

# 5 : Technical Writing and Effective Communication

IT3106 – Communication Skills II

Level II - Semester 1

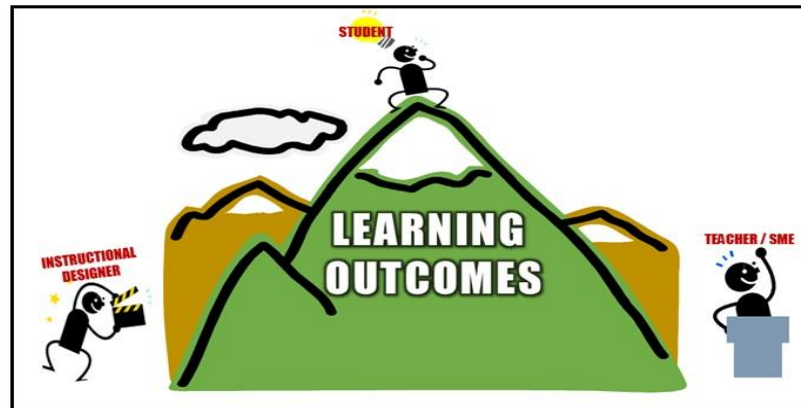
# Overview

This is the fifth topic of the course module, Communication Skills (EN3106). This section will introduce the aspects related to Technical Writing and Effective Communication. Further, it will give insights into the tools which makes the technical writing process easier. Additionally, the section introduce few technical documents knowing of which would helpful during and after the degree program.

# Intended Learning Outcomes

At the end of this lesson, you will be able to;

- Express concepts/ideas/proposals effectively to different audiences/stakeholders in a given context.
- Employ various tools and technologies in aid of effective professional and technical communication.



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## References

**[REF1]** Laplante, P. A., (2018) Technical Writing: A Practical Guide for Engineers, Scientists, and Nontechnical Professionals -Routledge; 2nd edition.

**[REF3]** Oetiker, T., Partl, H., Hyna, I. And Schelgl, E., (1995). The not so short introduction to LATEX2e. Electronic document available at <http://www.tex.ac.uk/tex-archive/info/lshort>.

## 5.1 Introduction to Technical Writing

***“The fundamental purpose of scientific discourse is not the mere presentation of information and thought but rather its actual communication. It does not matter how pleased an author might be to have converted all the right data into sentences and paragraphs; it matters only whether a large majority of the reading audience accurately perceives what the author had in mind.”***

--George Gopen and Judith Swan --

The Science of Scientific Writing

# 5.1 Introduction to Technical Writing

## Technical Writing [Ref1]

- It is easier to define technical writing by differentiating it from all other kinds of writing. There are mainly three differences.
  - Precision – Compare the precision needed for a process documentation of a nuclear plant and a new paper article. Technical writing needs high precision as otherwise it could lead to disasters.
  - Intent – Intent is objective and does not base on emotional properties. Therefore, technical writing incorporates concise and rational statements or information that are actionable.
  - Legal implications – While any kind of writing can be libelous, an error in technical writing can have serious consequences. Technical writing errors could lead to financial loss, damage to property, environmental catastrophe, injury, or death.

## • 5.1.1 Introduction to Technical Writing

### Technical vs Nontechnical writing by example [Ref1]

Nontechnical writing – could be an email to a friend or Facebook post.

*“So yesterday I’m driving to the bank on Valley Road when this idiot runs a stop sign and T-bones my car. Thank God I wasn’t hurt, but my side airbag deployed and that probably saved me. The car isn’t totaled, but the passenger side door was crushed and there is a lot of other damage to it and they had to tow it. The cop who responded to the scene thought I was looking at \$15,000 of damage or more. They towed my car to the body shop, but I haven’t gotten an estimate to repair yet. The other guy was driving some old clunker and it barely had a scratch on it. Stupid jerk was probably drunk, but the cop didn’t want to give him a breathalyzer test because I think he knew the guy.”*

Note the writing contains emotion, accusations, speculations, and blame which are not supposed to appear in technical writing.

## • 5.1.1 Introduction to Technical Writing

### Technical vs Nontechnical writing by example [Ref1]

Technical writing – the incident report written for an insurance company.

*“On October 1, 2017 at approximately 10 AM Driver A was proceeding by vehicle on Valley Road through a cross street. Driver B was proceeding through the stop sign at the cross street, colliding with the passenger side of the vehicle driven by Driver A. The driver side airbag for Driver A’s vehicle deployed. There were no injuries. Driver A’s vehicle needed to be towed.”*

Note the difference between the nontechnical writing example and technical writing example.



## 5.1.1 Introduction to Technical Writing

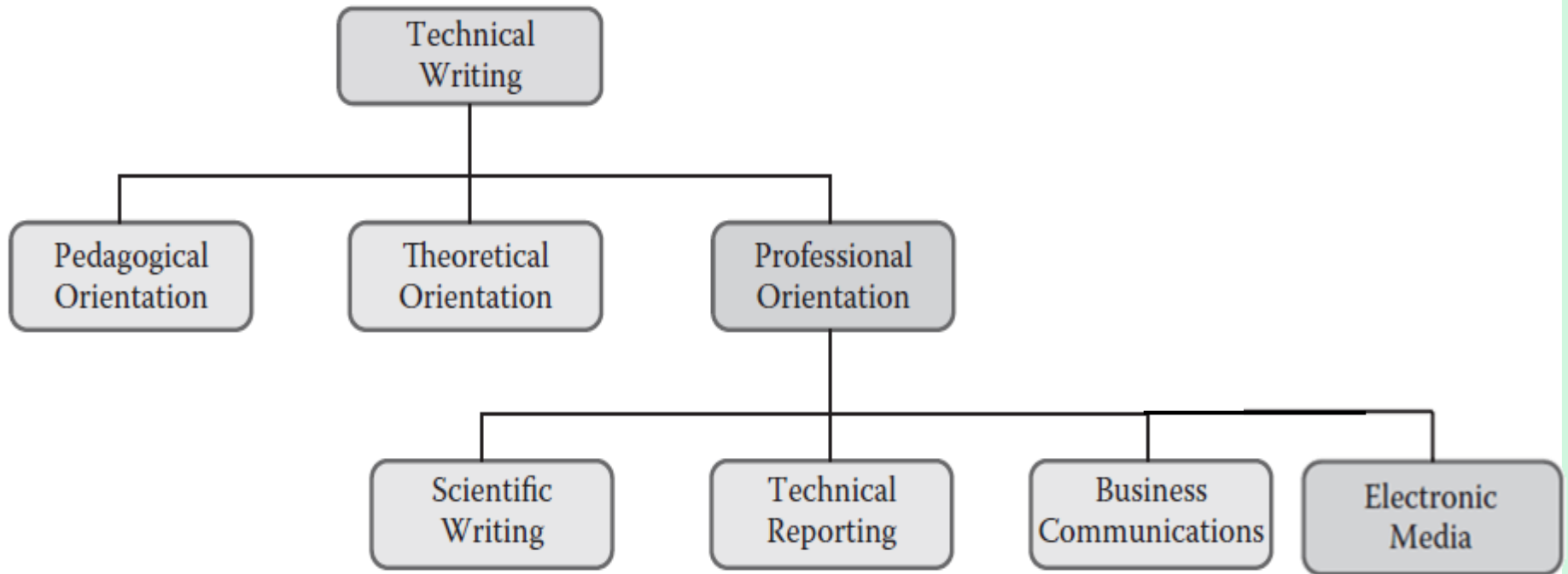
### Who writes technical documentation? [Ref1]

Any profession or trade could have a component of technical writing. Therefore, everyone is a technical writer, at least occasionally.

The style of technical writing may depend on the practices in the profession.

- Doctor
- Farmer
- Lawyer
- Engineer
- Teacher

## 5.1.2 Taxonomy of Technical Writing



Ref 1: Pg. 4: An updated version of Montgomery's taxonomy for technical writing of a professional orientation. (Redrawn from Montgomery, T. and Plung, D., Proc. of International Professional Communication Conference, 1988, Seattle, Washington, October 5–7, 1988, pp. 141–146.)

## 5.1.2 Taxonomy of Technical Writing

### Technical Reporting [Ref1]

Technical reports are documents that 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
- Bug reports

## 5.1.2 Taxonomy of Technical Writing

### **Business Communications [Ref1]**

Business communications include a wide range of correspondence that must be written in the course of business activities. Typical business communications documents that you may read or write include:

- Résumés
- Cover letters
- Customer relations writing
- Human resources communications
- Administrative communications
- Biosketch

## 5.1.2 Taxonomy of Technical Writing

### **Scientific Writing [Ref1]**

Scientific writing includes experimental research and associated documentation, as well as the scholarly publications that emerge from that work. Scientists and engineers can publish their work in a variety of venues, including:

- Books
- Journals
- Magazines
- Conferences
- Newsletters
- Websites and blogs

## 5.1.2 Taxonomy of Technical Writing

### Authority of Technical Writing [Ref1]

- Authority refers to the reliability of the scientific content, which tends to be much higher if manuscripts submitted for publication are reviewed by technical peers and tends to be much lower if the writing is not peer reviewed.
- Prominent in scientific writing which also defines multiple methods of peer reviewing.
  - Single blind
  - Double blind
  - Open peer review
- Most professions incorporate authority in technical writing by reviewing the material by using independent expertise groups / organizations recognized by the community.

## 5.1.2 Taxonomy of Technical Writing

### Authority of Technical Writing

- Single blind - Author doesn't know the identity of the reviewer.
  - **Advantages**
    - The anonymity allows reviewer to be honest without any influence from the authors
    - Knowing the author would allow him to understand the background of work
  - **Disadvantages**
    - Since the author is known to the reviewer, the feedback or comments could be biased
    - There could be potential discrimination that are not based on the technical criteria such as nationality, gender, race, etc.

## 5.1.2 Taxonomy of Technical Writing

### Authority of Technical Writing

- Double blind – Author and reviewer both do not know the identity of each other.
  - **Advantages**
    - The level of anonymity allows both reviewer and author to be protected against any criticism
    - Review is fair without much biases
  - **Disadvantages**
    - Full anonymity is not guaranteed as the identity could reveal through writing style, area of work, etc.
    - Background of the author is not revealed thus judgment is purely based on the written document.



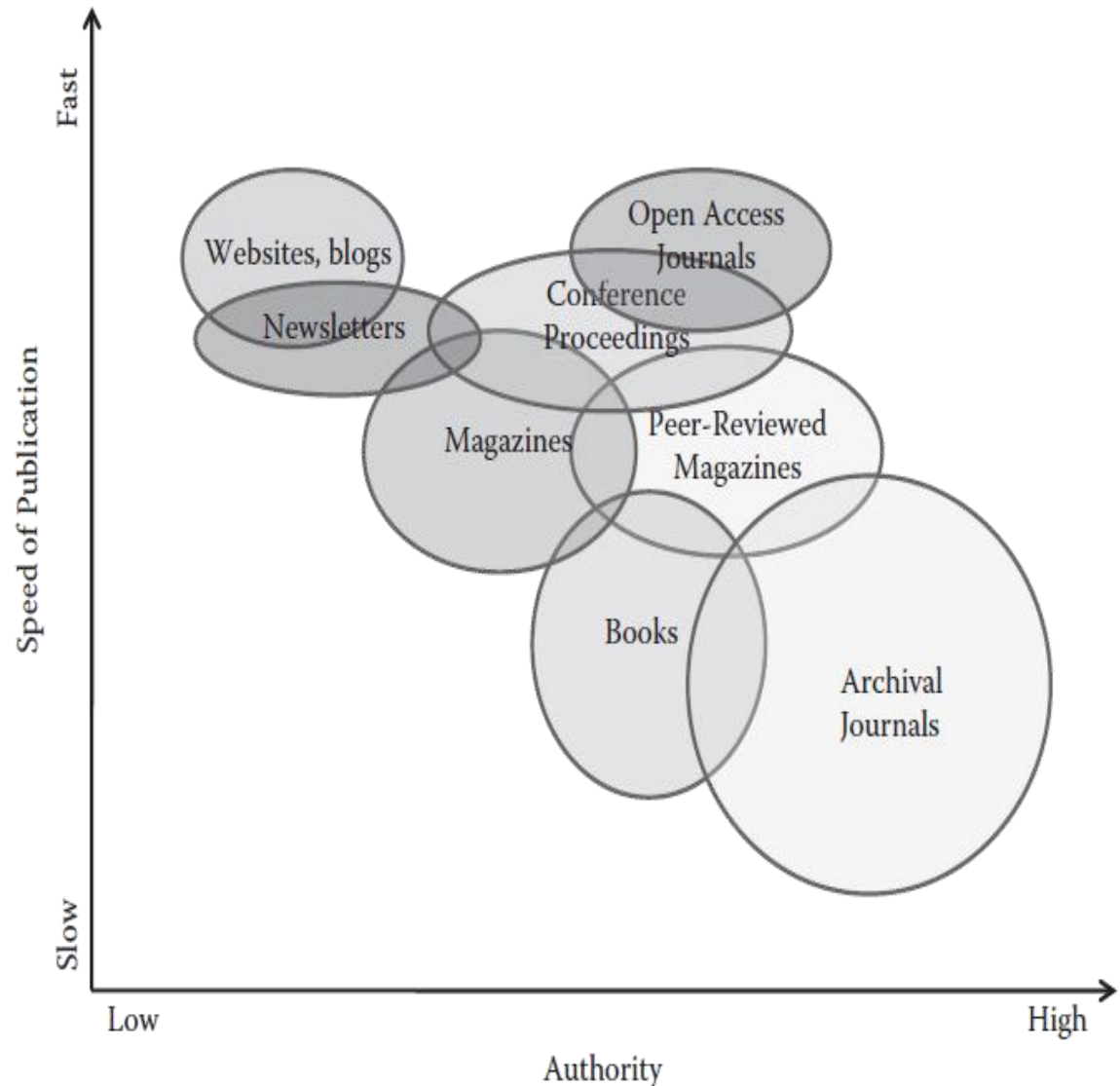
## 5.1.2 Taxonomy of Technical Writing

### Authority of Technical Writing

- Open peer review – Author and reviewer is known to all participants, during or after review process.
  - **Advantages**
    - Encourages accountability thus resulting in quality review process.
    - Reviewers are motivated to study in detail before commenting as their opinion is going in public
    - Knowing the author would allow him to understand the background of work
  - **Disadvantages**
    - Review could be biased based on the seniority of the writer
    - Reviewers might refuse to review due to post review criticisms

## 5.1.2 Taxonomy of Technical Writing

**Authority of  
Content and  
Speed of  
Publication of  
Technical  
Writing types  
[Ref1]**



## 5.2. Technical Writing Basics [Ref1]

In addition to the language skills, there are set of basic practices that you need to follow in technical writing.

- Structuring your writing
- Know your audience
- Choosing the right words
- Avoiding traps in writing
- The 5Cs of technical writing
- Referencing



## 5.2.1 Structuring your writing [Ref1]

### External Balanced Structure [Ref1]

- If you organize the content into major sections, subsections and so on, then the relative **number** of each of these should be uniform across the document.
  - i.e. if you have 5 subsections for each major section and 5 sub-subsections for each subsection, then it is good to have the fairly similar number on each major section.
- However, based on the context and may be provided templates, the structure could be different

## 5.2.1 Structuring your writing [Ref1]

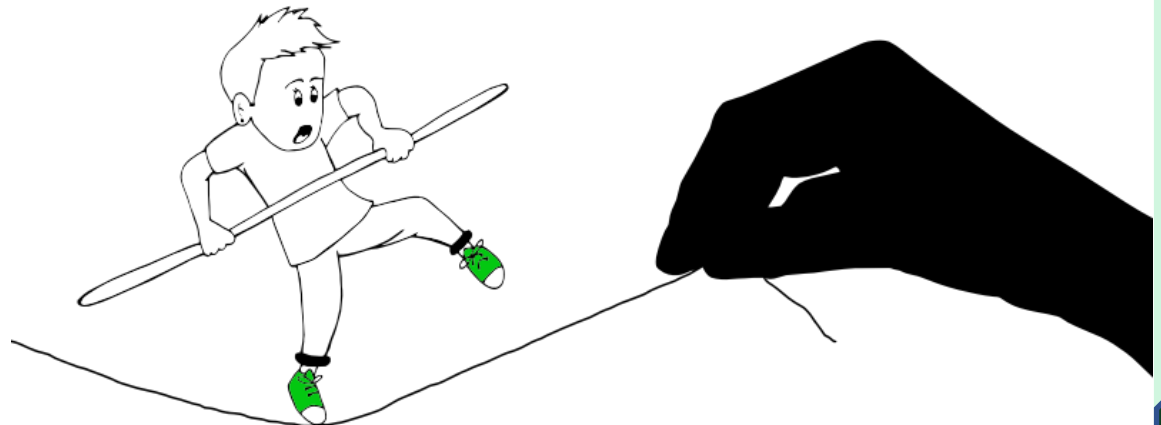
### Internal Balanced Structure [Ref1]

- If you organize the content into major sections, subsections and so on, then the relative **length** of each of these should be uniform across the document.
  - i.e. if you provide  $\frac{1}{2}$  a page of content for major section and content of 2 pages for sub section, then it is better to follow the same convention through out the document.
- However, based on the context and may be provided templates, the structure could be different.

## 5.2.1 Structuring your writing [Ref1]

### Internal and External Balanced [Ref1]

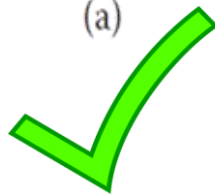
- Internal and external balance provide consistency and a uniform organization of content within a document.
- Well structured document would represent a Pyramid shape if the structure has been represented as a tree.
- Shapes other than that are considered to be less structured and need improvements.



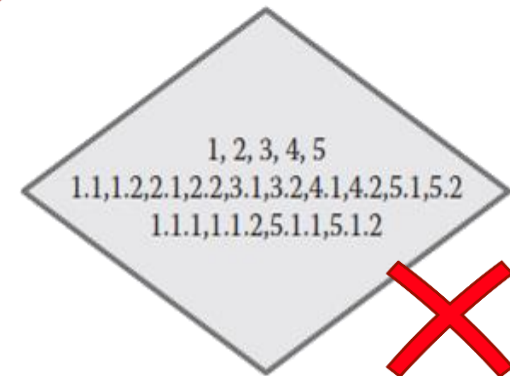
## 5.2.1 Structuring your writing [Ref1]



(a)



(b)



(c)



Pyramid (a), hourglass (b), and diamond-shaped (c) configurations for the heading levels in documentation. (From Laplante, P. A., *Requirements Engineering for Software and Systems, Third Edition*, Taylor & Francis, Boca Raton, FL, 2017.)

## 5.2.2 Know your audience [Ref1]

- Knowing your audience will allow you to:
  - Decide the writing tone;
  - Decide the amount of details;
  - Decide the point of view; and
  - Decide the structure.





## 5.2.2 Know your audience

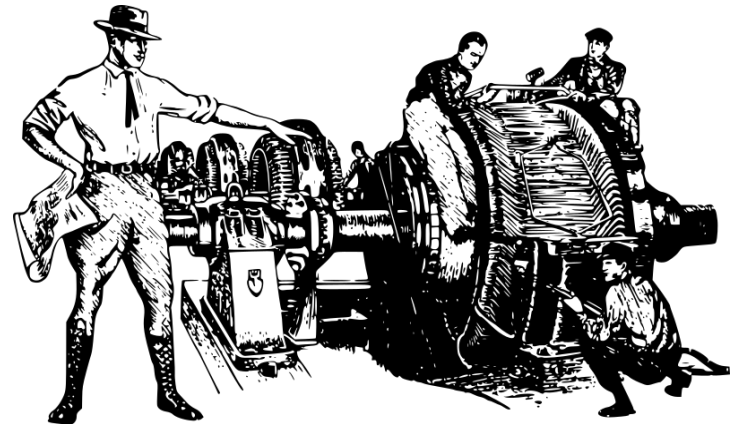
- Audiences are commonly categorized as:
  - Experts;
  - Technicians;
  - Executives; and
  - Nonspecialists.



## 5.2.2 Know your audience

- **Experts:**

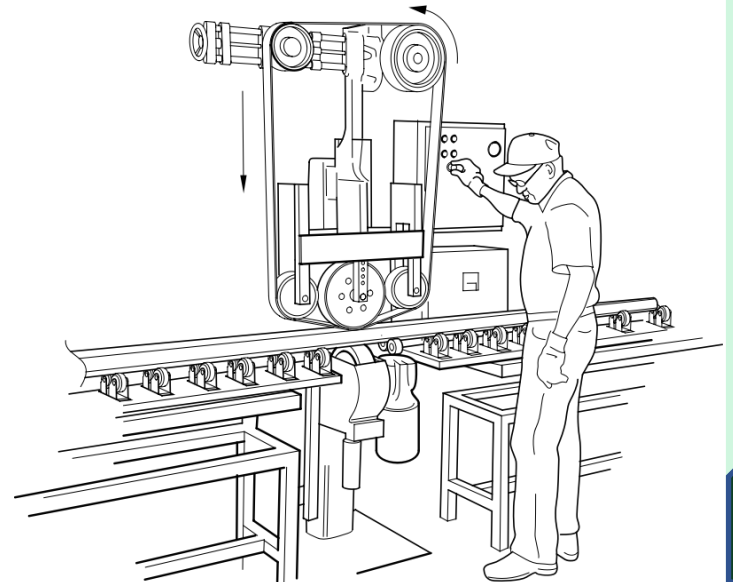
- Experts are the category of people who know the particular domain or product from theory to practice;
- The experts will be involved in research with respect to the particular domain so that they would know what others in the domain are doing as well; and
- They need very little information to map things with the domain or products.
  - E.g. Medical researcher on cancer



## 5.2.2 Know your audience

### • Technicians:

- People who build, operate, and maintain products of a particular domain is identified as a technician of the particular domain;
- Technicians could be specialized in a particular area of a domain;
- Technician possess highly technical knowledge though it is more practical nature; and
- Technicians prefer detailed information.
  - E.g. Aircraft technician



## 5.2.2 Know your audience

- **Executives:**

- These are the decision makers of an organization who may not be the experts of the particular domain the organization doing business on; and
- They like to have less technical details in a very concise and precise manner with statistical information to make decisions.
  - E.g. CEO of an organization



## 5.2.2 Know your audience

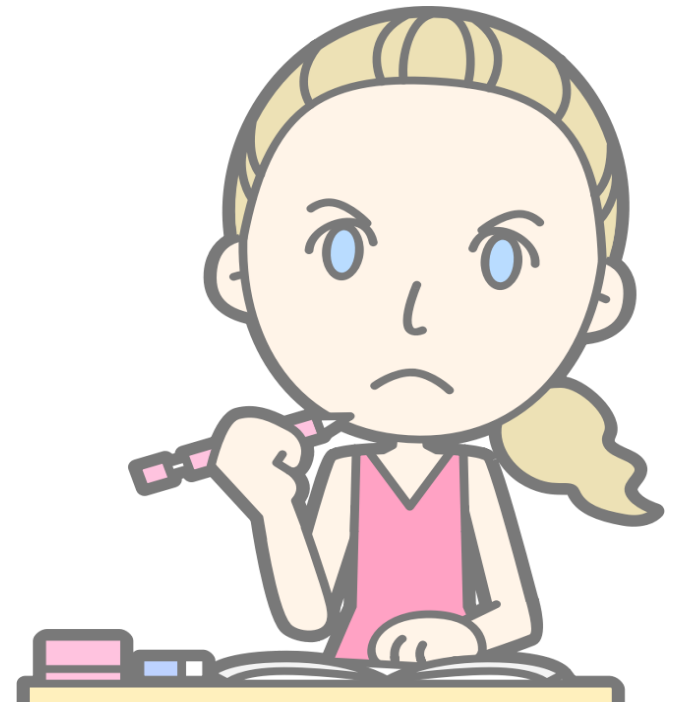
- **Nonspecialists:**

- These readers have the least technical knowledge in the domain;
- However, would like to learn and know the details with a gradual increase in complexity; and
- Nonspecialists could be the technicians who would like to evaluate new products, seek new knowledge, etc..
  - E.g. Technician switching to new product



## 5.2.3 Choosing Right Words [Ref1]

- Conciseness and precision are two desirable characteristics of technical writing. Choosing right words allows to achieve these qualities.
- Concise – Keep it simple and to the point
- Precise – measurable, exact, and accurate



## 5.2.3 Choosing Right Words [Ref1]

*“I have made this letter too long because I did not have the free time to make it shorter”*

- Blaise Pascal 1656

- The genius mathematician’s sentiment acknowledges:
  - The effort it takes to write concisely
  - The value of concisely written document

### • **Conciseness**

- Conciseness is not avoiding all details and treating subjects only in outline
- Conciseness is containing required details with the shortest possible expression which could contain both graphical representations and text
- Conciseness can be achieved by replacing multiple words with single word without tampering the meaning of the sentence

- **Refer TABLE 2.1 in Ref1**

## 5.2.3 Choosing Right Words [Ref1]

- **Conciseness examples**

- The Passport Office is replacing free of charge until the dates specified any current passport lost, damaged or destroyed as a result of the recent floods. Eligible applicants should contact the Passport Information Service (PIS) on 998 9988 for further information.
- **Concise version:** We are offering free replacements for current passports lost or damaged in the recent floods. You must contact us on 998 9988 by June 10.
- As of 4 August, students will be selected using processes which have been created in accordance with legal requirements. These processes will be used along with our diversity strategy and all of its relevant policies about student selection.
- **Concise version:** From 4 August, we will select students using processes that meet legal requirements, our diversity strategy and policies on student selection.
- **Ref:** <https://4syllables.com.au/resources/solutions-concise-writing-exercises>



## 5.2.3 Choosing Right Words [Ref1]

*“When you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind; it may be the beginning of knowledge, but you have scarcely, in your thoughts, advanced to the stage of science.”*

- William Thompson, Lord Kelvin, 1883

- **Precise**

- Precision can be achieved using measurable quantities and avoiding vague modifiers.
- Avoid the words “countless”, “some”, “approximately”, “huge”, “tiny”, “microscopic”, etc. and replace them with quantifiable / measurable expressions.
  - E.g. “*There are twelve possible causes for a subsystem failure*” statement is more precise than “*The possible reasons for a subsystem failure are numerous*”

## 5.2.3 Choosing Right Words [Ref1]

### • Hedging

- Precision may not be achieved at all times as prior statistics or a probability model may not be available for the particular case.
- Here is a short list of hedging words that should be replaced with a probability when possible:
  - Likely
  - Almost
  - Probably
  - Maybe
  - Might be

## 5.2.3 Choosing Right Words [Ref1]

- **Positive form**

- In technical writing, it is preferred to use the positive form of declarations, directions, and instructions rather than the negative.
- Example:
  - “do not include” could be replaced with “exclude”
  - “do not permit” could be replaced with “forbid”
- However, there could be cases where the negative form is essential to make the message clear.

## 5.2.4 Avoiding Traps in Writing [Ref1]

- **Clichés**

- A cliché is a lazy way to create an image. If you need to create such an image, do so through effective writing.
- Example:
  - “bite the bullet” could be replaced with “sacrifice”
  - “in this day and age” could be replaced with “today”
- **Refer TABLE 2.4 in Ref1**

## 5.2.4 Avoiding Traps in Writing [Ref1]

- **Anthropomorphic writing**

- Projecting human feelings, behaviors, or characteristics upon animals, inanimate objects, or systems in writing is called anthropomorphic writing.
- Avoid anthropomorphic writing on technical writing
- Example:
  - "8/23/2017, 3:11 PM EDT, upon running Test 3.1.2, the system failed miserably"
  - Systems cannot be miserable
- "the Internet is evil"
  - The Internet is neither evil nor good. Users of the Internet can be evil or good, but not the Internet itself.

## 5.2.4 Avoiding Traps in Writing [Ref1]

- **Malapropism**

- A malapropism is a word that sounds similar to an intended word but is logically wrong, often in some insidious way.
- Even the spelling and grammar checking feature of a word processor might not catch all the errors.
- Example:
  - “We expect reduced road surface life due to the increased destiny of the hot asphalt mix”
  - **destiny** has been used instead of **density**

- **Refer TABLE 2.5 in Ref1**

## 5.2.4 Avoiding Traps in Writing [Ref1]

- **Erroneous Heterographs**

- Two words are heterographs if they sound the same when pronounced but are spelled differently and have different meanings.
- Even the spelling and grammar checking feature of a word processor might not catch all the errors.
- Example:
  - "compliment" and "complement"
  - "hire" and "higher"
  - "hole" and "whole"
  - "their" and "there"

## 5.2.4 Avoiding Traps in Writing [Ref1]

- **Opinion versus Fact**

- Need to have a clear understanding about when to use opinion and when to use facts
- Suppose there is a published study illustrating the positive effects of alcohol on ten canaries in Lithuania.
  - Can these results be imputed on all humans? No.
- However, informed opinion is valuable in user manuals, experience reports, and in describing applications of products or systems.



## 5.2.4 Avoiding Traps in Writing [Ref1]

- **Acronyms, Domain-Specific Terms, and Jargon**

- Do not assume that readers are familiar with all the terms you are going to use.
- It is conventional to spell out acronyms once (and only once) before using them. Jargon and domain-specific terms may also be defined before first use.
  - Example:
    - “Baud: A data transmission rate in bits per second.”
- Prepare a glossary for the users
- **For examples, refer TABLE 2.6 in Ref1**

## 5.2.4 Avoiding Traps in Writing [Ref1]

- **The Laziness of “Very”**

- Using the word “very” is a cheap way to try to amplify meaning.
- Any form of “very” paired with another word should be replaced by a single equivalent word.
- Example:

- **“Very clear” → “Transparent”**
- **“Very often” → “Frequently”**
- **“Very weak” → “Feeble”**

- **For more examples, refer TABLE 2.7 in Ref1**

## 5.2.5 The 5 Cs of Technical Writing [Ref1]

- 1) Correct
- 2) Clarity
- 3) Complete
- 4) Consistent
- 5) Changeable



## 5.2.5 The 5 Cs of Technical Writing [Ref1]

### 1. Correct

- Information in the written artifact is grammatically and technically correct
- Example:
  - [incorrect] The automobile weight shall be no greater than 20 kilograms.
  - [incorrect] The automobile shall weight shall be no greater than 2000 kilograms.
  - [correct] The automobile weight shall be no greater than 2000 kilograms.

## 5.2.5 The 5 Cs of Technical Writing [Ref1]

### 2. Clarity

- Clarity (or unambiguousness) means that each sentence, related groups of sentences, or related sections of the written document can have only one interpretation.
- Example: Software user manual
- **[incorrect]** You shall click on the “logout” button to terminate the authenticated session. Clicking on the “logout” button shall return you to the login screen.
- **[correct]** You shall click on the “logout” button to terminate the authenticated session and you will get redirected to the login screen.

## 5.2.5 The 5 Cs of Technical Writing [Ref1]

### 3. Complete

- A technical document is complete if there is no missing “relevant” or “important” information.
- Completeness is a difficult quality to prove for any writing.
- The most powerful technique for reducing incompleteness is to have as many persons read the material as possible.
- Missing information should be updated even if they have been identified at a later stage.
- Version management is helpful to track updated documents so that the changes could be communicated to the stakeholders.

## 5.2.5 The 5 Cs of Technical Writing [Ref1]

### 4. Consistent

- The consistency of a document can take two forms:
  1. **Internal consistency** means that one part of the document does not contradict another part.
    - Example: **inconsistent UPS manual**
      - UPS maintenance section: Fully drained UPS battery will need to be recharged for 8 hours before use.
      - UPS warranty section: Fully drained UPS battery needs to be shipped to the UPS vendor for recharge.

## 5.2.5 The 5 Cs of Technical Writing [Ref1]

### 4. Consistent

2. **External consistency** means that the document is in agreement with all other applicable documents and standards.

- Example: **Government tender documents**
  - Government tender documents should be consistent with the standards and guidelines given by the government and may be the particular institution who are calling the tender.



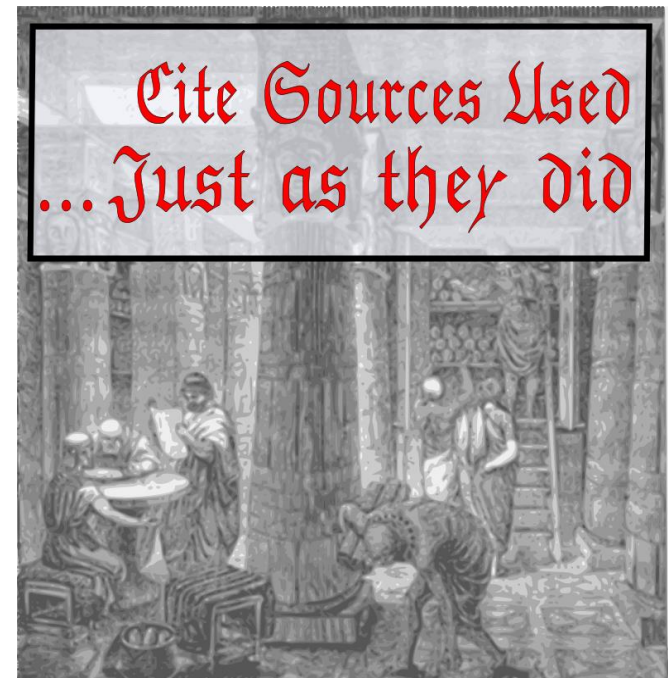
## 5.2.5 The 5 Cs of Technical Writing [Ref1]

### 5. Changeability

- Usually this means that the document is versioned, stored in a convenient electronic format, and compatible with common document processing and configuration tools.
- Maintaining version history is very important in technical writing to reflect the changes the document has gone through.
- A document that has to be regenerated or work from the beginning would make the documentation process a burden to an organization thus could get discouraged.

## 5.2.6 Referencing [Ref1]

- Every outside source that you use must be referenced, including websites, interviews, television programs, conference papers, books, journal articles, and so on.
- If you use information from any source literally, then it must appear in quotations, or offset somehow in the case of very long quotes.



## 5.2.6 Referencing [Ref1]

### Choose the right references

- Use credible references
  - Peer reviewed
  - Published in high ranked conferences / journals in the field
  - Well known authors in the field
  - Not listed in predatory journals
  - Higher number of citations
- Don't use obsolete references – Time and technology
  - Duration of validity would change depending on the domain. For example, in information technology, the validity period of a particular work would not last long given the rapid change of the domain.
- Cite adequate amount of references depending on the domain. However, you should not over-reference.

## 5.2.6 Referencing [Ref1]

### Choose the right references

- Use a balanced list of references
  - Books – books age quickly
  - Conferences – are not fully vetted
  - Journal articles – often too theoretical
  - Web references - do not have the same vetting and cognitive authority as the other types of references
- Do not cite articles from anonymous authors

## 5.2.6 Referencing [Ref7]

### Referencing styles (IEEE)

- The Institute of Electrical and Electronics Engineers (IEEE)
- In Text

as shown by Brown [4], [5]; as mentioned earlier [2], [4]–[7], [9]; Smith [4] and Brown and Jones [5]; Wood *et al.* [7]

- Reference list (for a conference)

*Basic Format:*

- J. K. Author, “Title of paper,” in *Abbreviated Name of Conf.*, (location of conference is optional), (Month and day(s) if provided) year, pp. xxx-xxx.

## 5.2.6 Referencing

### Referencing styles (Harvard)

- The Institute of Electrical and Electronics Engineers (IEEE)
- In Text

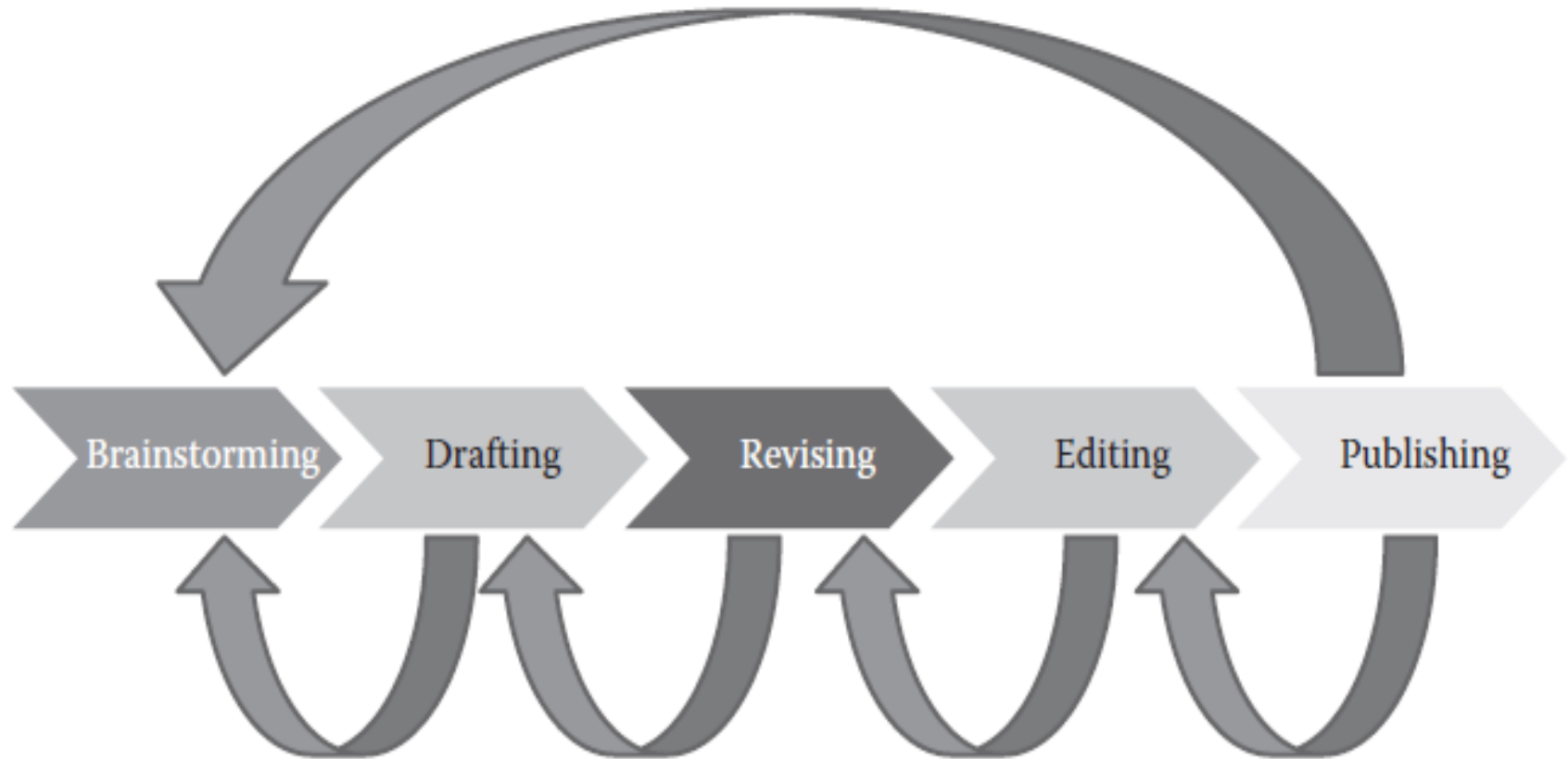
Some text referring the reference (Author Year)

- Reference list (for a conference)

Author(s) surname(s), Initial(s). (Year of publication). Title of article. Title of journal, volume number(issue/number, or date/month of publication if volume and issue are absent), page number(s).

Ref : Ref: <https://www.hup.harvard.edu/resources/authors/pdf/hup-author-guidelines-author-date-citations-and-reference-lists.pdf>

## 5.3. The Writing Process [Ref11]



Note that every step return to the previous step for improvements

## 5.3. The Writing Process [Ref1]

### 1. Brainstorming

- Brainstorming, sometimes called “prewriting,” is the process of recording your ideas on paper.
- Brainstorming could be done as a team or as an individual.
- The outcome of a brainstorming session would be a set of:
  - Ideas
  - Phrases to make you recall an event / conversation
  - Quotes
  - Pointers to other resources
  - Sketches
- In brainstorming, you should not worry about grammar or writing complete sentences or even the language.
- The importance is to dump what you have in your thoughts before it goes away.





## 5.3. The Writing Process [Ref1]

### Concept maps – A brainstorming tools



A brainstorming concept map for proposal to create a new technical department

- A concept map is a hierarchical representation of ideas showing the relationships from a central concept to various subconcepts and sub-subconcepts.
- Concept map can help to identify gaps in coverage
- When the diagram is substantially populated, you can use the nodes in the diagram as section headings, or subsection headings, and begin the draft writing phase.



## 5.3. The Writing Process [Ref1]

### 2. Drafting

- Drafting is the process of filling the content into the structure of the document.
- Output of the brainstorming session is used to build the structure, ideas, hints, points, references, etc.



Don't  
spend much time  
on grammar yet ...

## 5.3. The Writing Process [Ref1]

### 2. Drafting

- In drafting the document:
  - Need to write the document in the language you want the final document to be.
  - Need to write complete sentences, paragraphs around the topics identified.
  - Connecting paragraphs and logical flow of the document
  - Rearrange the content as appropriate
  - Identify new branches to carry on brainstorming.

Do versioning ...  
Keep backups ...

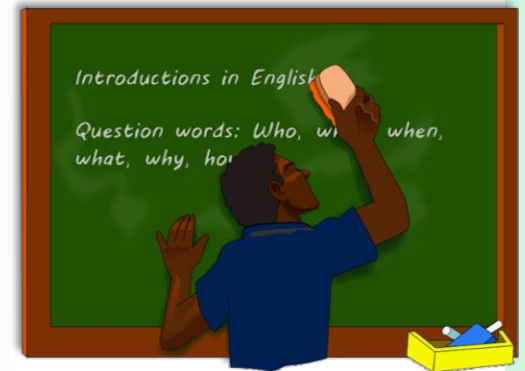


**Hint:** Do not delete content. Keep the removed content in an organized manner so that if you need it back later you can find it easily.

## 5.3. The Writing Process [Ref1]

### 3. Revising

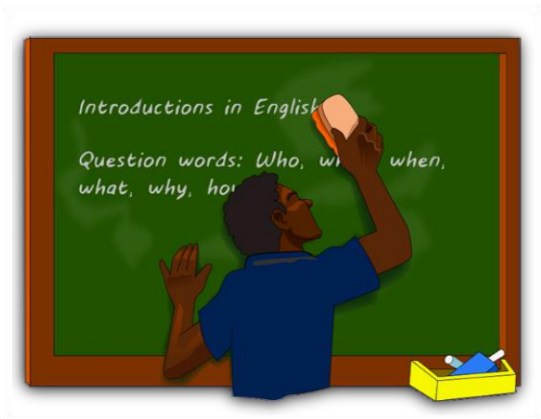
- Wait a few days before revising the document. Give some time for your mind to settle down.
- Be your own critical friend. Critically review your own writing.
- Expect the revised manuscript to be much shorter than draft
- Ask a friend to review your revised version.
  - Take criticism on your writing as an investment
  - At least find two critical friends who :
    - Has sound knowledge on the domain you write
    - Are not technical but has sound writing skills



## 5.3. The Writing Process [Ref1]

### Revising tools

- Use track changes feature of your word processor, don't directly edit the document.
  - You might change your mind later so make room for that.
- Take a printout and revise using a pencil or pen
  - Some prefer this for convenience
- Use sticky notes, or commenting features provided by the word processor
- Keep backups and backups of backups



## 5.3. The Writing Process [Ref1]

### 4. Editing



- At this stage you apply 5Cs
- Cross check references and citations.
- The writing may also be made more precise through word substitution and reduction.
- The fine points of presentation, grammar, and formatting are perfected.
- Content may be rearranged to fit the printing needs if applicable.

## 5.3. The Writing Process [Ref1]

### 5. Publishing

- Publishing is the finalization process for the document.
- It could be in digital form or printed form or both.
- If you are a student, publishing is akin to submitting your work to a professor, in that you have made your work permanent.
- In a professional setting, “publishing” means to deliver the document to some customer, manager, government, or peer where the document could be confidential.
- For books and articles, “to publish” is to make the final version publicly available.

