
UNIT 1 TECHNICAL WRITING: TECHNIQUES

Structure

- 1.1 Introduction
 - Objectives
- 1.2 Audience Analysis and Purpose Identification
 - 1.2.1 The Technical Person
 - 1.2.2 The Manager
 - 1.2.3 The General Reader
 - 1.2.4 Accommodating the Multiple Audience
 - 1.2.5 Identification of Purpose
- 1.3 Three-stage Process of Technical Writing
 - 1.3.1 Prewriting
 - 1.3.2 Drafting
 - 1.3.3 Revising
- 1.4 Technical Writing Style
 - 1.4.1 Choosing the Right Word and Phrase
 - 1.4.2 Sentence Structure and Length
 - 1.4.3 Using Headings and Lists
 - 1.4.4 Paragraph Structure and Length
 - 1.4.5 Maintaining Coherence within and between Paragraphs
- 1.5 Summary
- 1.6 Answers to SAQs

1.1 INTRODUCTION

Technical writing can be defined as writing about a technical subject, intended to convey specific information to a specific audience for a specific purpose.

The working world depends on written communication. Virtually every action taken in a modern organization is documented in writing.

- The average company has dozens of different forms to be filled out for routine activities.
- Expenditures over a specified amount require a brief report showing that the purchase is necessary and that the supplier from whom the purchase is sought to be made is offering a better deal than the competition.
- When a major project is being contemplated within an organisation, a proposal must be written to persuade management that the project would not only be feasible but also in the interest of the organisation.
- Once the project is approved and underway, progress reports must be submitted.
- In addition to all this in-house writing, every organisation must communicate with other organisations and the public. The letter is the basic type of format for this purpose. Inquiry letters, sales letters, goodwill letters, and claim and adjustment letters are just some types of daily correspondence. If a company performs contract work for other companies, then proposals and reports are again called for.

The world of business is a world of communication. If you can communicate well you are valuable to your organisation; if you cannot you are much less valuable. Scientists and engineers may be technically brilliant and creative, but unless they can convince coworkers and supervisors of their worth, their technical skills will be unnoticed, unappreciated and unused. If technical people cannot communicate to others what they are doing and why it is important, it is they and their technical skills that will be superfluous.

Objectives

After studying this unit you will be able to understand :

- the importance of audience analysis and purpose identification,
- the purpose of writing,
- the three-stage process of writing, and
- technical writing style.

1.2 AUDIENCE ANALYSIS AND PURPOSE IDENTIFICATION

The content and form of any technical document are determined by the situation that calls for that document i.e., by the audience and the purpose. Understanding the writing situation helps you to devise a strategy to meet your readers' needs and your own.

Once you have established the two basic elements of your writing situation you must analyze each before deciding upon the content that your document should include and form that it should take. The following four-step procedure will help you to analyze your audience effectively.

- Identify the uses the communication will have and the routes it will travel.
 - a Identify all of the possible audience, current or future, for a given communication.
 - Identify the concerns, goals, values, needs of the audience.
- Identify those arguments and approaches that will be most effective with the audience and try to anticipate any objections that might be raised.

As the above procedures suggests virtually every writing situation is unique. However, we may identify three types of audience :

- 1) The technical person,
- 2) The manager, and
- 3) The general reader.

1.2.1 The Technical Person

The term technical person is used to cover a fairly broad range of readers from the expert who carries out original research and writes articles for technical journals to the technician who operates equipment. In the middle of this range is the technically trained professional - the engineer, the biologist, the accountant - who analyzes and solves problems as they arise.

When you write for a technical person, keep in mind his or her needs. The expert feels quite at home with technical vocabulary and formulae. You can get to the details of the subject right away without providing the background. The middle level technical

person such as the engineer might need a brief orientation to the subject, unlike the expert; the engineer is always familiar with the theoretical background. The technician however needs schematic diagrams, part lists and step-by-step instructions to apply to a concrete task.

1.2.2 The Manager

The manager is harder to define than the technical person for the word 'manager' describes what a person does more than what a person knows. A manager makes sure that the organisation operates smoothly and efficiently.

Although it is difficult to generalize about the average manager's background, it is easy to identify his needs. Managers are mainly interested in getting the job done. When you write to a manager, try to determine his or her technical background and then choose an appropriate vocabulary. You will in all cases need to focus on the information the manager will need to carry out his or her job. For example, an engineer who is describing to the sales manager a new product-line that the research and development department has created will want to provide some theoretical background on the product so that the sales representatives can communicate effectively with potential clients. For the most part however the description will comment on the products capabilities and its advantages over competitors.

1.2.3 The General Reader

Occasionally you will have to address the general reader, sometimes called the layperson. Here you need to avoid technical language and concepts and translate. The layperson reads out of curiosity or self-interest, so use simple vocabulary and examples.

1.2.4 Accommodating the Multiple Audience

Half a decade ago, the need to address a multiple audience placed no heavy demands on the writer, because most managers were technical people, but this is not the case anymore. Moreover, because of the photocopier more people see written communication. If you think you might have a multiple audience, structure the document accordingly. For memos and reports include a preliminary section addressed to the manager and a detailed section addressed to the technical reader.

1.2.5 Identification of Purpose

Once you have analysed your audience-re-examine your general purpose in writing. Ask yourself 'What do I want this document to accomplish?' Think of your writing not as an attempt to say something but as a way to help others to understand it or act on it.

To come to a clearer definition of your purpose, think in terms of verbs. Try to isolate verbs that represent what you are trying to do and keep them in mind.

Communicating Verbs	Convincing Verbs
to explain	to assess
to inform	to request
to illustrate	to propose
to review	to recommend
to outline	to forecast
to authorize	
to describe	

The verbs can be used in clarifying the purpose of the document. e.g., "This report reviews the progress in the first six months of the heat-dissipation study."

1.3 THREE-STAGE PROCESS OF TECHNICAL WRITING

Many technical persons dislike writing and try to get over it as quickly as possible. The writing process described here will make writing easier because it breaks it down into smaller more manageable tasks.

1.3.1 Prewriting

This involves the following steps:

- **Analyzing** audience **and** purpose identification (has already been discussed in the previous section).
- e Brainstorming is a way of **generating** ideas. The process is to spend 15 - 20 minutes listing ideas about your subject as they come into your mind. You do not need to write full sentences, or impose any order on your thinking.
- Outlining involves refining this brainstorming list into a clear **and organised** plan. Creating an outline involves **three main** tasks.
 - i) Placing similar items together in a group.
 - ii) Sequencing items in the groups.
 - iii) Sequencing the groups.

You as a writer must constantly choose a pattern of development to use in developing **your** ideas. The analysis of your audience and your purpose is your best guide. There is no single approach to developing ideas. However, there are some standard patterns that usually work well in particular situations.

The following five patterns of development can be used effectively in technical writing:

- i) Chronological.(time)
- ii) Spatial
- iii) General to Specific
- iv) More important to less important
- v) Problems – methods – solution.

Chronological Pattern : This works well when you want to describe a process, give instructions on how to perform a task, or explain how something happens.

Spatial Pattern : In this pattern, items are **organised** according to their physical relationship to one another. The spatial pattern is useful in structuring a description of a physical object.

General-to-Specific Pattern : This arrangement is common in sales literature and reports intended for a multiple audience.

More Important-to-Less Important Pattern : This pattern is effective even in describing events or processes that would seem to call for a chronological pattern. For example suppose you were ready to write a report to a client after having performed an eight-step maintenance procedure on a piece of **electronic** equipment. A chronological pattern – focussing on what you did – would answer the following question : *What did I do, and what did I find?* A more important-to-less important pattern – focussing first on the problem areas **and** then on the no-problem areas – would answer the following question : *What were the most important findings of the procedure?* Most readers would probably be more interested first, in knowing *what* you found *than in how* you found it.

Problem-Methods-Solution Pattern : This is a basic pattern for outlining a complete project. Begin with the problem, discuss the methods you followed, and then finish with the result, conclusions, and recommendations. This is appropriate for reports after the work has been completed.

Here is an example of a topic outline in the problems-methods-solution outline. It was written by an engineer who had been asked by his supervisor to determine the best way to improve the efficiency of the temperature controls used in the space heaters manufactured by them. After explaining the reasons for wanting to improve the efficiency, he describes the technology the company currently uses. Next he describes his research on different methods of controlling temperature, concluding with the method he recommends.

<p>I. The Need for Greater Efficiency in Our Heaters</p> <p>1) Financial Aspects</p> <p>2) Ethical Aspects</p> <p>II. The Current Method of Temperature Control</p> <p><i>The Thermostat</i></p> <p>1) Principle of Operation</p> <p>2) Advantages</p> <p>3) Disadvantages</p> <p>III. Alternative Methods of Temperature Control</p> <p>A. <i>Rheostat</i></p> <p>1) Principles of Operation</p> <p>2) Advantages</p> <p>3) Disadvantages</p> <p>B. <i>Zero-Voltage Control</i></p> <p>1) Principles of Operation</p> <p>2) Advantages</p> <p>3) Disadvantages</p> <p>IV. Recommendation: Zero-Voltage Control</p> <p>Projected Developments in Semiconductor Technology</p> <p>Availability of Components</p> <p>Preliminary Design of Zero-Voltage Control System</p> <p>Schedule for Test-Analysis</p> <p>References</p>
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If the same outline were written in another format, i.e. sentence outline, this is how the part IIIA would appear:

<p>Temperature could be controlled by a rheostat.</p> <p>1. A rheostat operates according to the principle of variable resistance; adjustments to the rheostat would allow more or less current to flow in the heater by decreasing or increasing the amount of current in the line.</p> <p>2. The principal advantages of rheostats are that they are simple and reliable.</p> <p>3. The principal disadvantage of the rheostats is their size: a rheostat capable of controlling current in our 1,500 watt heater would have to be as big as the heater itself.</p>

A popular variation of the traditional notation system for signifying varying levels of headings is the decimal style :

- 1.0
- 1.1
 - 1.1.1.
 - 1.1.2
- 1.2
- 2.0 etc.

1.3.2 Drafting

A rough draft is a preliminary version of the final document. Some rough drafts are rougher than others. Many writers devise their own techniques for drafting, but the key is to write quickly leaving the revision to the next step. Your goal is to get beyond the "writers block" that can set in when you look down at a blank piece of paper. Write something it will be easy to revise later.

1.3.3 Revising

Some writers can simply read their drafts and instantly recognize all the problems in them; others devise comprehensive checklists so they will not forget to ask themselves important questions.

It would be useful if you do not revise your draft right after you have finished writing it. This will give you time to "forget" the draft and approach it as your readers will.

You can attempt revising in two stages.

- i) In the first stage concentrate on the largest issues, content and organisation. Recreate your outline by writing all your headings in a list. Perhaps in writing the draft you omitted a heading from your original outline. In the haste of drafting you might have added material that now looks irrelevant. If so, mark it. You might want to move it or omit it altogether. Look at the headings to see that the sequence is clear and logical : remember that you are trying to meet your audience's needs. If you now think that a different organisational pattern will work better, make the changes. Looking at your headings will also give you a sense of the emphasis you have given to the different topics in the documents. If a minor topic seems to be treated at great length, check the draft itself. Reread your draft also for accuracy. Have you provided all the necessary data? Are the data correct? Check them against your notes.
- ii) In the second stage, once you are satisfied that you have included the right information in the right order, revise for style.
 - a) Have you used the appropriate level of vocabulary for your audience?
 - b) Have you used a consistent terminology throughout and provided a glossary - a list of definitions - if any of your readers will need it?
 - c) Have you varied your sentences appropriately
 - a) are the sentences grammatically correct?
 - are there awkward constructions?
 - e) are the words spelt correctly?

Once you have revised your draft, give it to someone else to read. This will provide a more objective assessment of your writing. Choose a person who comes close to the profile of your eventual readers.

1.4 TECHNICAL WRITING STYLE

The word style as it is used here, encompasses word choice, sentence construction and paragraph structure. Technical writing, like any other kind of writing, requires conscious decisions – about which words and phrases to use, what kinds of sentences to create and how to turn these sentences into clear and coherent paragraphs.

Technical writing is meant to get the job done. The six basic characteristics of Technical writing that you need to bear in mind are:

- 1) **Clarity:** The written document must convey a single meaning that the reader can understand easily
- 2) **Accuracy:** The facts must be recorded carefully, objectively and without bias.
- 3) **Comprehensiveness:** The document must provide all the information the readers will need.
- 4) **Accessibility:** The readers should be able to locate the information they need easily
- 5) **Conciseness:** The document must be long enough to be clear but not a word longer.
- 6) **Correctness:** Good technical writing observes the conventions of grammar, punctuation, and usage, as well as any appropriate format standards.

1.4.1 Choosing the Right Word and Phrase

There are certain areas in which conscious choices need to be made :

- i) Active and Passive Voice
- ii) Person (of the Personal Pronoun)

There are two voices—active and passive. In the active voice, the subject of the sentence performs the action expressed by the verbs e.g., *Many physicists support the big bang theory.*

In the Passive voice, the subject receives the action e.g., *The big-bang theory is supported by many physicists.*

In most cases, the active voice is preferable to the passive voice. Active verbs make writing livelier and more personal. The active-voice sentence more clearly emphasizes the actor. It is shorter, because it does not require the *to be* verb and the past-participle as the passive voice sentence does. In the example above for instance, the verb is support rather than "is supported" and "by" is unnecessary.

The passive voice, however, is more appropriate in some cases:

The 'doer' is clear from the context :

e.g. Students are required to take both the courses.

The context makes it clear that the college requires that students take both the courses.

The doer is unknown :

The team for the World Cup has been announced.

The doer is unimportant :

The documents were hand-delivered this morning

To make something less hostile :

This bill has not been paid

is softer than

You have not paid the bill

In some cases reference to the doer is embarrassing, dangerous or in some other way inappropriate.

The best approach to the active-passive problem is to recognize how the two voices differ and use them appropriately.

Personal Pronouns

Organisations that prefer the active voice generally encourage the use of the first person pronouns. It is current practice to let the readers know there is a person behind the print. Besides being friendlier, 'I', 'You', and 'me' are also easier to understand. You should try to talk to the reader.

For instructions the most popular version is the second person in the imperative:

"Begin by locating the ON/OFF switch"

In the imperative style "you" is implied. Regardless of the preferred style, however, be consistent in your use of the personal pronoun.

Choosing the right words and phrases is of course very important. Here are seven basic guidelines for choosing the right word.

- **Be specific** : Use precise words, providing adequate detail and avoiding ambiguity.
- **Avoid unnecessary jargon** : Unnecessary jargon distances the readers and makes them feel inadequate. If you are addressing a technically knowledgeable audience, use appropriate jargon. It may be useful to add a glossary (list of definitions if the document may be read by non-technical persons).
- **Avoid wordy phrases** : Wordy phrases weaken technical writing by making it unnecessarily long. Here is a list of some of the most commonly used wordy phrases and their concise equivalents.

Wordy Phrase	Concise Phrase
A majority of	most
A number of	some, many
At an early date	soon
At the conclusion of	after-following
At the present time	now
At this point of time	now
Based on the fact that	because
Despite the fact that	although
Due to the fact that	because
During the course of	during
During the time that	during, while.
Have the capability to	can
In connection with	about, concerning
In order to	to

In regard to	about, regarding
In the event that	if
In view of the fact that	because
It is often the case that	often
It is our opinion that	we think that
It is our understanding that	we understand that
It is our recommendation that	we recommend that,
Make reference to	refer to
Of the opinion that	think that
On a daily basis	daily
On the grounds that	because
Prior to	before
Relative to	regarding, about
So as to	to
Subsequent to	after
Take into consideration	consider
Until such time as	until

- Avoid **cliches and pompous** words :

For example:

*The purchase of a computer **will** enhance our record **maintenance capabilities**.*

can simply be written as

*Buying a computer will help us **maintain** our records.*

Here is a list of some of the **most** commonly used fancy words and their plain equivalents:

Fancy Words	Plain Words
Advise	tell
Ascertain	learn, find out
Attempt	try
Commence	start, begin
Demonstrate	show
Employ	use
Endeavour (verb)	try
Eventuate (verb)	happen
Evidence (verb)	show
Finalise	end, settle, agree
Furnish	provide, give
Impact (verb)	affect

Initiate	begin
Manifest (verb)	show
Parameters	variables, conditions
Perform	do
Prioritise	rank
Procure	get, buy
Quantify	measure
Terminate	end, stop
Utilise	use

Avoid nominalisation :

e.g., *We had a discussion about the matter*

may be written as

We discussed the matter

An investigation of all possible alternatives was undertaken

may be written as

All possible alternatives were investigated

1.4.2 Sentence Structure and Length

The most commonly used sentence type in technical writing is the simple sentence because it is direct and clear. However, a series of simple sentences can bore and distract the reader. It would be useful to provide a variety of sentence types. Compound and complex sentences may be used to communicate more complex ideas. Similarly, using sentences of different lengths helps to make the writing more interesting. In general 15-20 words in a sentence is effective for technical writing. A succession of 10 word sentences would be too abrupt and choppy; a series of 35 word sentences may be difficult to comprehend.

The best approach to determining an effective sentence length is to consider the audience and the purpose.

Audience

The more readers know about the subject, the more easily they will be able to handle longer sentences.

Purpose

If you are writing a set of instructions or some other kind of information that your reader will be working from directly, short sentences are more effective. In addition, short sentences emphasise a particularly important point

1.4.3 Using Headings and Lists

Headings and lists though not unique to technical writing, are a major stylistic feature of reports, memos, and letters. For the reader, headings clarify relationships in a document. To signify the different hierarchical levels in headings in typewritten manuscript capitalisation, underlining and indentation may be used.

Like headings, lists help to the writer to manipulate the placement of the words on the page to improve the effectiveness of the communication. Many sentences in technical writing are long and complicated e.g.,

We recommend that more work on heat-exchanger performance be done with a larger variety of different fuels at the same temperatures, with special finds such as diesel fuel and shale-oil-derived fuels.

This sentence is easier to follow when revised as a list of bulleted items:

We recommend that more work on heat-exchanger performance be done with:

- *a large variety of different fuels at same temperature,*
- *similar fuels at different temperatures, and*
- *special fuels such as diesel fuels and shale-oil-derived fuels.*

In the latter version, the placement of the words on the page reinforces the meaning. Reports, memos and letters do not have to look 'formal' with sentences and paragraphs covering the whole page. Headings and lists make writing easier to read and understand.

1.4.4 Paragraph Structure and Length

The paragraph is the key unit of a composition. **As** you put your paragraph together focus on your readers' needs. Put the point—the topic sentence—up front. Technical writing should be clear and easy to read, not full of suspense. If a paragraph describes a test you performed on a piece of equipment, include the result in your first sentence. *The point to point continuity test on Cabinet 3 revealed no problems*—Then go on to explain the details.

The topic sentence in technical writing summarizes or forecasts the main points of the paragraphs. After the topic sentence, comes the *support*. The purpose of the *support* is to make the topic sentence clear and convincing. Because every paragraph is unique, it is impossible to define the exact function of the *support*. In general, however, the *support* fulfills one of the following roles:

- to define a key term or idea included in the topic sentence.
- to provide examples or illustrations of the situation described in the topic sentence.
- to identify the factors that led to the situation.
- to define the implications of the situation.
- to defend the assertion made in the topic sentence.

A length of 75 to 125 words will provide enough space for a topic sentence and four or five supporting sentences. Long paragraphs require concentration for longer periods and are more difficult to read.

The actual length of the paragraphs you write would depend on your analysis of the audience and the purpose of writing. You might need to write just 2 or 3 sentences in a paragraph written to describe a graphic aid. On the other hand a complex idea that requires 200 or 300 words should not be squeezed into one paragraph.

1.4.5 Maintaining Coherence within and between Paragraphs

In a coherent paragraph the ideas are linked together logically and clearly. You should express parallel ideas in parallel grammatical construction making the writing coherent by adding transitional phrases and words, repeating key words, and using demonstratives. Transitional words and phrases help your reader to understand your writing by pointing out the direction the thoughts are following. Here is a list of some common logical relationships between two thoughts and some of the common transitions that express those relationships:

Addition

Also, and, finally first (second etc.) furthermore, in addition, likewise, moreover, similarly

Comparison

In the same way, likewise, similarly

Contrast

Although, but, however, in contrast, nevertheless, on the other hand, yet

Illustration

For example, for instance, in other words, to illustrate

Cause-effect

As a result, because, consequently, hence, so, therefore, thus

Time or space

Above, mound, earlier, later, next, to the requisite, (left, next etc.) soon, there

Summary or conclusion

At last, finally, in conclusion, to summarize

Here are some sentences in which some of the above transitional words/phrases are used :

- 1) *So far*, we have dealt with space in two-dimensional horizontal plane; mainly to understand the footprint of activity in plan. *However*, space is a three-dimensional entity.
- 2) *Therefore*, in actual sense all the responsibility rests with the architect and engineer.
- 3) In cold climate, orientation of building for admitting sun's radiation is needed *while* it is not desirable in hot regions. *Similarly* winds can be desirable or undesirable.
- 4) In a house, *for example*, living room, bedroom, kitchen etc. may be termed as primary spaces.

SAQ 1

Underline the passive verbs in these sentences and replace all of them with actives, while preserving the meaning.

- i) The fact that the bridging of the gap presented engineering design problems was not appreciated by anyone at Reliance.
- ii) The passport was sent to you at the address on your application form but it was returned by the post office as undeliverable mail.

SAQ 2

In the following sentences unnecessary nominalisation has obscured the real verb. Revise the sentences to focus on the real verb.

- i) Pollution constitutes a threat to the Bharatpur Bird Sanctuary.

- ii) The switch from the current system to the microfilm can be accomplished in about two weeks.

SAQ 3

Rewrite and improve these wordy sentences. Make any changes you think necessary but don't change the meaning.

- i) The rental is payable in respect of each and every quarter.
- ii) Several directors meetings took place before they could reach a general consensus of opinion.

SAQ 4

The following sentences might be too long for some readers. Break each one into two or more sentences. If appropriate add transitional words and phrases or other coherence devices.

- i) In the event that we get the contract, we must be ready by June ~~with~~ the necessary personnel and equipment to get the job done. So with this end in mind a staff meeting, which all group managers are expected to attend, is scheduled for February 12.
- ii) Once we get the results of the stress tests on the 125-2 fibreglass mix, we will have a better idea where we stand in terms of our time constraints, because if it is not suitable we will really have to hurry to find and test a replacement by the Phase 1 deadline.

1.5 SUMMARY

It is very important for technical people to be able to communicate effectively.

The content and form of a technical document are determined by the situation that calls for that document **viz: The audience and the purpose.**

The three-stage writing process make writing easier because it breaks it down into smaller more manageable tasks. The stages are **Prewriting, Drafting, and Revising.**

Technical Writing style involves proper word choice, **sentence** construction and **paragraph** structure.

1.6 ANSWERS TO SAQs

SAQ 1

- i) No one at Reliance appreciated the **fact** that the bridging of the gap presented design problems.
- ii) ~~The~~ post-office returned the passport, **which** we had sent at the address on **your** application form as **undeliverable** mail.

SAQ 2

- i) The Bharatpur Bird Sanctuary is threatened by **pollution**.
- ii) We can switch from our current system to **the** microfilm in about two weeks.

SAQ 3

- i) **The** rental is payable for each quarter
- ii) The directors met several times before they could reach a consensus.

SAQ 4

- i) In the event that we get the contract, we must be ready by June 1 with the necessary personnel and equipment. Accordingly, a meeting of all group managers is scheduled for February 12.
- ii) We get the results of the stress tests on the 125-2 fibreglass mix. **Then** we will know where we stand in terms of our time constraints. In case it is not suitable we **will have** to hurry to **find** and test a replacement by the Phase 1 deadline.