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SECOND EDITION

Writing in the Technical Fields

A PRACTICAL GUIDE

THORSTEN EWALD

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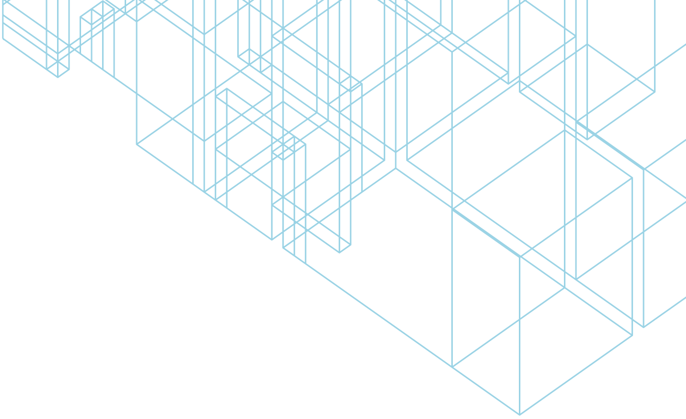

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I also need to thank the legions of students over the years who have inspired me and challenged me to do better and for whose benefit this text is intended. It's incredibly rewarding to be in constant contact with such dedicated, hard-working, and energetic young people. It is also very comforting; the future of Canada is in good hands, it seems to me.

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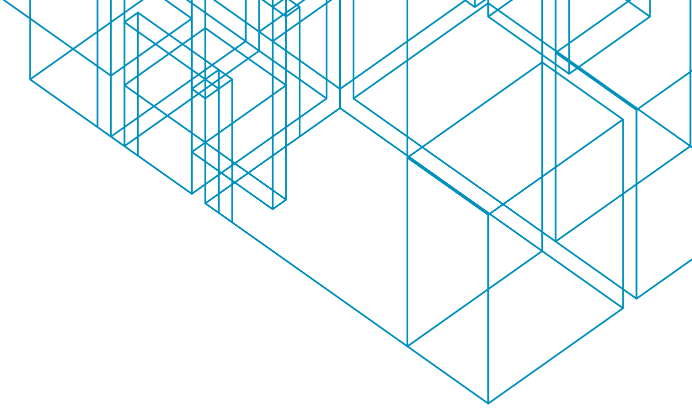


Introduction

Rationale for This Text

The education marketplace is pretty crowded with technical writing textbooks, so you are right to question why you should choose this one. This text has been created because, despite the numerous textbooks extant for first-year survey courses on technical writing, none really suited my course. I started to develop my own modules to send out to students and have now bundled them into a text in case they suit your course as well. There are several reasons why most other technical writing books haven't worked well in my courses.

First, I have found that technical writing textbooks are generally too big and too expensive. They might make good desktop references to accompany students through their professional lives, but they contain too many chapters and too much information for a two-term introductory technical writing course. This text is pared down.

Second, students find the writing of many texts overly formal. This formal tone discourages them from reading and makes it hard for them to absorb the information they require. It also seems out of step with the much less formal style of writing generally used (and deemed perfectly appropriate) in the North American workplace. This text also employs a lot of labelled graphics in place of long explanations—for instance, to demonstrate the layout of letters. This is hardly a unique approach, but it is helpful.

Third, many technical writing textbooks don't show students how to actually achieve results on the page: for instance, how to use Word properly to format text, insert citations, and the like. It's always surprising how little facility some students have with word-processing software, despite their expertise with smartphones and their inventive use of the Internet to shortcut their homework.

This text does one more thing. You've probably found that students have little trouble copying the formatting of documents and can usually be taught how to select content and how to sequence it. What they consistently have trouble with is the writing itself. They struggle not so much with the macro-design of documents, but with clear expression. They are self-conscious about their writing, fearful of speaking incorrectly on the page, and end up writing strangulated, stilted, awkward sentences and choppy paragraphs—to a large extent because they think that writing needs to be difficult. But of course, it doesn't.

On the other hand, once we get beyond those grating "It was, like, OMGs" and "Oh shut ups!," you've probably discovered that many students are well able to construct clear sentences and fluid paragraphs—when they are speaking. This text attempts to harness that natural communication ability and transfer it to the students' writing. Given that goal, it contains two substantial chapters on writing (Chapter 2 on sentences and Chapter 3 on paragraphs). These can be incorporated into the course and lecture material or just assigned as home study. Instructors can access additional writing exercises for both chapters online. And throughout, as mentioned, the text models a casual yet clear and effective writing style that is less intimidating and easier to emulate than that of many other texts.

Technical writing is first and foremost practical writing, and it is a change agent. Its purpose is to convey information required by a specific reader in a specific situation as briefly, clearly, and simply as possible so that the reader can perform whatever follow-up task may be required. This text attempts to model that practicality. It is an introductory text for students in a technical field who are getting their first exposure to technical writing. It can't be all things to all people, especially considering its compact size and targeted price point, but I hope it will help you in the design of your technical writing course.

Thorsten Ewald
Pragmatist

Introduction to the Second Edition

Surprisingly and gratifyingly, this text has sold well enough to warrant a second edition. Unsurprisingly, but equally gratifyingly, instructors who have adopted the text and reviewers offered the opportunity by the Oxford University Press have provided suggestions for improvement. I have tried to please.

This second edition of *Writing in the Technical Fields* embraces two major improvements and a number of smaller ones. The first major improvement is that many of the chapters now contain more writing exercises that students can access directly without instructors having to print out and photocopy the materials from the website—or download and display them on screen. This will make classroom prep that much easier and will enable instructors to assign exercises as homework to accompany the reading. Dastardly, but effective.

To benefit instructors who have been using the exercises from the website, we have promoted many of those exercises to the textbook; this means that returning instructors will be familiar with them and won't have to do as much prep. However, we have also included a slew of additional exercises and answer keys on the new, improved, and expanded website. See for yourself whether I'm overpromising.

The second big change—or series of changes that add up to a big change—is that we've included subjects that instructors found missing in the first edition and were forced to teach without textual support; this includes a more thorough description of the use of headings, expanded information on copyright, and a sample functional résumé, to name but a few. I have tried to fill all the gaps in the original text.

In addition, I've made a large number of small textual changes to sharpen the clarity of the writing and to enhance the students' comprehension.

You will already have noted the new layout, colour scheme, and cover page.

I'm very pleased with the way things have turned out and hope that you will be too. I also sincerely hope, however, that if, or when, you find more things to improve, you will let us know. I want this text, perhaps by the third edition, to offer precisely the assistance that you would like in your classroom.

The Chapters in Detail

Chapter 1: Why Technical People Needn't Fear Writing

Chapter 1 introduces the notion that technical writing, though not easy, doesn't have to be hard. It stresses that we all have natural communication abilities that we can harness if we don't get too scared of the empty page and freeze up. It introduces the notion of a natural, flowing, conversational writing style and explains how the planning and editing cycles can help to achieve such a style. Many texts prefer to describe the planning and editing of documents in chapters dealing with formal reports. The point that this chapter makes is that all writing benefits from a bit of forethought and that all documents require some editing. However, when we are actually writing, we should imagine ourselves sitting across the desk from our readers and write more or less the way we'd speak to them—without the F-bombs, of course.

Chapter 2: Technical Sentences

Chapter 2 describes how to create concise, clear sentences by focusing on a short checklist of common errors. The point is not only to get students to look for and correct these errors—for example passive voice, weak expletives, nominalization, low-content expressions—but also to emphasize that writing well is a craft that can be mastered by technical people. Who better, after all, to apply checklists and work to a standard? The end of the chapter offers exercises with examples from multiple disciplines, the answer keys to which, as well as additional exercises, are on the companion website.

Chapter 3: Technical Paragraphs

Chapter 3 applies the same principles as Chapter 2, but to the marshalling of sentences into fluid and coherent paragraphs. It provides guidelines and a structured approach to building paragraphs, as technical students tend to respond to this approach. These rules obviously don't instantly create great writers, but if followed, they will instantly improve most students' writing. The end of the chapter offers exercises with examples from multiple disciplines, the answer keys to which, as well as additional exercises, are on the companion website.

Chapter 4: Parallelism, Lists, and Layout

Chapter 4 begins by describing parallelism in sentences before moving on to lists. It makes clear that lists are a convenience for the reader, not the writer, and that they are a way to draw attention to important information, not an excuse for sloppy point-form paragraph development. This chapter also describes how headings and lists function as navigation aids to help readers find key information.

Chapter 5: Routine Correspondence

Once students have learned the building blocks of technical writing—sentences, paragraphs, and lists—they are ready to put them together into technical documents. Chapter 5 covers routine letters, memos, and emails. It makes the point that correspondence takes our stead because we can't always be there to speak to the reader in person. However, as already noted, we should think of ourselves as sitting across the desk from the reader, and in most situations, we should write in that same tone—at least for our first draft. This will make the text flow more naturally and will make the writing much easier.

Chapter 6: Technical Reports and Documents

Chapter 6 is light on textual explanation, letting the examples with extensive labels and captions do the talking. The focus is on seeing reports as logical structures that help us achieve specific purposes and on understanding that form follows function, another notion that plays to the strengths of technically minded people.

Chapter 7: Formal Reports

Chapter 7 describes how any report, if it is sufficiently long, may be formally dressed. But the purpose of this formality is not primarily to impress with good manners, but to enable the reader to navigate a document easily and find necessary information quickly. This chapter explains the formal report from a reader's perspective. It also explains how to use Word to do some of the necessary formatting.

Chapter 8: Intercultural Communication, Collaborative Writing, and Document Control

Chapter 8 describes how to write in teams, from planning to group writing to creating a unified voice. One of the difficulties of working in groups is keeping track of all group members' input and making sure their writing and editing don't get confused. This is the essence of document control. Today's students have more intercultural experience than any previous generation; they are accepting, generous, and open. But a few points on intercultural communication are still worth making, particularly given the internationalization and localization of technical writing in an increasingly globalized economy and problem-solving environment.

Chapter 9: References and Citations

Chapter 9 is a pretty standard guide to providing references and citations, and it gives the standard explanation of why they're necessary. This chapter chooses as its focus the numerical citation method frequently used by engineering and scientific organizations. It explains that many different forms of citation are possible and that the one to use will depend on the preferences of instructors, bosses, professional organizations, and publishers. It also demonstrates how most citation methods assigned can be employed using Word's References tools or online citation engines.

Chapter 10: Technical Graphics

Chapter 10 is short, pithy, and, quite appropriately, graphic. It demonstrates what sort of graphics best convey what sort of information, and how to use Word to create, insert, and embed those graphics. It also describes some of the common ways in which graphics can misrepresent information, by accident or design.

Chapter 11: Job Application Packages

Chapter 11 describes how students should create the sort of résumés and application letters that will help them leave the academic nest successfully. To be effective, résumés must work for all three stages of the selection process: the glance, the scan, and the read. Application letters require more than just persuasive information; they require a persuasive style that helps potential employers visualize the student as the sort of hard-working, dependable, talented, long-term employee on whom they'll take a chance. Some samples demonstrate how to achieve this.

Chapter 12: Technical Definitions and Descriptions

Chapter 12 helps students write technical definitions in three lengths and levels of detail (parenthetical, formal, and extended) and to plan and craft audience- and context-appropriate mechanism and process descriptions. The focus, as ever in this text, is on plentiful examples with helpful annotations.

Chapter 13: Instructions, Procedures, and Manuals

Chapter 13 helps students keep their instruction steps concise, simple, and sequential. It also helps them remember to put the notes, cautions, warnings, and danger alerts in the right places. Because students are unlikely to have to write a full manual in a first-year technical writing course, this chapter provides only a brief discussion of how manuals combine a series of instructions and/or procedures into a comprehensive document.

Chapter 14: Oral Presentations

Chapter 14 was left to the end not so much because students hate it the most, but because oral presentations are often the last assignment in a technical writing course, in conjunction with the term-end formal report. This chapter provides practical information on how to organize oral presentations, how to sequence slides, and how to create proper transitions between sections. It shows how to use PowerPoint to create "progressive reveals" of text or graphics and provides easy-to-follow (or at least understand) tips on how to stand and deliver.

Appendix A: Punctuation and Grammar

Appendix A provides an overview of the most common grammatical mistakes made by students and uses examples and explanations to help students correct them. These errors are arranged alphabetically so that instructors can note them in the margins of students' papers and expect students to find the error and learn to correct it.

Appendix B: Mechanics and Conventions

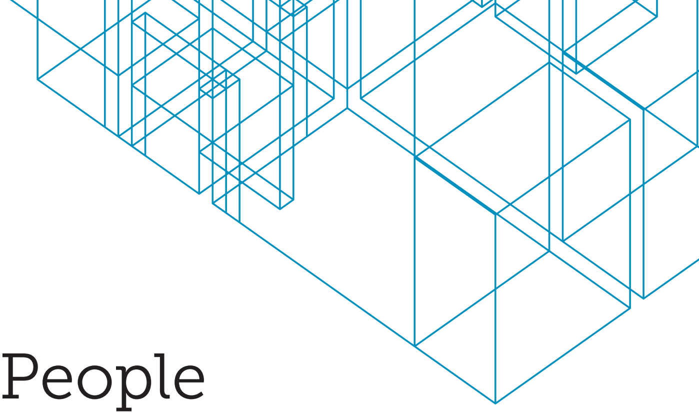
Appendix B does the same as Appendix A, but for mechanics rather than grammar. It includes some technical mechanics, such as Latin numerical prefixes, the proper use of degree symbols for different temperature scales, and so on.

Appendix C: Ethics

Appendix C provides a brief overview of the importance of ethics in general, touches upon ethical requirements for students and professionals, and describes how ethics apply to technical writing. It's not intended that this appendix turn sinners into saints, but merely that it create a better understanding of the topic and stimulate some discussion.

Glossary

The glossary is an alphabetized collection of frequently confused or misused words, such as "affect" vs. "effect," "all ready" vs. "already," and "continual" vs. "continuous." It is intended as a place to which instructors can refer students when they encounter these common mistakes in the students' writing. As such, it should save instructors from having to write lengthy explanations in the margins. This section is also intended to be enjoyed if read on its own, believe it or not.



Chapter 1

Why Technical People Needn't Fear Writing

In this chapter we'll introduce the practice of writing in the technical workplace in four easy parts:

- Writing in the Technical Workplace
- Why Technical People Can Master Technical Writing
- Attributes of Technical Writing
- The Writing Process.

You probably chose a technical field because you want to make the world a better place in some small, practical, technical way. Perhaps you'd like to design buildings or mechanical systems; perhaps you're thinking of developing medical technologies or sustainable practices. Maybe you have a hunch about a better mousetrap. What appeals to you in any case is the idea of making real change in the real world and seeing the results of your labours. What you probably don't want to do is write about it.

Unfortunately, there's just no getting away from writing in the technical workplace because you'll never work in perfect isolation, and where there's a need to communicate, there's a need to write. But this needn't worry you. Writing is a technical skill, not a gift, and this means that as a technical person, you are actually in an enviable position when it comes to learning to write well, regardless of what your high school English teacher may have said about your writing.

Writing in the Technical Workplace

The Extent of Writing in the Technical Workplace

Writing is a constant in the technical workplace because nothing can happen without communication. Every project you work on—and you may be working on several at a time—involves teams of people, often dispersed across offices, cities, or even countries. And every step of every project requires documentation. For instance, the extension of one of the light rapid transit (LRT) lines for the City of Calgary required a request for proposals (RFP) of over 700 pages. A primary engineering firm in Vancouver produced the RFP in collaboration with a series of subcontractors.

If you had been a civil engineer working on the RFP, you would have been communicating constantly with peers in your group to coordinate activities and workflows and to verify or distribute information. You would also have been communicating with subcontractors responsible for writing different sections of the RFP, with surveyors in Calgary, with the City of Calgary Engineering Department, and with a host of other stakeholders, as they are called. At the same time, you might have had to write progress reports to management within your company and to the client, to write employee evaluations for team members, or to help with the selection of subcontractors, recording your deliberations and decisions in writing.

Before the RFP was awarded to your firm, you might have been involved in the process of securing the work, also mostly in writing because there always has to be a paper trail proving due diligence.

Once the RFP was posted, it drew competing proposals from a number of engineering companies vying to design and build the LRT extension according to the specifications laid out in the RFP. Those proposals all ran to several hundred, if not a thousand, pages, all written at great effort. When one proposal was selected, meaning that the rest were written in vain, the selection committee had to write a report to justify the choice, again to prove due diligence.

When construction started, the engineers overseeing the project kept a project log and wrote regular inspection reports, progress reports, quality test surveys, engineering change orders, traffic pattern alteration requests, environmental assessment reviews, and innumerable other documents required by the city, various ministries, managers, employees, and so on—probably enough documentation to fill the site office from top to bottom, front to back.

This is why technical professionals in all fields spend between 20 and 40 per cent of their time communicating in writing on the job. A couple of hours per day might be spent on email alone. And the higher up you move in your organization, the more time you'll spend writing and managing instead of designing and doing calculations. For a sampling of engineers' and software designers' discussions about the role and importance of written communication in their workday and the proportion of time it takes, go to http://www.embeddedinsights.com/channels/2010/08/04/how-much-of-an-engineer's-job-is-writing. You might be surprised. Hopefully, you won't be dismayed.

The Cost of Poor Communication in the Technical Workplace

Poor communication at any stage of a project is very costly. In fact, a proposal that took a team of engineers and support staff weeks to put together at great cost to their employer might fail not because it doesn't meet the specifications of the RFP, but because it is vaguely written and difficult to understand. In other words, it may fail not because of flaws in the engineering design, but because of the way it's written. Indeed, according to a web poll by the Computing Technology Industry Association (CompTIA), poor communication is the reason most IT (information technology) projects fail (1).

But aside from its role in the failure of whole projects, poor writing also wastes time and causes frustration in daily communication. Poorly worded emails require lengthy discussions or a chain of emails to clarify what should have been clear on first reading. Alternatively, a misunderstanding due to a badly written email may cause the reader to waste time going down the wrong trail and then later have to redo work.

Often an email's tone is incorrectly perceived, simply because body language cannot be analyzed and tone of voice cannot be perceived; this can cause hurt feelings, ill will, and inaction. That inaction, whether caused by an inappropriate tone or unclear meaning, means that your good ideas or requests for information or maybe even your dire warnings may be ignored (2). Corporate officials for BP have admitted, for instance, that the Deepwater Horizon catastrophe in 2006 occurred because emails warning of the impending problem were ignored (3). Eleven workers died in the subsequent explosion, the rig sank, and the environmental damage to the Gulf of Mexico and its coast is incalculable. Health effects may be felt for decades. All because of ignored emails.

Why Technical People Can Master Technical Writing

Technical Writing Isn't Like Literary Writing

However, if writing was not your strong suit in high school and if literature and romantic poetry are not among your passions, don't despair. What makes technical and business writing effective is not the same as what makes literary writing soar. Technical writing is a simple, stripped-down tool designed to get the job done, and that's to convey information to people who need it. It's not meant to be fancy. It's meant to be clear and effective.

This is not to suggest that writing well is easy. Like any craft, it requires discipline, conscious effort, and some practice. But it doesn't require a natural gift for wordplay or perfect linguistic pitch. Instead, learning to write well actually plays to the strengths of technical people. As a technical person, you should be good at working within structured systems that follow rules and guidelines. You are used to working to specification and to applying rules and best practices consistently.

Whether you are designing a building, an electrical system, a hydraulic system, or a septic field; whether you are coding software or websites or creating a user interface, you do not rely on inspiration or make sacrifices to the gods. Rather, you work according to a set procedure, following guidelines and rules, using previous designs as a launching point. You focus on usability and practicality; you don't add needless embellishments or take poetic licence. In fact, the most elegant engineering solutions are invariably the simplest.

IN THE FIELD

Tom Gilchrist, Subsea Technologist and Technical Writer

Technical communication has been a common theme through most of my career. Long before calling myself a technical writer, I worked in the subsea technology field with saturation diving systems, atmospheric diving suits, robotic vehicles, and deep-diving manned submersibles. This complex work required reference to a wide variety of technical documentation, and I was surprised at how much of it was inadequate and poorly produced. Manuals sometimes seemed to be an afterthought to the products themselves, even in that demanding environment. I spent considerable time updating documentation to reflect our actual hardware configurations. I did not have formal documentation training at the time; I just did what seemed to make sense, based on the need.

Following my subsea career, I was a customer-support engineer with an electrochemical fuel cell company. Technical communication was an essential and significant part of my role there as well, requiring report writing, technical specification development, business proposals, test procedures, data analysis, and much more. In many cases, English was a second language for my customers, which meant that conveying technical concepts clearly and simply was particularly important. I completed a technical writing program at a local university in order to establish a definitive foundation for my expanding communication role.

Understand the subject matter; a good writer with a strong technical background is a rare combination. Understand your audience; consider their perspective. Imagine doing their job and try to anticipate the information they need to perform the task or understand the data you are describing. Pay attention to technical accuracy and simplify the language. Use clear illustrations; ensure photographs print cleanly. Format consistently; make the document look good—people do in fact make judgments based on appearance.

Originally trained as an engineering technologist and commercial diver, I have been self-employed as a technical writer since 2002. I draw on my former experience to provide documentation services to the subsea engineering and fuel cell technology fields, among others.

Technical writing functions exactly the same way. This textbook will present a few rules that you need to follow and will introduce a number of guidelines and principles that you can adapt to specific writing situations. Initially, you may have to make a conscious effort to apply them. But with a little discipline, these rules and principles will become automatic and you'll find your writing improve not only in quality, but also in ease. You'll write more quickly, more confidently, and more clearly.

You Already Know How to Communicate Well

There's another reason you'll find it easy to learn to communicate well in writing: you already know how communication works; you speak to people much of the day; you read magazine articles, newspapers, blogs, and websites; you watch the news in the evening; and occasionally you even read assigned texts for school. You know what works; you know what sounds good and what doesn't, what creates clarity and what gets in the way. Now you just need to develop the habit of thinking like a reader and always asking yourself, "Would this be clear to me if I came across it for the first time and didn't already know what it meant to say?"

Attributes of Technical Writing

Documents are tools used to convey specific information. Like any tool, each technical document is fashioned uniquely to achieve its purpose. There are, however, a number of attributes that all technical writing shares.

Technical writing must be

clear: it must be understood by readers the first time they read it, without any ambiguity or possibility of misunderstanding.
complete: it must provide all the information the reader will need in order to understand the situation and the follow-up required.
concise: it must be as brief as possible while remaining clear and complete. The more words you take to say something, the longer it takes to read and the more verbiage there is in which readers may lose their way.
accessible: it must be organized and formatted so that readers can find the specific information they require without having to read the entire document.

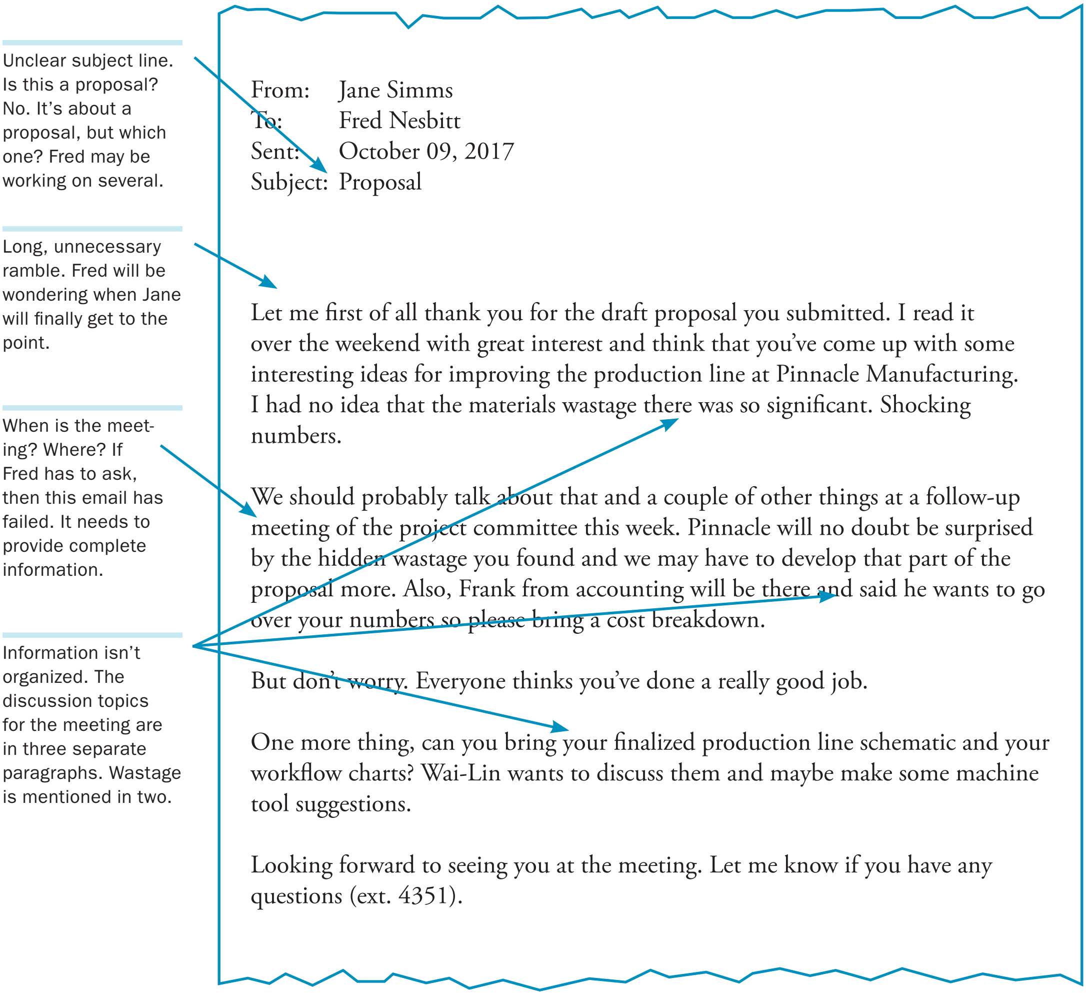
In addition, of course, technical writing like all writing must be completely free of grammatical, mechanical, and factual errors. Grammatical errors can lead to misunderstandings and will, like mechanical errors, make you look unprofessional. Factual errors will make you look not just unprofessional, but incompetent.

Take a look at the examples of poor and good writing in Figures 1.1 and 1.2 and see how these attributes apply.

The main idea comes much too late in the first email, and the information is not clearly organized. The most important information in the document—the topics to be discussed at the meeting, for which Fred will have to prepare—is not easy to find. Some necessary information, such as the meeting time and place, are omitted completely.

The second email is far better. Even though, like the first, it takes the time to give Fred credit for work well done and has a friendly close, it is only 90 words long, compared to the first email's 174. In other words, the second email is virtually half as long, yet it contains more useful information, specifying, for example, a meeting time and place. This email has the virtues of conciseness and completeness.

It's also a far better work tool. It groups all the discussion topics for the meeting together and highlights them by creating a bulleted list. This list makes the key



From: Jane Simms
To: Fred Nesbitt
Sent: October 09, 2017
Subject: Proposal

Let me first of all thank you for the draft proposal you submitted. I read it over the weekend with great interest and think that you've come up with some interesting ideas for improving the production line at Pinnacle Manufacturing. I had no idea that the materials wastage there was so significant. Shocking numbers.

We should probably talk about that and a couple of other things at a follow-up meeting of the project committee this week. Pinnacle will no doubt be surprised by the hidden wastage you found and we may have to develop that part of the proposal more. Also, Frank from accounting will be there and said he wants to go over your numbers so please bring a cost breakdown.

But don't worry. Everyone thinks you've done a really good job.

One more thing, can you bring your finalized production line schematic and your workflow charts? Wai-Lin wants to discuss them and maybe make some machine tool suggestions.

Looking forward to seeing you at the meeting. Let me know if you have any questions (ext. 4351).

Unclear subject line. Is this a proposal? No. It's about a proposal, but which one? Fred may be working on several.

Long, unnecessary ramble. Fred will be wondering when Jane will finally get to the point.

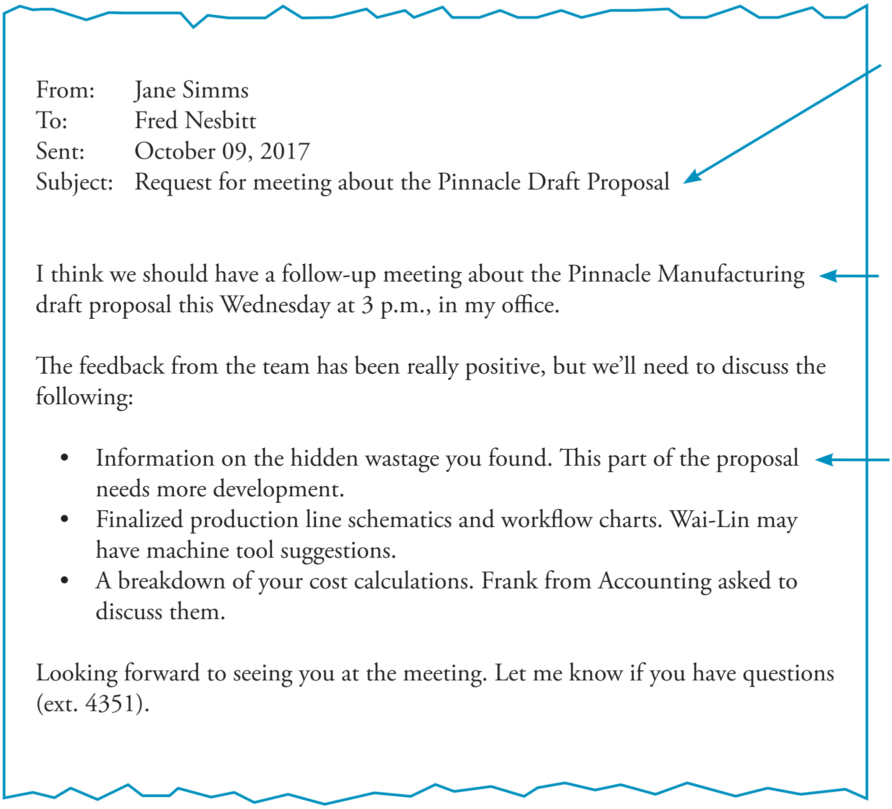
When is the meeting? Where? If Fred has to ask, then this email has failed. It needs to provide complete information.

Information isn't organized. The discussion topics for the meeting are in three separate paragraphs. Wastage is mentioned in two.

FIGURE 1.1 **Badly written and poorly organized email.** Note how unhelpfully the information is structured. And when is the meeting? The email doesn't say. Read the subject line and ask yourself whether it accurately describes the contents of the email. Does the email actually contain a proposal?

information—the information that Fred will have to work on before the meeting—easy to find and easy to work with. In other words, this email makes information accessible.

Throughout this text and throughout the course, you will be exploring concepts and developing skills to enable you to write the second kind of document, the kind that helps your colleagues to quickly understand useful information and to use it to perform necessary tasks—no more, no less.



From: Jane Simms
To: Fred Nesbitt
Sent: October 09, 2017
Subject: Request for meeting about the Pinnacle Draft Proposal

I think we should have a follow-up meeting about the Pinnacle Manufacturing draft proposal this Wednesday at 3 p.m., in my office.

The feedback from the team has been really positive, but we'll need to discuss the following:

- Information on the hidden wastage you found. This part of the proposal needs more development.
- Finalized production line schematics and workflow charts. Wai-Lin may have machine tool suggestions.
- A breakdown of your cost calculations. Frank from Accounting asked to discuss them.

Looking forward to seeing you at the meeting. Let me know if you have questions (ext. 4351).

Clear, unambiguous subject line. Fred knows exactly what this email is about: a meeting. And he knows exactly about which proposal.

The opening statement identifies the purpose of the document. It immediately conveys the main idea.

The discussion topics are not just grouped, but also listed, forming a handy checklist that Fred can refer to and make notes against as he prepares for the meeting.

FIGURE 1.2 Properly written and well-formatted email. Note how easy it is to find relevant information. This email is half as long but contains more useful information, like a suggested time and place for the meeting. The list of discussion topics will help Fred prepare for the meeting. The clear subject line will help him find this email in his congested inbox every time he needs to check the list of discussion topics as he prepares for the meeting.

The Writing Process

So how do you go about crafting a concise, clear, and accessible professional document? In any writing situation, whether your document is short or long, formal or not, you should begin by thinking about what you hope to achieve with your document (its purpose) and to whom you are writing (the reader).

Determine the Purpose

If there's no reason to write, don't. But if you need to accomplish something by writing, be absolutely clear on what it is you hope to accomplish. Generally speaking,

> *"Perfection is finally attained not when there is nothing left to add, but when there is nothing left to take away."*
>
> —Antoine de Saint-Exupéry

you're trying to inform readers or trying to get them to do something. Often we combine these goals, as when you inform someone of an incident or circumstance and then ask them to perform or authorize an action in response. For instance, you may send your construction manager an email informing him or her that your pump broke and that you've purchased a new one, attaching a copy of the invoice. Or you may have to ask for approval to spend the money if it exceeds a certain amount. Your purpose in the latter case would be to obtain permission as quickly as possible to purchase a new pump.

Consider the Audience

The audience is the person or people to whom you're writing. If the audience is intimately familiar with the details of your project, you won't have to provide as much context. If the audience is a fellow techie, you won't have to define your terms. If your audience doesn't like to pinch pennies when it comes to necessary equipment, you don't have to do much persuading. However, if your audience is a penny-pinching accountant with no real understanding of construction practices, you may have to explain why replacing the pump is necessary given the hydrology of your site, even if it runs counter to the accounting department's every miserly instinct. Of course, you'll also have to explain hydrology in layperson's terms.

This is how audience and purpose define the content of documents. Ask yourself before you set pen to paper (or fingers to keyboard) what this particular reader will need to know and need to be told so that he or she understands what you're saying and will agree to what you're asking.

While every writing situation is unique, it is generally useful to think of audiences as falling into a few broad categories: decision makers, experts, agents, and general readers.

Decision Makers

Decision makers such as managers and supervisors, even if they come from a technical background, are often removed from the technical details of a project, their responsibilities being finance, policy, and administration. Managers are generally overwhelmed with correspondence, reports, and meetings, so they appreciate brief summaries to get the gist and clear context to figure out how your document fits into their business considerations as a whole. They may require definitions of technical terms. They will definitely want to know what you consider to be the most likely outcome of whatever you are recommending.

Inasmuch as managers tend to be the people who decide whether your document gets turned into action, it is their information needs that you need to consider most strongly.

Experts

Technical experts have a thorough understanding of the technical details of your report. They require detailed technical information and helpful tables and illustrative figures. Often they are the only ones who will look at the supporting information in the appendices. They are able to check your calculations and question your conclusions.

Busy managers often have their engineers, accountants, and other experts advise them on technical considerations, and thus experts often influence decisions even when they don't have decision-making responsibility.

Agents

Agents are the readers who will be directed to carry out the actions described in your document, such as machine operators, field technicians, office staff, laboratory workers, installers, or sales staff. They require clear organization so that they can find the directions they are to carry out, as well as clear instructions or procedures so that they can follow your directions without having your technical expertise. They will also always appreciate a clear explanation of why changes are necessary and how they will affect—and preferably improve—the agents' workdays.

General Readers

General readers, or lay people, have the least amount of technical expertise and are generally outside your organization: for example, citizens reading a report on the effects of an LRT extension on the environment, noise levels, traffic patterns, and so on in their neighbourhood. General readers need technical terms to be defined, they benefit from frequent graphics that illustrate basic technical concepts, and they appreciate descriptions of how the content of the document (the proposed LRT extension) will affect—and preferably benefit—them. They will need technical terms defined. On occasion, general readers can be decision makers, for instance, if they are clients or community members who have a chance to vote on your proposal.

Brainstorm the Content

With your purpose and audience clearly in mind, start brainstorming. At this stage, you're simply jotting down all the information that may be relevant and useful to the reader, in no particular order. Just put down ideas and elaborate on them a little.

You could use various worksheets available online, the back of an envelope, or, most efficiently, your word processor.

Organize the Content

Once you're satisfied that you've got all the information that you'll need to include in your document, begin to organize it. You don't need to rewrite it; save yourself some time by just numbering the items you've already written and drawing lines to