGURES

Figure 1.	Garden Hose Nozzle	4
Figure 2.	Inch Dial Caliper	4
Figure 3.	Hose Nozzle Sections	4
Figure 4.	Exploded View Assembly	5
Figure 5.	Shear Stress Example	6
Figure 6.	Shear Stress Strain Diagram	6
Figure 7.	Shim Ring & Flange Contact	7
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Figure 11.	O-Ring Groove FEA Model	9
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LIST OF TABLES

Table 1.	Hose Nozzle Parts List	5
Table 2.	Young's Modulus Values for Plastics	6
Table 3.	Standard O-Ring Sizes	9

Cont...

Some points in writing list of Figures

- Graphs and Illustrations should be neatly drawn or produced with computer software (preferred).
- **Fonts** should be of similar size as the text of the report.
- Give each figure a descriptive **title**, centered over the figure, starting with “Figure 1:...”
- Acknowledge any figures that are not your own work.

Some points in writing Tables

- Tables should be produced with **computer** software.
- **Fonts** should be **similar** in size as the text of the report.
- Give each table a **descriptive title**, centered **over the table**, starting with “Table 1:...”
- Acknowledge any tables that are not your own work.

1.7 Abstract

- is an accurate representation of the contents of a document in an abbreviated form.
- The Abstract, is a short paragraph which summarizes the **entire report**:
 - **Aims/Purpose**: what does this experiment intend to accomplish? (1 sentence)
 - **Methods** (optional): how was it accomplished? (0-1 sentence)
 - **Results**: what were the major findings (directly measured or observed)? (1-3 sentences)
 - **Conclusions**: what implications do these findings have? (1-2 sentences)
- It should be approximately 100-150 words (1 / 3 of a page, double-spaced)
- Though abstract is found near the beginning of the report, it should be written **after we finished the writing of the report**.
- Many times, scientists will only read paper's abstract to determine whether the paper will be relevant to them.

The summary/abstract does NOT:

- provide **general background** information.
- explain **why** you are doing the research, investigation or design.
- refer to **later** diagrams or references.

Here is an examples of a good abstract.

Abstract

- The aim of this experiment was to determine the influence of carbon content on the tensile material properties of steel. Specimens of 1020, 1045, and 1090 steel were tensile tested until failure. Of the three types of steel examined, 1020 had the lowest yield strength but the highest elongation, at 52kpsi and 62%, respectively. 1090 had the highest yield strength and lowest elongation, achieving 75kpsi and 7.8%, respectively. It appears that higher carbon content increases strength and decreases ductility in steel.

2. BODY SECTION

- Is where you present your work.
- In this section the author:
 - describes the **methods**, **assumptions**, and **procedures**;
 - presents and discusses the **results**;
 - draws **conclusions**, and **recommends** actions based on the results.

The body of the report:

- presents the **information** from your work, both real world and theoretical, or your design.
- **organizes** information logically under appropriate headings.
- **conveys** information in the most effective way for communication:
 - ✓ uses figures and tables.
 - ✓ can use bulleted or numbered lists.

Parts of the body/text

- Introduction
- Methods, Assumptions, and Procedures
- Results and Discussion
- Conclusions
- Recommendations*

2.1. Introduction

- provides the **background information**.
- is usually **half to three-quarters** of a page in length.
- Its purpose is to set the context for your report.
- It **prepares the reader** to read the main body of the report.
- It **focuses** on the subject, purpose, and scope of the report.
- It puts a clear statement of the **aims** of the project
- **It states technical background** necessary to understand the report;
 - e.g. theory or assumptions

Cont...

- Subject* - defines the topic and **associated terminology**; may include theory, historical background, and its significance
- Purpose* - indicates the reason for the investigation, **objectives**
- Scope* - indicates the extent and **limits** of the investigation

2.2 Methods, Assumptions, and Procedures

- Information in this section includes:
 - System of measurement
 - Types of equipment used and accuracy
 - Test methods used
- **Methods**
 - How did you discover the problem? What measuring tools were used? What measurement system was used?
- **Assumptions**
 - What do you think, but cannot substantiate as fact?
- **Procedures**
 - How did you gain a better understanding of the problem?

2.3 Results and Discussion

- The *results and discussion* section describes what you learned about the problem *as a result of your research*, identifies the *degree of accuracy* related to your findings, and gives the reader your view of the *significance* of your findings.
- **Results**
 - explain your findings with help of graphs or tables , simulations etc
- **Discussion**
 - How accurate are your findings? What is the significance of the results of the research?

2.4 Conclusion

- The conclusion section provides an effective **ending** to your report.

This section:

- states whether you have **achieved your aims**
- gives a **brief summary** of the key findings or information in your report
- Highlights the **major outcomes** of your investigation and their significance.
- The conclusions should **relate to the aims** of the work:

Example

- **Aim**

- The aim of this project is to design a mobile phone tower.

- **Conclusions**

In this report, a design for a mobile phone tower has been presented. The key features of the tower are... It was found that...

2.5. Recommendations*

- is often included in reports that are **the result of** tests and experiments, field trials, specific design problems, and feasibility studies.
- The author may recommend **additional areas of study** and suggest a **course of action**, such as pursuing an alternate design approach.
- You should not introduce new ideas in it.

Additional Studies

- Is there information that still needs to be learned?

Suggested Actions

- What does the author want the reader to do with the information?

3. Back Matter

- The *back matter* supplements and **clarifies the body** of the report, makes the body easier to understand, and **shows where additional information** can be found.
- *Components of Back Matter*
 - References
 - Bibliography*
 - Appendixes*
 - List of Symbols, Abbreviations, and Acronyms

3.1 References

Activity

1. What is referencing?
2. Why should you write reference?
3. What is the difference between reference and bibliography?
4. Where do we use references in the report?
5. What are the forms of writing references?
6. How do we write references?

References

- is the place where the author cites all of the *secondary sources** that were used to:
 - develop an understanding of the problem
 - support the information contained in the report
- The **reference** list only identifies **sources referred to (cite)** in the text of your research.
- It is arranged in alphabetical order of authors' surnames and chronologically for each author.

3.2 Bibliography

- A **bibliography** is presented in the same format as reference list but **it includes a list of all material** referred to due to the course of your investigation.
- In other words, a bibliography presents the same items as a reference list but it also includes all other sources which **you read or consulted** but **did not cite**. This must be done using the **referencing convention** specified by your lecturer/tutor.

Where and how to write references

Referencing of sources in written work generally occurs:

- a. in the body of the text as either
 - **in-text citations** or
 - **footnotes**, and
- b. at the end of the text in the form of
 - a **reference list** or
 - a **bibliography**.

Therefore, the **two parts to referencing** are:

- **citations** in the text of the report
- a **list of references** in the final section

Cont'd

- A **citation** shows that **information comes from another source**.

- The **reference** list gives the **details** of these sources.

You need to **use in-text citations** and provide details in the **references** section **when**:

- 1.You **incorporate information** from other sources
- 2.You **quote word-for-word** from another work (when you do this the **page number** must be given in the **in-text citation**)

Cont'd

- **Example of in-text citation and reference list entry:**

Example of in-text citation

a. Quotation

- Corrosion is defined as a “chemical action which harms the properties of a metal” (Glendinning 1973, p.12).

b. Paraphrasing

Students should take just a few notes in direct quotation from sources to help minimize the amount of quoted material in a research paper (Lester1976, 46-47).

Referencing style

- Nowadays, the **APA system of referencing** is popular, and has some advantages in **technical** material.
- As **APA** style, a bibliography/ reference list is written in the following **manner** and **arranged alphabetically**:
 1. **Name of the author** with the last name first and initials afterwards,
 2. The **year of publication** is given in bracket after the name of the author or authors,
 3. **Title** of the book or the work is written, underlined/ bolded/italicized and followed by a **full stop**,
 4. **Place of Publication** followed by a colon (:).
 5. Name of the **publishing agency** or publishers and followed by a full stop (.).

Examples of writing reference lists

- Hawley, R. (1996). Leadership challenges in an engineering environment, *Engineering Management Journal*, vol 6 no 5, pp 217-231.
- Seliger, W.H. and Shohamy, E. (1989). **Second Language Research Methods**. Oxford: Oxford University Press.
- Singh, K.Y. (2006). **Fundamental of Research Methodology and Statistics**. New Delhi: New Age International (P) Limited Publishers.
- Van Emden, J. (2005). **Writing for Engineers**. (3rd ed). Palgrave: Macmillan.

Activity

The following works are not arranged to be used as a reference in research report writing. Rewrite them using APA style of documentation.

1. 2nd edition of an introduction to qualitative research at London by u. flick in 1995, sage publications.
2. The practice of communicative teaching by C. Brumfit in 1986, Pergamum press at oxford.

Activity

- What is plagiarism?
- How can we avoid it?

Plagiarism

Plagiarism can be:

1. *Unauthorized use of the language and thoughts of another author and the representation of them as one's own*
2. *Submitting someone else's text as one's own or attempting to blur the line between one's own ideas or words and those borrowed from another source.*
3. *Carelessly or inadequately citing ideas or words borrowed from another source.*

How to avoid plagiarism

- Plagiarism can sometimes be the result of **poor note taking**, or **paraphrasing** without properly **citing** the reference. You can avoid plagiarism by:
 - **citing** your references
 - **referencing** correctly
 - recording direct **quotes** and paraphrases correctly when note taking.
- **Quotes**
 - When you use the exact words, ideas or images of another person, you are **quoting** the author.
 - If you do not use quotation marks around the original author's **direct words** and cite the reference, you are plagiarizing.

Paraphrasing

- Paraphrasing is when you **take someone** else's **concepts** and put them **into your own words** without changing the original meaning. Even though you are not using the same words you still need to state where the concepts came from.
- **Note taking**
 - Poor note taking can lead to plagiarism. You should always take care to:
 - **record** all reference information correctly
 - use **quotation** marks **exactly** as in the original
 - paraphrase correctly
 - clearly **distinguish** your own ideas from the ideas of other authors and researchers. All plagiarism is viewed seriously by the University and can incur penalties.

3.3 Appendixes*

- Anything that cannot be left out of a report, but is too large for the main part of the report and would serve to distract or interrupt the flow belongs in the *appendixes*. Examples include:
 - Large tables of data
 - Flowcharts
 - Mathematical analysis
 - Large illustrations
 - Detailed explanations and descriptions of test techniques and apparatus
 - Technical drawings

Example of Appendixes

In Equation (5.16), $R_0(I, lc)$ and $R_k(I, lc)$ represent multipath signal part of self and multiple access interference. In Equations (5.19) and (5.20), given the variance of these terms. Here, we are

going to see the proof of these simplifications.

Generalizing the expression of $R_0(I, lc)$ for $R_k(I, lc)$, we have

$$R_k(I, lc) = \sum_{l=0}^{L-1} \sum_{lc=0}^{L-1} h_{k,l}(t, \tau) h_{k,lc}^*(t, \tau) e^{-j\theta_{l,lc}} \int_{|l-lc|T_c}^{T_0} e^{-j2\pi\Delta f d_{l,lc} t} a_k(t - |l-lc|T_c) a_0^*(t) dt \dots\dots\dots (A-1)$$

To simplify this expression let us first substitute the expression of $a_k(t)$ and $a_0^*(t)$.

$$R_k(I, lc) = \sum_{l=0}^{L-1} \sum_{lc=0}^{L-1} h_k(t, \tau) h_k^*(t, \tau) e^{-j\theta_{l,lc}} \int_{|l-lc|T_c}^{T_0} e^{-j2\pi\Delta f d_{l,lc} t} \sum_{m=0}^{M_k-1} \sum_{n=0}^{M_0-1} a_m^{(k)} a_n^{(0)*} P_T(t - (|l-lc| + m)T_c) P_T(t - n \dots\dots\dots (A-2)$$

Appendix B

Part of MATLAB code used for simulation purpose

1. Matlab code for uniform data rate

```
if(q<=nmobp)
if(SIRP(q)>=SIRP0(q))
    if(sum(pdinewp)<(Pmax))% previous study
        pdp=pdpi(q); SIp=SIRP(q);
    else
        SIp=SIRP(q); pdp=pdpi(q)-db2lin(0.5);
    end
else if(SIRP(q)<SIRP0(q))
    if(sum(pdinewp)<=(Pmax-db2lin(0.5)))
        pdp=pdpi(q)+db2lin(0.5); SIp=SIRP0(q);
    else if(sum(pdinewp)>(Pmax-db2lin(0.5)))
        SIp=SIRP0(q); pdp=pdpi(q)-db2lin(0.5);
    else
        SIp=SIRP0(q); pdp=pdpi(q);
    end
end
```

3.2 List of Symbols, Abbreviations, and Acronyms*

If more than five *symbols*, *abbreviations*, or *acronyms* are used in the report, they are to be listed with their explanation.

LIST OF SYMBOLS, ABBREVIATIONS, & ACRONYMS

List of Symbols

A	=	Shear Area
G	=	Shear Modulus of Elasticity
V	=	Shear Force
τ	=	Shear Stress
$\varnothing$	=	diameter
$\square$	=	bore depth

List of Abbreviations

THRU	=	Through Hole
------	---	--------------

List of Acronyms

CAD	=	Computer Aided Design
FEA	=	Finite Element Analysis

Examples- list of symbols

- **V** volume of a sphere
- **r** radius of a circle
- **π** pi

Unit Four: Process of Writing TR

- **Writing technical report** involves and explains:
 - **what is done,**
 - **why it was done,**
 - **what has been discovered** and
 - **what is the significance of the findings.**
- And again, it should clearly state and explain:
 - **what novel comes out of your work,** and
 - **how it relates to prior knowledge.**

Planning (Preparatory steps in writing report)

- An **effective report** is the **result of careful preparation** and **execution of the plan**.
- The following are **important preparatory steps** to writing a report:
 - *Selecting an appropriate and specific topic*
 - *Identifying Clear Objectives for Writing*
 - *Define your scope*
 - *Determine your audience*
 - *Collect the data*
 - *Organize the material*
 - *Making an outline*

a) Selecting an Appropriate Subject Matter:

- In the process of writing technical report, the first and crucial step is **selecting a viable and practical topic**.
- “Any writing without a topic seems **like** a boat without an anchor”
- A technical report writer should focus on the specific aspect of a subject matter so that it becomes **manageable**.

Techniques of Selecting Subject Matter

1. Space (Locale): refers to the **number of pages** in technical reports.

- They have **limited numbers of pages**.
- Topics which are **worldwide** basis ***cannot be adequately treated*** in technical reports.
- So, technical report writing **highly** deals with a **highly specialized locale**.

• **For example:**

Parks → National Parks → Semien Mountains National
Parks → The Present Condition of the Endemic Species of
Semien Mountains National Park

Cont'd

2. Using Specific Terminologies: this can be done by moving from

- General terms to specific one
- Unmodified to modified
- Unknown to known
- Abstract to concrete

Example:

Printed materials → Books → Textbooks → Technical
Report Writing

3. Asking Journalistic Questions: this is another important method of limiting a topic of technical report. Sometimes, it is called the “**Wh**” *question method*.

B. Identifying Clear Objectives for Writing

- This keeps the writer to move forward in a solid direction.
- The statement that states the purpose of the report known as the **controlling sentence or thesis**.
- But, this statement should be structured in a **complete declarative** sentence as well as **clear, specific** and **concise**.
- To identify the objective of the report; determine:
 - why you are writing the report and
 - what you hope to accomplish.

Cont'd

- Benefits of a clearly defined objective :
 - It helps you decide what information to include and to leave out.
 - It helps you pitch the report at the right level.
 - It makes it easier to write the report.
- An objective is not what you intend to **write**, it is what you intend to **achieve**.

For example, Writing a research report is not an objective, it is a *task*. The *objective* is to extend the readers' knowledge of the world by reducing their uncertainty and increasing their understanding of it.

- Concentrate on the **objective**, not the associated task.

In writing objectives, we should use **behavioral terms** that show specific result:

- To inform
- To describe
- To explain
- To instruct
- To evaluate
- To recommend
- To provoke debate
- To persuade
- To convince....
- To compare....
- To verify...
- To evaluate....
- To identify...

Eg Topic: Machine Operator Training Programs in Kombolcha Water Supply Office

- **Objective:** To evaluate the effectiveness of machine operator training efforts in water supply project

C. Define your scope

- Scope – refers to the boundaries of the report:
 - what will be included and excluded.
 - helps save your time and money by delimiting your area of focus.

E. Collecting Data

- Many reports become ineffective because the writer did not:
 - use the proper method,
 - consult the right documents,
 - approach the right people, or
 - secure the right answers.

Cont'd

- Categories of methods and sources for collecting data:

1. **Methods (Primary Data)**

- Personal observation
- Telephone Interview
- Personal Interview
- Questionnaires

2. **Sources (Secondary Data)**

- **Internal Records** (letters, memoranda, reports, contracts, agreements, transcript of talks, orders, office notes on files)
- **Library**

F. Organization of Materials

- **Logical structure** refers *the natural unfolding flow of an idea* as the reader progresses through the document.
- This is achieved by going from the **general** to the **specific** which should lead *logically* to the conclusions.
- As many readers can read the report from beginning to end and use it, the length of the report should be as certainly short as needed (Ten pages).
- To overcome the problems on the side of the reader, a writer should make each section clearly identifiable.
- The best way to organize material is to **prepare the outline** of a report before you actually start writing it.

G. Making an Outline

- While constructing your outline keep the audience in mind.
- Reject the material which you think will be *beyond your reader's comprehension* or which will not help him take a decision or action.

There are some principles that will help you to decide:

- what to include,
- what to reject, and
- how to organize the selected material into the form of an outline.

Principles of Organization

i) Logical ordering

- First method is to order the material from the **least important to the most important** or **vice versa**. The **former** is effective if the report is **interpretive** and the **latter** is advisable if the report is **informational**.
- Other methods of ordering are:
 - Categorical
 - Coordinating, and
 - Subordinating
 - Comparative
 - Chronological.

Cont'd

i) Coordinating

- Topics or sub-topics with **equal rank** should be assigned the **same level** in the outline .

1. Sources of Water

1.1 ponds

1.2 Rivers

1.3 Lakes

1.4 Seas and Oceans

ii) Subordinating

- You should clearly determine which ideas can be grouped under one topic or subtopic and in what order.

For example,

ENVIRONMENTAL POLLUTION

1. Introduction

1.1 Definition

1.2 Causes of pollution

1.2.1 Population growth

1.2.2 Increased productivity

2. Types

2.1 Air pollution

2.2 Water pollution

3. Suggestions for Reducing Pollution

3.1 Publicity about its hazards

3.2 Advisory Services

ii) Making an Outline

- **An outline** will:
 - provide you with a framework.
 - indicate the pattern of your report
 - provide you with a starting point for writing.
 - serve as a map.
 - indicate the nature and sequence of topics and sub-topics to be discussed in your report.
 - shows which topics are more important, which are of equal status, and which are subordinate.

Outline Systems

a) Alphabetic System

I. X X X X X X X

A. X X X X X X X

B. X X X X X X X

1. X X X X X X X

2. X X X X X X X

a. X X X X X X X

b. X X X X X X X

II. X X X X X X X

A. X X X X X X X

B. X X X X X X X

b) Decimal System

1. X X X X X X X

1.1 X X X X X X X

1.2 X X X X X X X

1.2.1 X X X X X X X

1.2.2 X X X X X X X

2. X X X X X X X

2.1 X X X X X X X

2.1.1 X X X X X X X

2.1.2 X X X X X X X

Outline Formats

i. Topical Outline

describes in a few words.

I. Characteristics of Voice Mail

- A. Speed
- B. Cost
- C. Equipment

ii. Discussion Outline

provides more information about the topics and the subtopics,

I. Voice mail offers the latest technology for sending messages.

- A. It offers speed.
- B. It costs no more than a telephone call.
- C. Special equipment is needed.

Cont'd

NB. The words, phrases, or sentences that you use for indicating the topics or subtopics of your outline should generally have parallel grammatical construction.

For Example, (Incorrect)

1. Advantages of Nationalization

1.1 Mobilization of national resources

1.2 **Promotes** agricultural production

1.3 Encouragement of new classes of entrepreneurs

1.4 **Channelizing** people's saving towards productive purposes

Cont'd

Correct Example

1. Advantages of Nationalization
 - 1.1. Mobilization of national resources
 - 1.2. Promotion of agricultural production
 - 1.3. Encouragement of new classes of entrepreneurs
 - 1.4. Channelization of people's saving towards productive purposes

Qualities of Good Technical Writings

- As a technical writing, the readability, professionalism, objectiveness and the impact of the report are expected qualities.

The basic characteristics to produce good reports are:

1. **Accuracy:**

- conventions of grammar, punctuation and usage,
- spelling,
- accurate sentences,
- paragraphing as well as any appropriate format standards apply throughout the document.

2. Clarity

- A technical report should convey a single meaning.
- Figures must be understandable.

3. Comprehensiveness

- is crucial for two reasons:
 - **Firstly**, the people who will act on the document need a complete, self-contained discussion so that they can apply the information effectively, efficiently and safely.
 - **Secondly**, the document will be the official company record of the project from its inception to its competition.

4. Accessibility

- refers to the ease with which one can locate the information the readers seek.

5. Brevity or conciseness

- In report writing, there is no minimum or maximum page length requirement .
- It is not common for technical reports to exceed 20 pages.
- It may stand against clarity and comprehensiveness.

Cont'd

- The solution to this conflict is to balance the claims of clarity, conciseness, and comprehensiveness by:
 - choosing shorter words than the longer ones and
 - using economical grammatical forms.
- This helps the readers save their time as well as no to loss the information they need to know.

6. Modest writing

- writing in full (writing “it is” rather than “it’s”)
- avoiding slang or colloquial expressions, but using words correctly.

Introducing sentences or paragraphs using phrases such as:

- ‘At the same time’,
- ‘On the other hand’, or
- ‘Bearing this in mind’,
- for example, keeps the smooth flow of information and helps to catch the attention of the readers to the supplementary information which follows.

7. Continuity

- A report should include logically and interestingly organized information.
- This requires continuity between successive sentences, paragraphs, and sections and even between the written text and the figures and/or tables.
- To keep the smooth flow of information, using appropriate transitional words, phrases, sentences, or even paragraphs play a vital role.

Cont'd

- One of the most important aspects of presentation information is arranging it using different ordering methods.
- Ordering requires you to make series of decisions on:
 - which information to make first,
 - which in the middle, and
 - which to make last.

Types of Ordering Methods

1. **Chronological (Natural) Order:** relating materials due to time sequence.
 - is used when describing a process and reporting what has happened.
 - The commonly used traditional words in such way of ordering are first, second, next, finally, etc.
 - The types of report which can usually be developed using this order are:
 - progress reports,
 - process descriptions, and
 - situational reports.

2. Enumeration order

- focuses simply on listing the points.
- Here there is no need of considering the time sequence.
- It begins with the most important and ends with the least important.

3. Spatial (Space) Ordering

- considers the physical appearance of something.
- It usually guides audiences visually and directionally to help them have a vivid and accurate image.
- The phrases which commonly and usually used are “to the left,” “behind,” “in front of.”
- These kinds of reports are descriptive as they give the tangible picture of an object, a product or a place.

4. Cause and Effect:

- We often use this kind of ordering When a report shows:
 - the why of something,
 - why something happened,
 - why something is true, or
 - when a report shows the consequence of an event or decision.
- It is the type of ordering often used in analytical report.

5. Compare and Contrast

- is used for analyzing the similarities and differences between any two objects, procedures, policies, etc. in detail.
- **Comparison** stands for the state of **alikeness** whereas **contrast** refers showing **unlikeness** between two or more events or things under discussion.

6. Problem Solving: is used in reports when there is a problem or difficulty and need to propose for a change or solution or recommendation. It is good employing this kind of ordering information in proposal writing.

THE END

THANK YOU!!!

GOOD LUCK!!!