Technical Writing Essentials (Expanded 2nd edition)

Technical Writing Essentials (Expanded 2nd edition)

Designing Professional Communications in the Technical Fields

SUZAN LAST

UNIVERSITY OF VICTORIA
VICTORIA, BRITISH COLUMBIA

Exceptions:

- S.1. Excerpt from T. Wells, *Scientific Sailboat Racing*, New York: Dodd, Mead, and Co., 1950, pp. 94-96. *This book is out of print, and every attempt has been made to locate the copyright owner. For noncommercial, educational use only.*
- Fig. 1.5.1. Tufts University. "The Engineering design process". *Every attempt has been made to locate the copyright owner. For noncommercial, educational use only.*
- Fig. 3.4.1; 3.4.2. EPCOR, Edmonton's Water Utility. "Water Consumption in Edmonton during 2010 Gold Medal hockey game". *This data is credited to EPCOR. Publication details of the originating report are unavailable. For noncommercial, educational use only.*
- Fig. 5.2.1. *Cover images from journals are used to illustrate difference between popular and scholarly journals, and are for noncommercial, educational use only.*
- Fig. 5.2.2. DeSmog Blog. "Why climate deniers have no credibility — in one pie chart". *For noncommercial, educational use only.*
- Fig. 5.3.1. "Concept map for refining a topic on climate change". *Every attempt has been made to locate the copyright owner. For noncommercial, educational use only.*
- Fig. 7.4.1. Thumbnail cover of R. Sturnback and M. Okuna, *Star Trek: The Next Generation: Technical Manual*. New York: Pocket Books, 1991. *For noncommercial, educational use only.*

If you have any questions about the above, please contact press@uvic.ca

Cover image: *Sailboat*, photographer Suzan Last

This book was produced with Pressbooks (https://pressbooks.com) and rendered with Prince.

Contents

2. PROFESSIONAL STYLE

3. INFORMATION DESIGN

8. PUBLIC SPEAKING

APPENDICES: Academic Writing Basics

Land Acknowledgement

Technical Writing Essentials is a collaborative effort of many folk, most of whom work at the University of Victoria in British Columbia, Canada. The University of Victoria's campus is located on the traditional lands of the Coast Salish Peoples. Many of the contributors are settlers here, and we acknowledge with respect that we do our research, writing, and teaching on the traditional territories of the Lək̓ʷəŋən (Songhees and Xʷsepsəm/Esquimalt) Peoples on whose territory the university stands, and the Lək̓ʷəŋən and W̱SÁNEĆ Peoples whose historical relationships with the land and waters continue to this day. We also acknowledge our responsibility to seek and learn from opportunities for truth telling and reconciliation, and the need to engage in the ongoing work of decolonizing our campus community both inside and outside the classroom.

Acknowledgements

This work, first and foremost, has been a student-driven endeavour. Over the years, numerous students have requested an open, online resource, and have presented compelling arguments to support the benefits of such a work. So it is thanks to them that this work first came into being.

I would also like to acknowledge the generous support, collaboration, and peer review of many colleagues in the Humanities, Engineering, and Science faculties at the University of Victoria, as well as collaborators from other institutions. Thanks is also due for the funding provided by an Open Education Resource grant from the University of Victoria's Office of Research and Innovation, as well as funding from the Learning and Teaching Innovation and the Academic and Technical Writing Program.

Finally, I would like to acknowledge the invaluable support and guidance of Inba Kehoe and her colleagues at the Copyright and Scholarly Communications Office at the University of Victoria, whose sharp editorial eyes and diligent quality control helped ensure that this book will be a valuable and accessible resource for students.

Resources for Instructors: How to Use this Textbook

Instructors are sometimes called upon to teach technical/professional writing even though they may not have a background in writing studies (e.g. a Phd in Rhetoric and Composition). If you find yourself in such a position, this chapter is written with you in mind. The ideas outlined here suggest one possible way to use this textbook to help you design a general structure and assessment plan for a technical/professional writing course. This design uses a project and team-based approach that asks students to respond professionally to a formal Request for Proposals (ideally that comes from a real educational partner). Feel free to adapt the ideas here to suit your pedagogical needs.

I make one key assumption here: students will have previously taken a first-year academic writing course as a prerequisite. Therefore, they will (a) be familiar with academic writing genres (research and argumentative essays), (b) be able to write in a formal analytical style, using vocabulary, sentence, and paragraph structures that are appropriate for an academic audience, (c) incorporate source material ethically by quoting, paraphrasing and citing, (d) understand basic principles of rhetoric, and (e) have academic research skills. A technical/professional writing-in-the-disciplines (WID) course will reinforce and build on this foundation.

A general course outline using this textbook could follow the structure outlined in the table below.

Unit	Description	Chapters
Unit 1	**What is technical/professional writing**? What does it look like? How does it differ in purpose and style from other kinds of writing you may have done or studied? What are some key characteristics and expectations of a professional writing style? Understand "genre" and "conventions" in professional writing contexts. Provide an overview of the work students will do in this course, (and the RFP or "catalyst" for that work). **Early Deliverable**: Translation assignment or exercise. What revisions would be necessary to transform a given text (online editorial, academic essay, or other sample) so that it has a clear transactional purpose, addresses a specific audience, and conforms to technical writing conventions?	Ch. 1 Ch. 2
Unit 2	**Information design and visual rhetoric.** Apply document design and visual rhetoric skills in a low-stakes individual assignment. Students might write an analysis explaining how a text or website uses design and visual rhetoric; or they might write a Memo that includes a problem definition and a proposed course of action. Ideally, this will be related in some way to the term project (proposing an approach or preliminary response to the RFP, a client analysis, etc)	Ch. 3
Unit 3	**Teamwork and Project Management.** Begin the team project by focusing on team formation and developing team processes (Team Charter). *If your course includes a team project, "teamwork" should be a learning objective and should be explicitly taught in the course.* I recommend designating class time for team meetings and providing draft agendas to guide their work. After focusing on setting up team expectations and processes, student teams can then work on refining the project focus and developing a collaborative research and writing plan for completing their assignment.	Ch. 4 Ch. 5
Unit 4	**Scaffolding the Team Project.** Design lower-stakes deliverables that help build towards and make progress on the final deliverable. These will vary depending on what kind of project students are working on, and might fall over several weeks of the term. For example, you might include a Work Plan, Progress Report, Technical Description, User Experience Research, Consultation/Engagement Plan, Work-in-Progress presentation, peer review, and so on.	Ch. 6 Ch. 7 Ch. 8
Unit 5	**Finalizing and Reflecting.** Will students give a final Presentation on their project? Conduct a focus group or other kind of consultation/engagement? Design a poster or website? Write a formal Proposal, Recommendation Report, Feasibility Study, or other kind of long report? Once the final team deliverable is complete, students should have the opportunity to individually reflect on the process of completing the project. A final reflection assignment (as a kind of Post Project Review) allows them to reflect on the team and project processes they used, what worked well, and what they might do differently next time.	

Backwards Course Design

Start with where you want students to end up and work backwards. This means starting with

identifying learning objectives, determining the final deliverable, and then creating a scaffolded system for getting there in a step-by-step manner that allows for feedback and iteration.

STEP 1: Identifying Learning Objectives

A course is designed around its learning objectives: all assignments, activities, exercises, lectures, and resources should be designed to help students achieve them. Students' work is graded on how well it demonstrates achievement of one or more of these objectives.

Sample Learning Objectives for a Technical Communication Course

At the end of the course, students should be able to

- Apply a problem-solving approach to communication tasks; formally define a problem and formulate a structured approach to addressing the problem.
- Employ individual and collaborative writing processes that include researching, planning, drafting, responding to feedback, revising and editing/proofreading
- Demonstrate an awareness of various genres and conventions of technical writing; select and adapt genres, writing styles, and rhetorical strategies for different audiences, purposes and contexts
- Design and format information for readability and accessibility in a variety of contexts and modes
- Implement effective and equitable collaboration and project management strategies for team projects
- Select, evaluate and synthesize credible research sources to support your purpose and help your audience make an evidence-based decision

STEP 2: Design the Final Deliverable

Start with the final deliverable you want students to create – this should allow students to demonstrate achievement of as many of the course learning objectives as possible (working at or near the top of Bloom's taxonomy of cognitive skills). It might be a formal long report of some sort (something that emulates a co-op work term report, or the kind of report that is commonly expected in the workplace). I typically use one of the following: Recommendation Report, Feasibility Study, or a Proposal in response to a Request for Proposals. Whatever final deliverable you choose, I recommend that you develop a "catalyst" that provides a meaningful exigence for this report. Developing a project that asks students to take on a real world problem

(rather than something entirely hypothetical) and apply the course learning in a realistic way makes the learning more meaningful and engaging. Having a real "client" or intended audience reinforces the importance of rhetoric.

You can do this by developing a relationship with a campus or community partner who is willing to act as a "client" and present the class with an open-ended problem to address. I have worked with Facilities Management (waste and energy management), Student Services, Campus Sustainability Office, and assorted ancillary services, as well as off campus organizations, to create "community engaged" or "service" learning opportunities. While this takes time and bandwidth, having a real person/organization with a real problem is worthwhile in that it increases student engagement in the course. I work with the partner to create a Request for Proposals (RFP) as the catalyst for the course project. Guidelines for creating a course-based RFP are outlined below.

Designing an RFP for In-Course Use

An effective Request for Proposals used as the basis of a course project will necessarily be much shorter than an actual RFP, but should provide clear guidance to potential responders by including the following elements:

1. **Introduction/Overview**: The RFP should introduce the organization requesting the proposals, describing who they are, what they do, their key mission, values and goals. Include relevant links to their website and any key documents that are important for applicants to review (e.g. Strategic Plans, "About" page, mission statement, etc.). Students need to understand the audience they are writing for, and be able to research them further.
2. **Present the Need/Goal:** the RFP should provide a brief project overview, explaining why solutions are necessary or desired; it should define the scope of the project and proposal (if the project has multiple phases, what phase is this RFP addressing?)
3. **State the Solution Requirements**: The RFP should state the requirements and specifications (measurable objectives you'd like solutions to achieve; constraints that solutions must abide by such as deadline, budget, material constraints, etc.) upon which the proposed solutions must be based. Where necessary, requirements should include clear definitions or examples to ensure that all parties share a common understanding of requirements.
4. **Describe Submission Expectations**: The RFP should outline the overall submission process (including where opportunities to ask questions and receive feedback during the process might exist), describe the document submission requirements (length, required content, structure, format, etc).
5. **List Resources**: The RFP should include a list of resources that applicants can review to (a) understand key ideas in the RFP, (b) study examples of similar solutions or inspirations, (c) refer to key documents or websites that should guide responses.
6. **Evaluation Rubric**: Explain how submitted proposals will be evaluated by the client.

Example Proposal Evaluation Rubric

Criteria	Short List!	Maybe?	Rejected
Understands who we are, our values, goals and needs	Demonstrates sophisticated and detailed understanding of who we are (our mission, values, and goals), what we want/need, why we need it, and the requirements we have specified in the RFP.	Shows a good understanding of who we are, what we want, and why we want it; understands key requirements.	Does not demonstrate a clear understanding of who we are, what we want, or why we want it. Does not seem to understand all requirements.
Alignment of Proposed Solution with Requirements	Offers a well-focused, original, and compelling idea that fully aligns with all goals and requirements stated in the RFP. Robustly meets and even exceeds objectives; abides by all constraints. Does not require any compromises to stated requirements. Evidence-based ideas are fully supported with highly credible research.	Proposes a promising and well-focused idea that meets most or all RFP objectives to some degree; abides by all constraints, but may require some minor compromises. Evidence-based ideas sufficiently supported by credible research.	Proposed idea seems vague and unfocused (or highly predictable). Does not meet all objectives or abide by all constraints. Not sufficiently evidence-based; some claims are not sufficiently supported by research.
Sufficient descriptive detail provided for Proposed Solution(s) and Implementation	Proposed idea is described clearly in thorough and compelling detail, including robust visuals to illustrate ideas fully. Feasibility and potential benefits are fully and convincingly described. Limitations or potential issues are addressed in a credible way.	Proposed idea is clearly described in sufficient detail, and uses visuals effectively to illustrate ideas. Feasibility and potential benefits are clearly outlined.	Description may lack necessary detail to show how it will solve the problem or be feasible. Visuals do not sufficiently illustrate ideas. Potential benefits are somewhat unclear.
User-Centred and UD approach	Robust explanation for how the proposed idea addresses the defined needs/wants of users, and will provide tangible benefits. Detailed consideration of how the solution fully meets a variety of accessibility needs.	Explains how the proposed solution will meet users' needs /wants and provide benefits. Design contains some accessibility considerations.	Insufficient description of how the proposed idea will benefit target users. Little or no consideration given to accessibility features for uses with disabilities.

Communication	Consistently communicates ideas in a clear and engaging manner, using professional formatting and appropriate style. Shows attention to detail and high-level understanding of audience.	Communicates ideas clearly for the most part; uses a professional format and style that is appropriate for the audience.	Ideas are sometimes unclear or presented in a somewhat unprofessional manner. Does not have a clear sense of intended audience.

STEP 3: Scaffold the Process

Working backward from the final deliverable, build a "scaffold" of shorter, lower stakes assignments that allow the students to make progress and receive feedback along the way to make sure they are on track. I recommend devoting some class time to allowing teams to meet and at least get started on key deliverables. This might entail providing worksheets for problem definition, technical description, audience analysis, social landscape mapping, etc. It might mean assigning draft portions of the final deliverable. It could focus on reinforcing team processes, like assigning a collaborative Work Plan, Work Log, and/or Progress Report. The sample assessment plan below illustrates a fairly robust scaffolding for a 14 week, face-to-face course with 24 students. What you can feasibly do will depend on your class size, length of the term, and delivery mode. Larger the class size, the fewer scaffolded deliverables you will be able to give timely feedback on that will help them with the next assignment.

Sample Assessment Plan	**weight**
Memo (Individual Assignment)	10%
Team Participation and Engagement/ Professionalism grade	10%
Team Charter	5%
Refined Project Pitch and Collaborative Work Plan	10%
Report Template/Outline and Draft Introduction/Problem Definition (and/or sample technical descriptions, data visualizations, weighted objectives chart, etc.)	10%
Progress Report (choose your own format)	5%
Peer Review of Draft Proposal	5%
Proposal (final revised version)	25%
Post Project Review/Reflection (individual assignment in memo or short report format)	20%

STEP 4: Create Rubrics

Ideally, students will understand how each assignment will be evaluated before they submit it. Checklists help students make sure they have included all required elements; rubrics help them understand your expectations for each required element and how it is weighted. A strong rubric will clearly describe what "meeting expectations" looks like (what you need to do to get a B/B+ grade), what exceeding expectations looks like (A/A+ grades), and what not fully meeting expectations looks like (C or lower grades).

A holistic rubric describes the assignment as a whole at each grade level; an analytical rubric describes expectations for selected graded criteria at each grade level. Clearly no rubric can cover all possible criteria for assessment in a writing assignment, so they have to have some room for flexibility built into them. Here is a very generic example of an analytic rubric that can be adapted to suit a variety of assignments.

Criteria	A	B	C	D/F
CONTENT **(40%)**	Thoroughly develops all required content, plus unexpected and original content elements in a way that effectively reinforces purpose	Contains all required content elements in a sufficiently developed way that effectively supports your purpose	Solid work overall, but may be missing 1 or 2 required content elements, or some may be under-developed or not fully support your purpose	Several missing or woefully underdeveloped content elements. Purpose is not sufficiently supported.
SUPPORTING RESEARCH **(20%)**	Sophisticated integration of more than the required number of highly credible and relevant sources. Flawless citational practice.	Effective integration of the required number of sources in a way that helps to develop and support your argument. Generally strong citational practice.	Some synthesis of sufficient number of secondary sources, but integration may be awkward; may need more credible sources; and/or citational practice may contains several errors.	Insufficient supporting research (may not have sufficient number or quality of sources; integration may be confusing; may violate academic integrity policy)
INFORMATION DESIGN **(20%)**	Exemplary use of design features and genre conventions to present information in a compelling visual format that supports your purpose.	Effective organization, formatting, and use of visual rhetoric to support the content and purpose. Adheres well to genre conventions.	Clear attempt to organize and format information to aid readability, but some revision needed to meet reader's needs.	Organization and formatting of information creates confusion for the reader. Significant revision needed.
RHETORIC & STYLE **(20%)**	Sophisticated use of professional style and rhetorical strategies form a compelling argument that successfully persuades the intended audience and is a pleasure to read.	Uses a generally professional style and balance of ethical rhetorical strategies that is effective for persuading the intended audience to find the information credible and compelling.	Use of formal style and rhetorical strategies are generally sound for the intended audience, but may be somewhat inconsistent, slightly out of balance (overly emotional), or inappropriate (slang or ad-speak) in 2-3 places	Often uses a style of expression and/ or rhetorical strategies that are not appropriate for persuading the intended audience in this context.

Importance of Feedback and Reflection

Providing detailed, constructive, supportive and meaningful feedback is arguably the most important and beneficial part of a writing course. It is also the most time consuming. Creating detailed rubrics takes time up front, but will help you save time down the road when grading

assignments. Still, rubrics are rather "blunt" instruments and sometimes exceptionally strong (or weak) papers can get average scores on a rubric because they do unexpected things. So it's best to prepare to be flexible, add written feedback, and refine your rubrics over time and iterations. Feedback should let students know what is working well, what needs improvement, and how/why they can improve it.

Refining one's writing skills is a process of "deliberate practice" and "continual improvement." This process requires meaningful feedback from instructors (and peers) and focused reflection on the part of the student. Building in opportunities for reflection will help students develop self-regulated learning strategies. Here are some reflective prompts you might ask students to consider:

- What went particularly well in your assignment?
- What didn't go as well as you expected?
- What sort of process did you use? Was it effective? why or why not?
- Did you change your approach since the last assignment? What did you do differently and how did it work?
- What is something you want to work on going forward? What strategies and/or or resources will you use to help you?

Here are two helpful resources on providing feedback on students work:

> John C. Bean's "Reading, Commenting on, and Grading Student Writing," in *Engaging Ideas: The Professor's Guide to Integrating Writing, Critical Thinking, and Active Learning in the Classroom*. Wiley, 2011.
>
> Asao B. Inoue and Mya Poe's How to Stop Harming Students: An Ecological Guide to Anti-Racist Writing Assessment

Introduction to the 2nd Edition

Since this textbook was first published in 2019, much has changed, and these changes have led to the revised and expanded 2nd (2026) edition. This edition contains updated information, links, and resources; has cut some out-of-date or no longer relevant content (e.g. references to "stakeholders"), and has added and expanded content throughout the text related to multimodality and accessibility. Specifically, this 2nd addition includes new content on Gen AI (1.4), visual rhetoric (3.4), leadership (4.4), source synthesis (5.4), and User Experience (ch. 6), some of which was added by other contributors. I've also added a "How to use this Textbook" section as a resources for instructors. I hope you find the 2nd edition useful.

Humans have engaged in technical communication for literally thousands of years. Palaeolithic cave paintings may have provided useful information about when to hunt certain animals. Stone tablets invented 5000 years ago provide our first examples of "writing" for transactional purposes like recording ownership of property. The Romans kept detailed technical information about aqueduct design, and so on. Over the centuries, innovations such as the inventions of paper and ink, the printing press, telegraph, radio, television and the computer allowed information to be disseminated more widely, and now instantaneously. Each of these innovations responded to the various communication needs of the time and developed specific patterns and conventions for communicating information.

In our increasingly technological and internationalized workplaces, communications and collaboration skills are among the most sought-after competencies employers require of job candidates. Indeed the educational framework for 21st Century Learning is based on 4 key skills: *critical thinking*, *creativity*, *collaboration* and *communication*. Every job posting you see will almost certainly ask for candidates with who can think critically and creatively, have **excellent communications skills** and **can work effectively as part of a team**. The ability to communicate clearly and effectively in written, verbal, visual, interpersonal and collaborative contexts is vital for success and advancement in the workplace, and developing these skills is the focus of this textbook.

You have probably learned the conventions for communicating in an academic context, and seen how these differ from the way you might communicate in social context. So you know that learning to read and write in a new context, using potentially unfamiliar conventions, can take some work. Some of that work entails reflecting on your experiences.

Questions for Reflection

Reflect on your experiences with learning to read and write in various contexts

- How did you first learn to read and write? Who influenced you?
- What do people in your culture and/or your family believe about reading, writing and telling stories?
- What are some of your most positive reading and writing memories?
- Describe some moments when you struggled with reading or writing. How did you react?
- How does your reading and writing for school differ from what you read and write outside of school?
- What do you see as your key strengths and weaknesses as a communicator?
- Do you believe that you are a good writer? Why or why not? Is your belief connected to how others have described your writing?
- Describe your writing process. How do you tackle writing tasks? What do you find most frustrating most rewarding in this process?
- Currently, how do you see this next step of your writing journey? What do you want to accomplish? What concerns do you have?

No matter how brilliant or innovative an idea may be, if it is not communicated clearly and promoted effectively to the right audience, it will likely not become a reality. For an innovative idea to move from concept to project to completion requires many stages in a design process (see **Figure 1**), almost all of which require clear communication and effective teamwork.

Figure 1. *Phases of a project with some accompanying communications tasks [Image description below]*

If the design and implementation teams cannot work and communicate effectively with each other, their final product will fail to meet its potential.

Technical Writing Essentials introduces the key elements of professional style, information design, collaboration, research, and presentation skills needed to design productive workplace communications for a variety of purposes and audiences.

Image Description

Figure 1 image description:

Once there is an idea, a project goes through a design process made up of five stages.

1. Inspiration
    - you have a great idea
    - Share the idea with others
    - Convince them it's worth pursuing
    - Get approval to go ahead
2. Pre-project planning.
    - Form Team
    - Define the Problem
    - Conduct Research
    - Public engagement
    - Possible approaches
3. Project Development.
    - Create or respond to an RFP
    - Write proposal
    - Develop design concepts

- Project management plan
- Feasibility Studies

4. Project Implementation.

    - Contracts and permits
    - Progress reports and documentation
    - Continued research and development
    - Collaboration with contractors, clients, users, etc.

5. Project completion.

    - Close contracts
    - Final reporting
    - Supporting documentation: User Guides, FAQs, Troubleshooting

[Return to Figure 1]

1. WHAT IS TECHNICAL COMMUNICATION?

Chapter 1 Learning Objectives

This chapter will help you understand what technical writing is, what it "looks like," and why its important by covering the following:

1. Apply a "problem-solving" approach to communications tasks, starting by learning how to fully define the problem before looking for solutions
2. Distinguish the main conventions and characteristics of technical writing those used in other forms, such as journalism and academic writing
3. Understand and apply strategic "writing moves" and develop iterative writing processes appropriate for technical communication contexts
4. Develop an understanding of what Generative AI is and how its adoption might impact you as a learner and professional
5. Apply what you have learned so far by examining "case studies" that demonstrate the costs of poor communication in various contexts.

> "*Some of the most accomplished engineers of all time have paid as much attention to their words as to their numbers, to their sentences as to their equations, and to their reports as to their designs.*"
>
> Henry Petroski, "Engineers as Writers"[1]

When you hear the term "technical communication," what comes to mind? Perhaps you think of scientific reports, specifications, instruction manuals, software documentation, or technical manuals. And you are correct. However, technical communication is so much more than that. Technical writing is a category of writing that encompasses not only technical materials such as manuals, instructions, specifications, and software documentation, but it also includes writing produced in day-to-day business operations such as correspondence, proposals, internal communications, media releases, and many kinds of reports.

Technical writing is "transactional" in that it is meant to achieve a clear purpose. It includes the communication of specialized technical information, whether relating to computers and scientific instruments, or the intricacies of mindfulness meditation. And because oral and visual presentations are such an important part of professional life, technical communication also

encompasses these as well. For an interesting example of technical communication on TikTok and Instragram, check out this video: Tech Comm Examples: Black Forager – Enoki vs Deadly Galerina.

We might define technical communication, then, as using various modes (oral, written, visual) of communication to manage technical information, to analyze a problem, find and evaluate evidence, and draw conclusions in a way that allows people to take action. Queens University Library maintains a Database of Technical Reports published from the late 1970s to the present, including a wide range of technical reports from government, NASA, and the Engineering Research and Development Centre. It's useful to scan through some of these to get a sense of the wide range of form and content that is covered under the umbrella of "technical reports."

Here are some examples that you might not have thought of as "technical writing" — but in each case, the authors have analyzed and addressed a problem and suggested possible solutions:

> **Climate Change 2022: Impacts, Adaptations and Vulnerability.** Working Groups II Contribution to the IPCC Sixth Assessment Report assesses the impacts of climate change, looking at ecosystems, biodiversity, and human communities at global and regional levels. It also reviews vulnerabilities and the capacities and limits of the natural world and human societies to adapt to climate change. Note that the website contains 2 downloadable summaries, a Summary for Policy Makers and a Technical Summary. What do you suppose are the key differences between these two summaries?
>
> **Honouring the Truth, Reconciling for the Future,** is an executive summary of the findings and recommendations of the Truth and Reconciliation Commission of Canada. This Executive Summary is over 300 pages long, indicating the depth and breadth of the commission's findings overall. It allows readers to see the extensive information available and choose which parts would be most appropriate for their context.
>
> One of the sections of the larger TRC report, which is available separately, is the **Truth and Reconciliation Commission of Canada: Calls to Action** (2015). Note that this document is presented largely in easy-to-read bullet points in organized numbered sections, making the 94 calls to action (note that it does not use the word "recommendations") very straightforward to understand and implement. Calls to action 62-65 directly address Education for Reconciliation. Institutions committed to decolonization make extensive use of this document to guide their decisions-making and policy changes.

Thus, technical writing is highly "transactional" as it conveys information to enable and encourage specific actions — to help the people communicating with each other to achieve specific goals.

Why are Technical Communication Skills Important?

In a 2018 survey of over 1000 professionals from various professions, over 70% of engineers and almost 50% of programmers rated the quality of their writing as either "very important" or "extremely important" to their job performance, as well as to their career advancement.[2] Engineers who are more advanced in their careers spend less time engaged in hands-on technical problem solving and more time engaging in communications tasks such as

- researching, reading and writing reports, proposals, emails, letters, memos, etc.
- giving or watching presentations related to their work
- formally meeting and discussing with colleagues, teammates, managers, clients, and so on.

Clearly, the stereotype that engineers don't need communication skills is way off base! Indeed, career advancement depends significantly on communication skills; the more one advances in their career, the more essential strong communication skills become. And the stronger your communication skills, the more likely it is that you will advance.

Technical communication is "transactional" – it entails a purposeful transaction between sender and receiver that provides specific information for practical and specific purposes (informing, instructing, persuading) and is usually geared towards meeting the needs of a specific audience. Technical communicators produce a wide variety of documents and other products, such as

- Proposals and requests for proposals (RFPs)
- Technical or research reports
- Documentation records and product specifications
- User guides (step-by-step instructions, procedures, manuals)
- Online help, technical support
- Reference information (encyclopedia-style information)
- Consumer literature (information for the public about regulations, safety issues, *etc.*)
- Marketing literature (product specifications, brochures, promotional literature)
- Technical journalism (found in trade magazines, media releases, *etc.*)

Thus, it is a highly "designed" form of communication that requires practitioners to have a heightened awareness of the typical **genres** and **conventions** (rules and expectations) and **rhetorical situations** (audience, purpose, context) in which they are communicating.

This textbook aims to provide you with that heightened awareness – that is, to introduce you to the basic conventions of technical communications, and to train you to take a reader- and

audience-centred approach to communications tasks, to find the tools and methods that will work best to communicate your ideas to your target audience, and to achieve the desired results.

What Does Technical Writing Look Like?

Technical communications can take many forms, depending on the purpose and intended audience. Chapter 2 will walk you through various characteristics of professional style, and Chapter 3 will focus on information design and visual rhetoric. In the meantime, consider the following example of technical writing, which is an excerpt adapted from a book called *Scientific Sailboat Racing* by Ted Wells. [3] From the excerpt in the box below, what can you tell about the intended audience?

The most common question asked by skippers wanting to get to the windward mark faster than they have been doing is "**How can I make my boat point higher?"** Getting to the windward mark first depends primarily on the skill and experience of the skipper; however, having a well-rigged boat will make a significant difference. Look for the following, in order of importance:

1. **Sails:** Have good quality sails, and use the appropriate sails for the wind conditions expected. No one can win races with poor sails, so use the best you can afford. Keep in mind that the leeches of all sails flutter a little, the jib will backwind the luff of the main on any full or medium sail, and in very light wind, even a perfectly cut sail will probably develop a wrinkle along the front of the battens. If the sails are obviously no good, replace them.
2. **Mast and Centerboard:** Ensure that the mast is far enough forward and the centerboard is far enough back so that there is little or no weather helm. Make sure the stiffness of the mast suits the sails.
3. **Jib Fairleads**: Ensure jib fairleads are properly located for the type of jib being used and the strength of wind expected.
4. **Cleats:** Have cleats for both jib and mainsheet; place cleats so that crew can easily make small adjustments for varying wind velocities and hang on the to the jib sheet without having it pop out of the cleat.
5. **Traveler**: Have a mainsheet traveler that allows the main to be pulled down without pulling the boom in too far; it should allow the sail to be pulled down tightly enough so that the leech does not fall off without pulling the boom in any further than it should be.
6. **Tiller:** Have a flexible tiller extension that allows you to sit well forward, but can be adjusted so that it does not get in the way when coming about.
7. **Boat Weight:** Keep the boat as close to minimum weight as possible. Clearly, a lighter boat is easier to handle, but this is not as critical as other factors. If choosing between a lighter crew member with less skill and experience, and a heavier crew member who has greater skill, the latter is usually preferable.

Once the boat is properly set up, a skilled and experienced skipper can point significantly higher than expected by understanding and using wind deflection from other boats. Immediately to leeward of any boat and extending for a distance of about three mast lengths, there is a wind shadow where the wind velocity is greatly decreased. To leeward of the bow of the boat there is a very small region where the direction of the wind is deflected opposite to the normal deflection and where the velocity is accelerated slightly (see Figure 34). Except in the direct wind shadow, the deflection of the wind is more important than the decrease in wind velocity, as the decrease in velocity is very slight except in the immediate shadow of the sails of the windward boat.

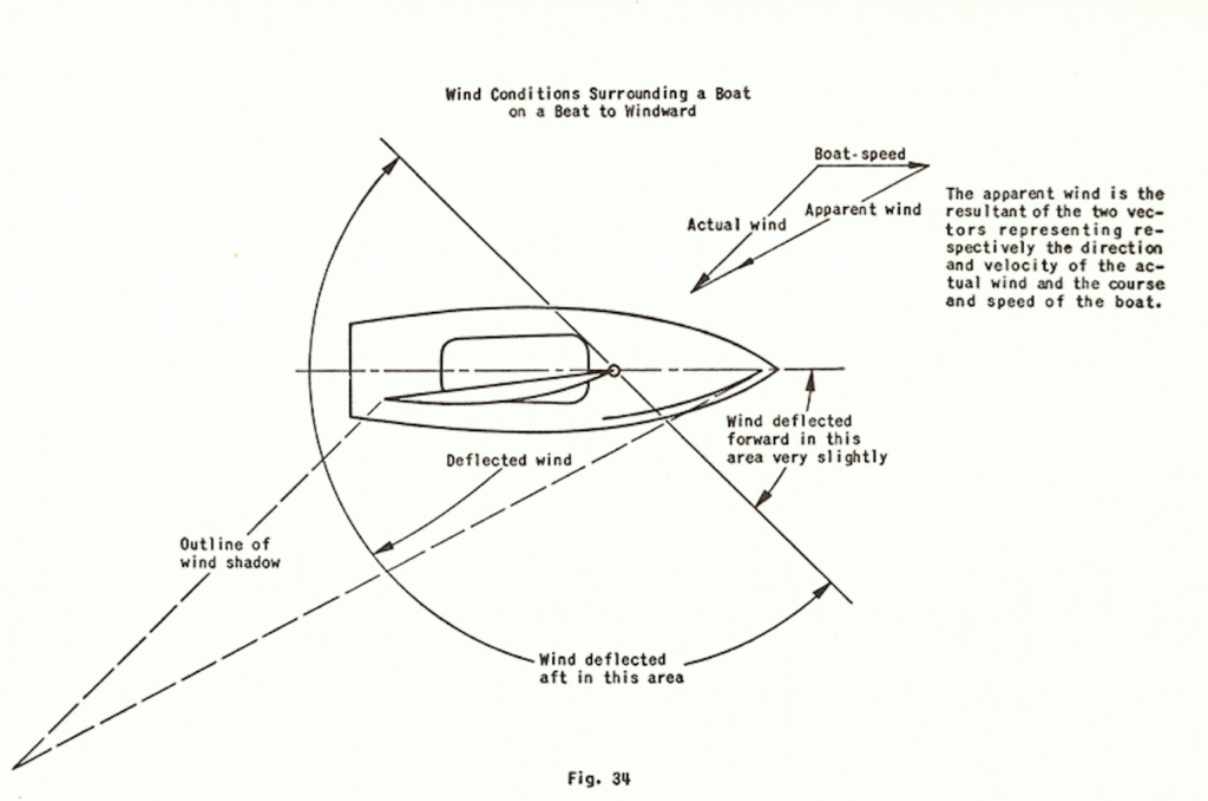
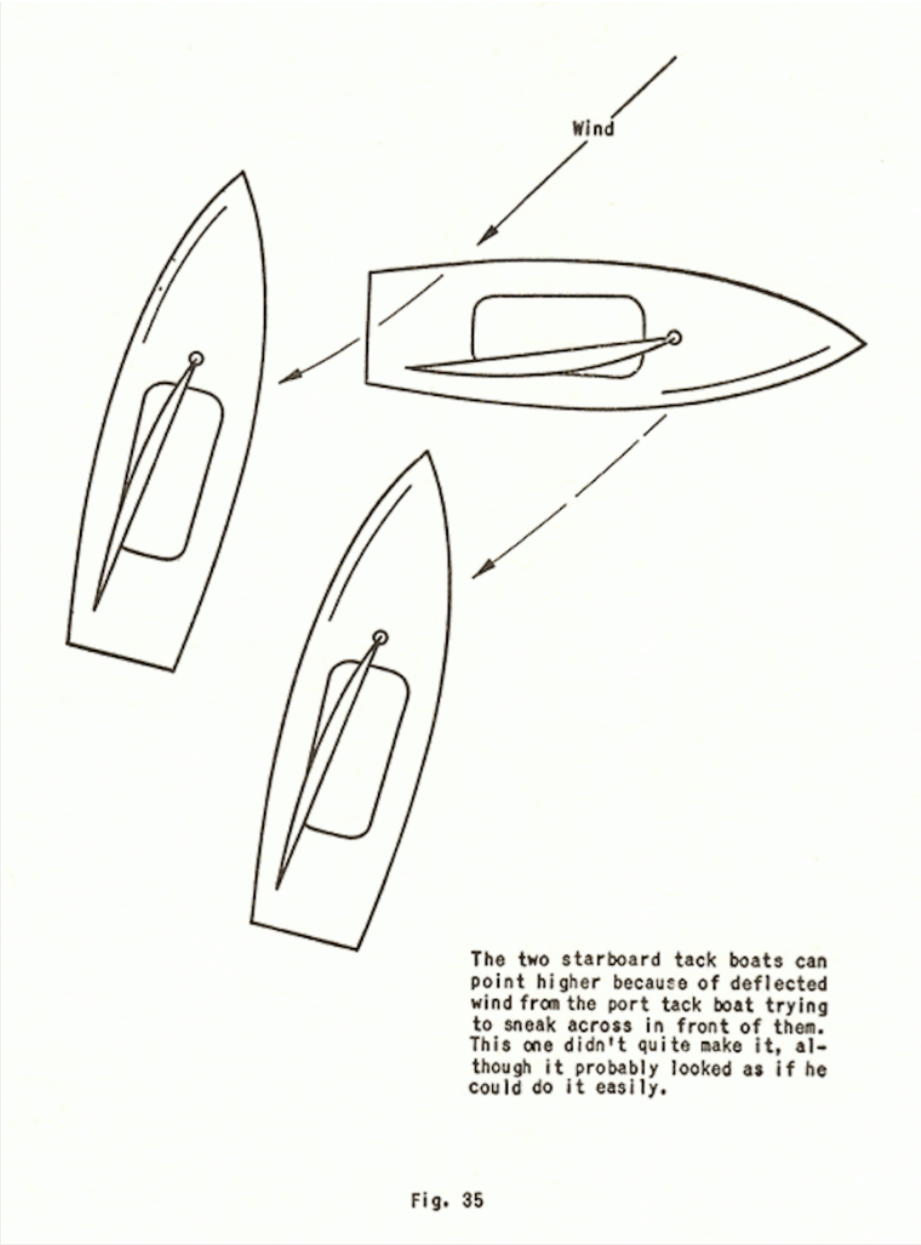


Fig. 34

Because of this wind deflection, a boat on the opposite tack cutting behind another boat will be able to point appreciably higher than it normally would. Many skippers on port tacks who thought they could clear starboard tackers have been fooled by not realizing this fact. The deflection of their wind in trying to cross in front of the starboard tacker will enable the starboard tacker to point higher without luffing than he normally would be able to do, and the port tacker who thought he could squeeze by suddenly finds that he cannot (See Figure 35).



The two starboard tack boats can point higher because of deflected wind from the port tack boat trying to sneak across in front of them. This one didn't quite make it, although it probably looked as if he could do it easily.

Fig. 35

EXERCISE 1.1 *Draft some technical writing related to your interests*

Reflect on the description and example of technical writing above in relation to your experience as an

employee, as a student, or as someone with a hobby. What kinds of documents have you written that could fall under the umbrella of Technical Writing?

Write a paragraph or two on a topic about which you have specialized knowledge, and can use specialized terminology to convey specific information or instructions that the reader would use for a specific purpose. For example, you might write about effective techniques for executing certain skateboard manoeuvres or how to execute a yoga position such as a "downward facing dog." For an interesting example, watch this video (How Trauma can Affect your Voice: Voice Actor Explains) describing in highly technical detail how Noah Wiley's vocal qualities change to depict trauma in *The Pitt*.

Consider your audience when choosing how to write this. Will the audience have to be familiar with the terminology used, as in the above sailing and video example? Or are you writing for a novice? See if you can write a paragraph that can "baffle me with your techno-jargon," and then re-write for a general audience, using plain language.

Notes

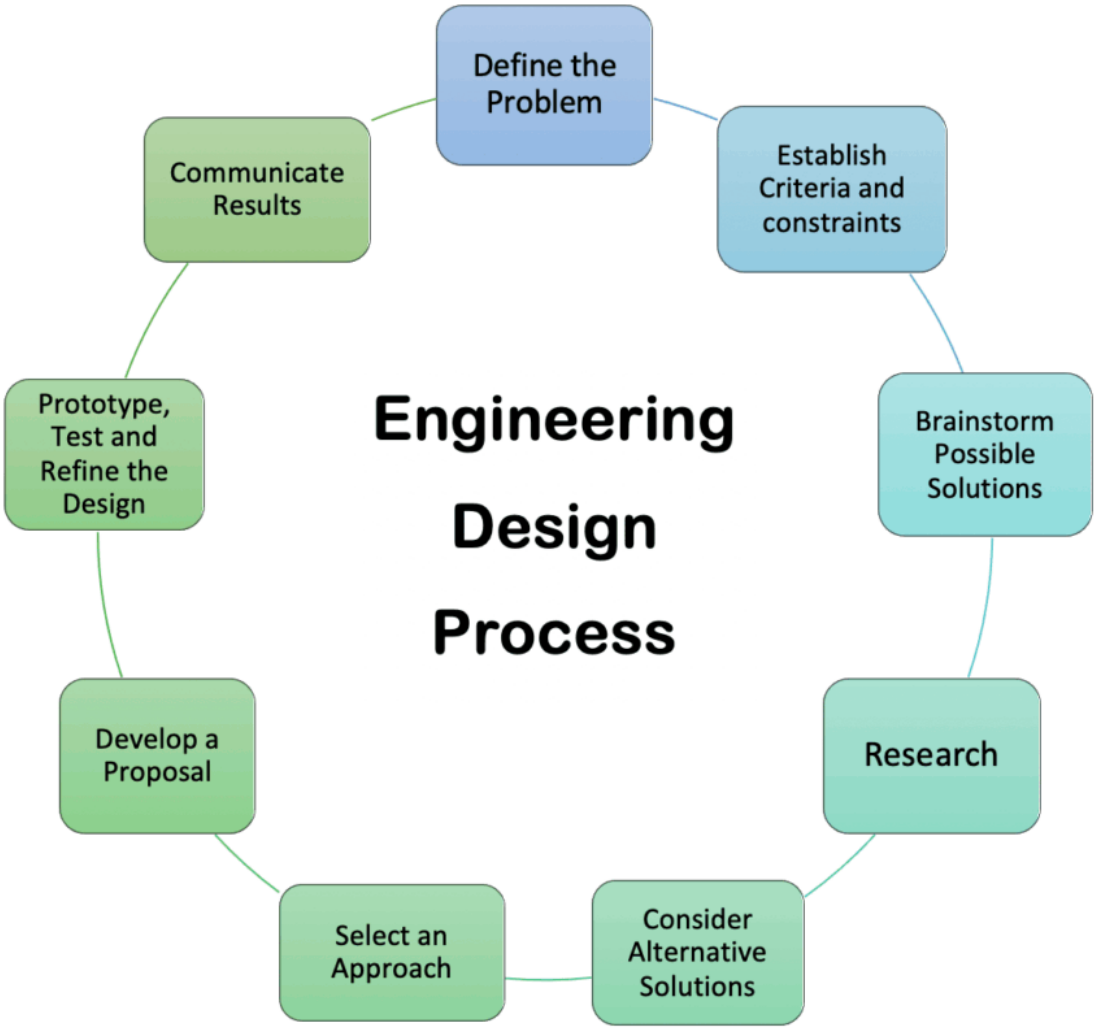
1. H. Petroski, "Engineers as Writers." *American Scientist*, vol. 81, no. 5 (1993): 419–23. http://www.jstor.org/stable/29775007.
2. J. Swartz, S. Pigg, J. Larsen, J. Helo Gonzalez, R. De Haas, and E. Wagner, "Communication in the workplace: What can NC State students expect?" Professional Writing Program, North Carolina State University, 2018 [Online]. Available: https://docs.google.com/document/d/1pMpVbDRWIN6HssQQQ4MeQ6U-oB-sGUrtRswD7feuRB0/edit
3. T. Wells, *Scientific Sailboat Racing*, New York: Dodd, Mead, and Co., 1950, pp. 94-96.

1.1 Problem-Solving Approach to Communications Tasks

EDUARD COJOC-WISERNIG AND SUZAN LAST

In the workplace, many of the communications tasks you perform are designed to solve a problem or improve a situation. The message itself can sometimes be the solution, or it can be one of the tools you use to find and implement the solution. Whether you are doing work for a client, for your employer, with your team, or for someone else, you will typically use some sort of design process to tackle and solve the problem. Applying a design process to communication tasks can help you create a systematic approach for addressing the situation appropriately and effectively.

Design processes may differ depending on the kind of problem being solved or the kind of design your aiming for. The process for designing an industrial manufacturing plant may look different from the process for designing a new software application, a user manual, a municipal water treatment facility, or a biomedical device. But in all cases, **the first step in designing any solution is to clearly define the problem**.



Albert Einstein is often crediting with saying that if he had 1 hour to save the world, he would spend 55 minutes defining the problem. Whether or not he actually said this, the sentiment is a valid one. You cannot begin to work on solutions until you have a clear understanding of the problem, its impacts, and the goals you want to achieve. It often takes significant time and effort gain this thorough understanding. Poor communication at the problem definition stage can derail a project from the start. The video below by design engineer Jordan Robert provides clear examples of why spending time at the beginning to understand and fully define the problem before trying to solve it is time well spent; and why failing to do so can have serious consequences.

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://pressbooks.bccampus.ca/technicalwriting2ed/?p=25#oembed-1

Flemming and Johnston[1] have argued that problem definition "may be the most important cognitive activity in creative problem solving," but that many novice engineers lack the skills and clear framework to effectively define a wide range of real-world problems. The next section seeks to address this by providing you with an adaptable framework for defining a problem.

Framework for Defining a Problem

Defining the problem helps you understand it in complex and sophisticated ways that allow you to come up with effective solutions. There isn't just one way to define a problem, but Barry Hyman's Problem Formulation model[2] offers a useful and adaptable approach. His framework for defining a problem consists of 4 key elements: Need, Goal, Objectives, and Constraints

STEP 1: Understand the Need ("unsatisfactory situation")

Identifying the need for a solution entails studying, understanding, and describing the "unsatisfactory situation" that creates the need for a solution. This statement might answer questions such as: *What is wrong with the way things currently are? What negative effects does (or could) this situation cause? For whom?* You will likely need to do background research to supply data that quantifies these negative effects. More importantly, you need to understand and develop **empathy** for the people and environments feeling those impacts. Modern engineering requires not only data, but also empathy to fully understand the need. To consider who you need to understand and empathize with, and likely consult with while defining and addressing the problem, you might use the **Four I Framework**:

- **Impacted**: who is directly or indirectly impacted by this problem? What is their lived experience?
- **Invested**: Who has a clear stake in addressing this problem? Who is directly invested (financially, emotionally, politically, *etc*)
- **Influential**: who has the power to make decisions, direct resources, fund, or block the project? (City council, regulatory boards, policy makers, clients, *etc*)
- **Interested**: Who cares about this problem or is simply interested in it? (Local citizens, advocacy groups, neighbours, *etc*.)

Clearly there may be some overlap in these categories. Someone who is negatively impacted by a current situation may also be highly invested in solving it; someone who is financially invested may also have a great deal of influence. The critical thing to understand about the need statement is that it explains **why a solution is needed;** it does not offer a solution. (For example, "I need a

pizza" is not a need statement (despite the word "need" in it); it suggests the possible solution for the real need, which can be stated as "I'm hungry."

STEP 2: Establish a Goal (what "solved" looks like)

The goal statement describes what the improved, "satisfactory" situation will look like once a solution has been implemented. At this point, you are still not describing how to solve it, only the goal that any proposed solution should achieve (e.g. "not feel hungry any more"). The broader you make your goal, the more open-ended your problem is, allowing for a wider variety of creative solutions. A narrowly focused goal ("eat something that will satisfy hunger") limits your scope to a smaller number and variety of possible solutions. A narrow goal may make it easier to find a solution quickly, but a broader goal will encourage you to "think outside the box" and come with more original and innovative ideas.

STEP 3: Define Measurable Objectives (the "should" criteria)

You will need to define the specific and measurable objectives that any solution to the problem should try to optimize. These are the criteria you will use to "grade" solution ideas. Objectives are often framed as "should" statements: **A good solution "should + verb."** Since you will need to measure how well a solution achieves an objective, these verbs should suggest a form of measurement. A good solution should "minimize" environmental impact, "maximize" efficiency, "reduce" cost, "increase" accessibility for people with limited manual dexterity, etc. You can make your objectives more specific by adding measurement units and limits:

Vague Objectives	Measurable Objectives
The solution should be light	The solution should be light enough to carry easily with one hand (ideally under 5 kg)
The solution should be fast	The system should be able to process at least 500 concurrent user requests with less than 50ms of latency.
The solution should be sustainable	The design should minimize municipal water use during operation. The design should maximize the use of post-consumer recycled plastics, aiming for at least 80%.

Note that *sustainability* and *accessibility* are increasingly treated as crucial requirements in modern engineering design.

STEP 4: Identify Constraints (the "must" criteria)

Constraints define the absolute limits that any feasible solution must adhere to in order to be acceptable. These are the strict "pass/fail" or "go/no-go" conditions. If a solution violates a constraint, it is rejected ("fails"). Typical constraints include

- **Budget**: solution must not cost more than $10,000 to implement; or must have a payback period of less than 15 years)
- **Time**: The solution must be fully implemented within 1 year
- **Space**: The solution must fit within a 1.5 x 1.5 m area within the existing utility room, without requiring structural renovation.
- **Regulations/Standards**: the solution must abide by all municipal safety codes
- **Range limits**: the design must travel at a speed between 30 – 60 cm/ second
- **Baselines**: the solution must meet minimal accessibility requirements; the appliance must achieve a minimum Energy Star rating.

EXAMPLE Problem Definition

NEED: (the "unsatisfactory situation"): it's 7pm and I'm really hungry! I haven't eaten since noon, and have worked hard all day. I still need to do 2 hours of homework before bed to study for a midterm tomorrow morning

GOAL: not feel hungry (very broad); eat a satisfying dinner (more specific) so that I can focus on studying, and get a good sleep.

OBJECTIVES: My dinner should try to optimize the following:

- Be ready to eat quickly, ideally within 60 minutes (faster time = higher score)
- Require minimal effort (solutions that require less effort will score higher than solutions that require more effort)
- Be nutritious (at least 3 food groups, including protein and vegetable)
- Taste good (at least a 3 on my personal "deliciousness" scale of 1-5)
- Be satisfying (sufficient quantity and density of calories)

CONSTRAINTS: My dinner must

- not cost any money (I'm broke!)
- use only ingredients that I currently have access to (I'm too tired to go shopping)
- not contain peanuts (I have an allergy).

Now you can look through your cupboards and fridge to starting coming up with solutions. You might think outside the box and see if you can get a friend to bring you food; maybe you have a "free meal" with Door Dash. If you go with the broader goal (not feel hungry), you might find innovative ways to eliminate hunger without eating food, but you would have to revise your objectives and constraints accordingly (feel sated, be able to focus on homework for at least 2 hours, be able to sleep for at least 7 hours, not risk health, etc).

Communication as Solution

Hopefully, it has become clear that the engineering design process and the writing process have a lot in common! You can apply Hyman's model directly to your communications tasks.

Think of a document you have to write as a solution to a specific problem. Before you begin drafting, you must define the communication problem you are trying to solve:

Understand the Need: consider what gave rise to the need to communicate. Does someone lack sufficient information to make a decision or take a position on an issue? Did someone request information? Is there some unsatisfactory situation that needs to be remedied by communicating with your audience? What specifically is unsatisfactory about it? Consider your audience. For example

> *A potential client lacks sufficient information to decide if my proposed heating solution is feasible and affordable.*
>
> *My instructor lacks sufficient examples of my written work to assign a grade for how well I met the course learning objectives.*

Establish a Goal: What is your desired outcome? Consider your purpose in writing. What do you want your reader to do, think, or know after reading? Do you want your reader to make a decision? Change their opinion or behaviour? Follow a course of action? For example

> *Provide the client with enough information, in an effective and readable format, to confidently hire our firm to build the solution.*
>
> *Provide my instructor with samples of my writing that demonstrate that I have not only achieved the course learning objectives, but exceeded expectations (and get an A).*

Define Objectives: What specific criteria should your document meet to be highly effective? What genre, style, content and format will be most effective in communicating your message? How will it be "graded"? For example: The document should use clear headings

for readability, include specific information about costs and benefits, and use persuasive, evidence-based arguments supported by credible sources.

Review the client's RFP to see what specific objectives it lists and how your proposal will be assessed.

Review the Assignment Description and Grading Rubric for your assignment to determine specific requirements and learning objectives that your instructor will use to evaluate your work. For instance, it should be clear, concise, coherent, concrete and correct.

Identify Constraints: what are the pass/fail conditions of this document? For example: The proposal must be no longer than 5 pages, must be submitted as a PDF by Friday at 5:00 PM, and must strictly follow IEEE citation style. Consider your rhetorical situation. What conditions exist that present barriers or challenges to communication? How can you address them? For example,

How much time is your audience willing to spend reading this?

What format and style do they require? Is there a Style Guide you must follow? A template you must use?

How much time do you have to create it? Do you have a deadline? (due date)

Are there requirements for using sources? (academic integrity rules, minimum number of sources, etc.)

Keep in mind that the document you produce is ultimately evaluated in terms of how well it responds to the "problem" — that is, how well it meets the overall goal and demonstrates achievement of specific objectives while abiding by constraints.

EXAMPLE: *The Prompt Engineering Parallel*

In the modern workplace, engineers sometimes use Generative AI to brainstorm, write code, or review documents. Have you ever received a useless or hallucinated response from an AI? It is likely because your prompt was a poorly defined problem.

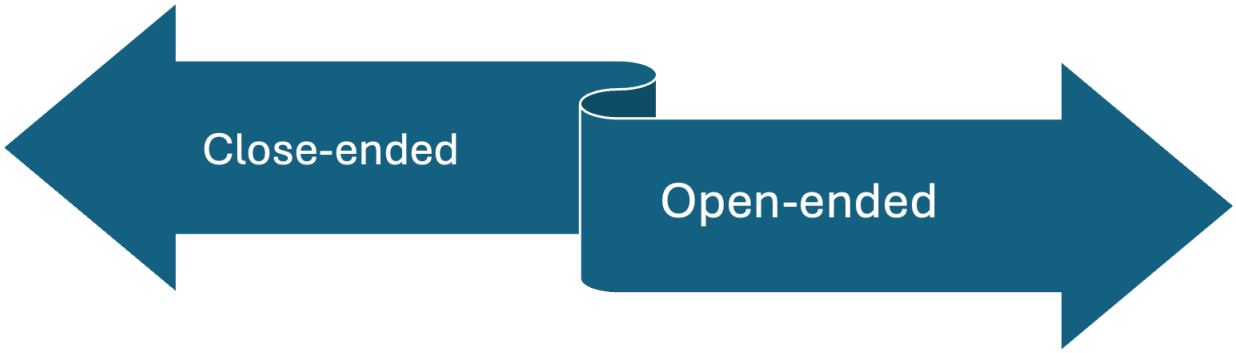
Think about this as a communication problem. You want AI to generate a solution you can work with, so you have to define the problem effectively. When writing a prompt for a Large Language Model (LLM), you can apply Hyman's model directly:

- **Need**: "I am struggling to understand the difference between torque and horsepower."
- **Goal**: "Explain the concepts to me at a 1st year university level so I can apply my understanding on my first-year physics exam."
- **Objectives**: "Use examples and analogies related to bicycles or other familiar mechanical objects."
- **Constraints**: "Do not use calculus. The explanation must be under 300 words."

By explicitly defining the objectives and constraints of your prompt request, you are more likely to receive a useful solution (output) from the AI.

The Spectrum of Engineering Problems

Hyman's formulation offers a framework for defining a specific problem. However, there are different kinds of problems and you may need to adapt this model to address them. Problems exist on a spectrum, from close-ended problems (with one correct solution) to fully open-ended problems with innumerable possible solutions. To accurately define a problem, you will need to understand what kind of problem you are tackling.



Closed-Ended Problems: These problems have a single, unique, correct solution that does not change over time. You just need to find the correct answer (solve for X). **For Example:** calculating the exact voltage drop across a specific resistor in a simple circuit; calculating the volume of a cylinder, or the area of a triangle.	**Open-Ended Problems:** There is no single "right" answer, only "better or worse" solutions that must be carefully evaluated against measurable objectives and constraints. These require judgment and critical thinking. **For example:** "Design a system to reduce traffic congestion in the downtown core."

Very few real-world engineering problems are fully close-ended (constrained to one solution) or fully open ended (no constraints at all allowing innumerable solutions). Most fall somewhere in between. The more open-ended the problem, the more creativity, critical thinking, and decision-making skills are needed to define the problem. Defining clearly measurable objectives and

identifying constraints helps you to move the problem into a more manageable area on the spectrum.

A Note on "Wicked" Problems

At the far end of the open-ended side of the spectrum, we have what Rittell and Webber[3] called "wicked" problems. These "unsatisfactory situations" are complex, contested, and continually evolving, and therefore almost impossible to clearly or conclusively define, let alone solve. They tend be complex societal and policy problems that have innumerable causes and that cannot be easily dealt with using a technical or scientific problem-solving approach. Think climate crisis, homelessness, poverty, unequal access to health care, COVID 19 pandemic, terrorism, sustainable transportation, *etc.*

The wicked problem may resist a singular definition because

- It might be perceived differently by different people with conflicting ideological approaches; without agreement on the problem (or why a solution is needed), it is difficult to come up with an effective response
- There may be many interconnected causes to the problem
- People might experience the impacts of the situation differently, and may have varying or even competing ideas of what an improved situation (goal) might look like.
- It is difficult to come up with clear metrics (objectives) for testing solutions that everyone can agree on, and set limitations (constraints).

Without clearly defined goals and measurable objectives, it is hard to determine what "success" might look like. These problems also tend to be "high stakes," having significant social and environmental impacts on a variety of people, organizations, and environments. This makes experimentation with different solution options challenging, as there may be dire consequences to "failing" in this experimentation process.

Where a "tame" problem is relatively easy to define, and the effectiveness of solutions can be easily measured, a wicked problem cannot be easily defined, and there is not one correct solution; the "right solution" that can totally address and solve the problem does not exist. Solutions can be considered "better" or "worse," or even "right" and "wrong" simultaneously by different people. Trying to address wicked problems requires judgment, compromise and ongoing assessment and adaptation to the continually evolving situation and varying contexts. It also requires very careful and thoughtful communication strategies! Because every approach requires trade-offs and

compromises where a valuable outcome might need to be sacrificed, every decision is provisional and open to criticism.

This sounds dire, but the wicked problem framework can be helpful, and even reassuring, as it helps those trying to tackle such problems to remember that the complexity of this issue has no single, correct solution: it's not that you lack the skill or knowledge to find it; it's that it does not exist. However, wicked problems do require you to have a sophisticated understanding of

- the interconnected contexts and how they might evolve
- the potentially conflicting needs and values of a wide range of the people involved
- the various trade-offs that need to be negotiated
- the need for continual assessment and iteration.

How you communicate about wicked problems is critically important, given the many perspectives and ideologies involved. The way you define it, how you frame it rhetorically, how you talk about the people who are impacted, will all convey crucial information about your approach that could either win you support or provoke opposition. Wicked problems are clearly the most challenging to address, but they are the ones that we most need solutions for!

EXERCISE 1.2 *Apply the Wicked Problem Framework*

Corbin *et al*. in "The Wicked Problem of AI and Assessment"[4], describe the issue of students using AI to help them complete their writing assignments and how professors should assess student work in university as a "wicked" problem.

Discuss how this issue fits into the "wicked problem framework" in that it has many impacted parties who see things differently (*student*, *professors*, *administrators*, *employers*, *etc*), many possible solutions that might be better or worse depending on context, and many interconnected issues (*learning*, *grade inflation*, *academic integrity*, *instructor and student work-loads*, *environmental impacts of resource use*, *etc*) that need to be considered.

EXERCISE 1.3 *Review Objectives and Constraints*

Based on the example problem definition described earlier in this section (It's 7 pm and I'm hungry!), categorize

each of the following criteria as either an **objective** or a **constraint**. For objectives, define the measurement parameters you would use to "grade" each solution option on a scale of 1-3 (3 being the best). How would you rank the objectives from most important to least important to achieve?

- My meal must contain protein
- My meal should have at least one vegetable
- I need to keep the cost as low as possible
- The meal cannot cost more than $20
- I'd like to optimize nutritional content
- The meal must be gluten free
- I don't want to spend a lot of effort on making the meal
- I want to eat as soon as possible
- My meal must be ready by 8:00 pm at the latest
- I like to use locally produced food products whenever possible

Imagine that based on the contents of your kitchen, you came up with 3 possible solutions. Rank these solutions based on how well they meet your objectives and constraints:

> Kraft dinner and canned green beans
>
> Week-old leftover chicken and 3 veggie stir fry (found hiding at the back of the fridge)
>
> Tomato, mushroom and cheese omelette

Notes

1. S.A.C. Flemming and C.R Johnston, "The nature of a problem, problem diagnosis, and engineering design." *Canadian Engineering Education Association (CEEA) Conference Proceedings*, paper 112, June 2020.
2. B. Hyman, "Ch. 2: Problem formulation," in *Fundamentals of Engineering Design*, Upper Saddle River, NJ: Prentice Hall, 2002, pp. 40-54.
3. H. W. Rittell and M. M. Webber, "Dilemmas in a general theory of planning." *Policy Sciences* vol. 4(2), pp. 155–169, 1974. https://doi.org/10.1007/BF01405730.
4. T. Corbin, M. Bearman, D. Boud, & P. Dawson, P. (2025). The wicked problem of AI and assessment. *Assessment & Evaluation in Higher Education*, 1–17, 2025 https://doi.org/10.1080/02602938.2025.2553340

1.2 Conventions and Characteristics

Different kinds of writing employ different strategies, depending on the purpose and intended audience. You are likely familiar with the idea of genre from studying novels, plays and poetry, and from enjoying different genres of movies, music, or video games. We think of these as genres because they adhere to certain conventions that are common to each category. However, genres are more than simple categories based on form; genres are repeated patterns or "norms" of communication that have arisen out of situations that recur frequently enough for us to develop specific and "conventional" ways of responding. Following the conventions of the genre is a key way to meet the expectations of your audience in a given situation.

You might think of is a kind of "programming" or algorithm running in the backend of these specific interactions that provides guidance, not only on form, but also on style, content and structure we might use to effectively communicate in this situation. Genres provide us with patterns for effectively interacting — and meeting the expectations of our audience — in commonly recurring situations.

Technical writing situations may be similar in some ways to academic writing, and therefore some of conventions you may already be familiar with may apply. For example, readers of both genres expect evidence-based argument to support their claims, and a style of language that is fairly formal. However, there are some differences as well. For example, academic writing tends to have longer sentences and paragraphs than technical writing, and tends to use fewer formatting devices like headings, lists, and visuals. Why do you suppose that is? Considering the needs and expectations of the different audiences might give you some insight.

> **Scholars read academic writing** because they are *interested* and want to learn more about the complex research being done in a particular field. They may want to apply it to their own research. Therefore, they are willing to wade through dense prose that is not necessarily formatted for easy reading. In many cases, these are "professional readers" who don't find this task onerous. The writing is designed for highly educated people with expertise in the field.
>
> **People read technical writing** mostly because they have to; it's necessary for them to do their job. The reader may or may not have a lot of technical expertise in the area, so writers need to design the content, format, and style to make the reader's job as easy as possible. Thus, conventions have arisen out of this need that differ from academic ones. Choosing and appropriate genre and following the conventions allows us to "get stuff done."

Readers of technical writing have come to expect certain features in documents to help them

work through and understand the information efficiently. These include (a) use of headings to organize information into coherent sections, (b) use of lists to emphasize key information and present it concisely, (c) use of figures and tables to present visualize data and information, and (d) use of visual design to enhance readability. All of these topics are covered in detail in Chapter 3: Information Design. These conventions arise out the need to fulfill specific **purposes** of technical writing, which include the following:

- Present technical or specialized information in an accessible and usable ways
- Provide clear instructions on how to do complete a task or process
- Convey information that advances the goals of the company or organization.

Technical documentation is intended to communicate information to the people who need it in a way that is clear and easy to read, to help make decisions, support productivity, and achieve goals. Designing technical communication is like designing any other product for an intended user: the ultimate goal is to make it "user friendly."

Key words here are *accessible*, *usable*, *clear*, *goal-oriented*, *effective*, and *reader-centred*. The characteristics of technical writing support these goals and concepts.

EXERCISE 1.4 *Choose an Appropriate Genre*

Imagine that you got into a car accident on your way to a physics midterm. Luckily no one was hurt, but the accident was your fault (you were stressed out, in a hurry, and not paying proper attention), and you were driving your grandma's car, which will need significant repairs before it can be driven again.

You now need to communicate with several people about this incident. Consider (a) why you must communicate, (b) what form of communication to use to best achieve your purpose, (c) what information and details to include, and (d) what conventions and strategies you would use to communicate this incident to the following audiences:

- **Police**: You will need to provide information about the accident and deal with the insurance company.
- **Physics Instructor**: known for being very strict about attendance and punctuality. Since you missed the midterm, you need to request a make-up exam.
- **Your Grandma:** you have to let her know what happened to her car and what you plan to do about it.
- **Best Friend**: once finished at the accident scene, you want to contact your best friend/roommate to get a ride
- **Yourself**: consider how you might write for yourself to reflect on or process this incident.

1.3 Technical Writing Moves and Processes

Just as we employ specific strategies and use defined design processes to creatively solve complex problems, we use strategic **writing moves** and employ iterative **writing processes** to create complex documents. The sections below discuss these in more detail.

Technical Writing Moves

Whether writing for school or work, we tend to use certain recurring rhetorical strategies or "writing moves" to structure our ideas. The list of strategies below is not exhaustive, but covers many of the writing moves we frequently make, and offers some description and examples. Note that these are often used in combination and can overlap. Consider how you might use these in your upcoming writing tasks.

NARRATION: Telling a story can be an effective way to engage your reader and create a personal connection. The narrative usually comes from a distinct perspective, must clearly relate to your purpose, and presents a series of events (beginning, middle, ending) that are linked by cause and effect. Narrative can be a powerful tool to use in a need statement when defining a problem, or when describing user personas and their "pain points."

DESCRIPTION: Technical descriptions use concrete, specific detail to help the reader imagine and understand the described object or process the way the author does. Measurable descriptors might include weight, dimensions, densities, distances, age, colours, materials, speeds, interactions. Descriptions can focus on the sensory experiences of sight and sound, but might also include feel, smell, and taste. You might even use figurative language (metaphors, similes, and analogies) to engage the reader's imagination and help them understand an unfamiliar idea by comparing it figuratively to a familiar concept ("an algorithm is like a recipe").

DEFINITION: Definitions can range in length from a short phrase or sentence (defining a term) to multiple paragraphs (defining a problem). You might define how you are using a word, how you are framing an idea, or treating a controversial idea. Problem Definition, as discussed in Chapter 1.1, may include a complex combination of writing movies such as narration, description, explanation, analysis, summary and synthesis.

SUMMARY: Summaries can have a variety of purposes, but are generally designed to help a busy reader understand large amounts of complex information in a condensed form. **Abstracts** offer a

condensed version of an academic article; **Executive Summaries** provide the key information from a long report. In general, when writing a summary, you should prioritize important information and leave out minor details; you should also condense information accurately and objectively, without editorializing or evaluating; and of course, you should follow conventional citational practices to clearly indicate when you are summarizing someone else's words and ideas.

ANALYSIS: Where a definition might explain *what* something is or does, an analysis tells you *how* it works. It focuses the component parts of a system and how they interact to perform the desired function. For example, a rhetorical analysis seeks to understand how the rhetorical strategies used in a persuasive text work together to appeal to the intended audience. An analysis of a complex machine will show how the various parts connect and work together to achieve the machine's purpose. A process analysis might review the workflow to understand how tasks are completed and how efficiency might be improved. An analysis moves into an **evaluation** when you go from explaining "how" to evaluating "how well" it meets defined criteria.

COMPARISON: We often compare two or more items (or ideas), in terms of specific criteria, in order to understand more about them and perhaps select the most appropriate one for a particular purpose. Comparison focuses on the key similarities and/or notable differences between the items in order to help the reader make a choice or understand the compared items in more detail. Written comparisons often use specific structures such as "block" or "point-by-point" to organize the examination of the items being compared.

ARGUMENT: This is clearly a complex writing move that might include any or all of the above strategies. An argument is intended to persuade or influence the reader's thinking or behaviour in some way. An effective argument should define a context or controversy out of which the argument arises, present a clear position or claim, explain why this position is valid, and provide compelling evidence to support all claims. In some cases, an argument must consider and try to refute opposing arguments. Strong arguments will make strategic use of rhetorical appeals (to emotion, logic, and credibility) to win the hearts, minds and trust of the audience.

SYNTHESIS: Synthesis entails combining and summarizing ideas from different sources and perspectives in order to enhance your own perspective. Like summarizing, synthesis must accurately and objectively represent the ideas of other, and should offer a comprehensive and proportional representation of the sources relevant to the topic. Synthesis might be used to show significant consensus on a topic, reveal the complexity and variety of perspectives on an issue, identify trends in the research, point to gaps in existing research, or even create new understanding by finding interesting connections between seemingly unrelated ideas.

EXPLORATION: you might engage in exploratory writing such as brainstorming, freewriting, concept mapping, making pros and cons lists, and so on, to help you gather your thoughts and generate potential ideas for further research. You might start with a hypothesis or question and

see where your exploratory writing leads you. It can help you solidify your current understanding, test your ideas, and even change your own mind!

REFLECTION: this metacognitive move helps you look inward and understand your own motivations, assumptions, strategies, preferences and processes. Reflecting on experiences helps you learn from them, by considering not only ***what*** you did, but ***how*** and ***why*** you did it, and ***how*** it turned out. Reflecting on what led to success helps you repeat it; reflecting on what actions or assumptions led to problems or failure helps to figure out how to adjust strategies and mindsets to get better results in the future. Reflections can be for your personal use only, but they are also used in professional practice to evaluate current progress and conduct post project reviews.

Enhance your Learning and Performance by Building Reflection into your Processes.

"Life-long learning" is not just a catchphrase – it is a really important part of continual development and improvement. We are all learning at every stage of our lives. As students, parents, employees, managers, we continually need to learn and adapt. One of the most important elements of the learning process is reflection. If we don't take the time to reflect on what we are experiencing and learning, we often don't fully absorb or retain the learning. Reflection is an integral part of continual improvement and growth:

- It helps it determine what is working well (and what we should keep doing) and what is not serving us and needs rethinking.
- It helps us develop and adjust our strategies and processes
- It empowers us to develop greater self-awareness and set goals for ourselves.

You've probably heard the saying, "we learn from our experiences," or "we learn from our mistakes." This is only true, however, if we reflect on those experiences and mistakes. Failure can be one of the greatest teachers, if we take the time to reflect on what happened, why it happened, and what we might do differently next time to get better results.

We might give in to the tendency to "not dwell" on mistakes to try to "forget" them (and the accompanying embarrassment); however, if we do this, then we are likely doomed to repeat these mistakes and failures. Changing our mindset and thinking of mistakes and failures as learning opportunities helps us grow. As a wise kindergarten teacher once said, if you have a belly button, you make mistakes. We all make them, so let's learn from them!

Remember to reflect on and celebrate the successes too! Reflecting on what went well and what you did "right" helps you to repeat and refine the strategies and processes you used to get there.

Exercise 1.5 *Writing Moves in a Problem Definition*

Consider how many of the above writing moves you might use when writing a thorough Problem Definition and use these to draft one for an upcoming task:

- **Narration**: When describing the "need" for a solution, you might tell the story of specific people who are impacted by the current "unsatisfactory situation." The story might help establish empathy for those currently dealing with the problem.
- **Description**: you might describe the negative impacts of the current situation in measurable ways. You might also **compare** the current situation to the improved future situation once a solution has been implemented.
- **Definition**: While the entire thing is a definition, you might include smaller definitions within to define specific solution requirements (objectives and constraints that any solution needs to adhere to) or technical terminology that might be unfamiliar to your reader.
- **Argument**: In some cases, you might be need to persuade your reader that a problem actually exists that really needs to be solved. You may also need to convince them that the criteria you have chosen to evaluate potential solutions (your measurable objectives) are appropriate. You may need to justify your scope.
- **Summary & Synthesis**: a thorough problem definition will include research from a variety of sources to help identify the need for a solution and justify the evaluation criteria you will use to select a solution.
- **Exploration**: In planning your problem definition, you might engage in exploratory writing to help you brainstorm ideas (how to limit scope, define measurable objectives, structure content, etc).

Writing Processes

Using or developing an effective process helps us to engage in complex tasks. For example, a design process allows us to understand and solve complex problems in a systematic way. Without a clear process to follow, we would have a hard time developing feasible solutions. The same is true for complex writing tasks. Without a clear process, our writing might lose track of focus or purpose, go down a tangential "rabbit hole," or meander incoherently. A writing process mirrors a design process in many ways in that we must understand our purpose and audience (define the problem), conduct research, design the content (or solution), and iterate (revise/edit) as needed.

In both design and writing processes, there are steps or stages, but we don't always proceed directly from one step to next in a chronological manner. These processes are often iterative, meaning we might return to previous stages in the process from time to time. The more complex the task, the more iteration might be needed. Examine the Design Process (**Figure 1.3.1**) and Writing Process (**Figure 1.3.2**) diagrams below. What similarities and differences can you see in these two processes?

Figure 1.3.1 *Design Process.* [1] [Image description]

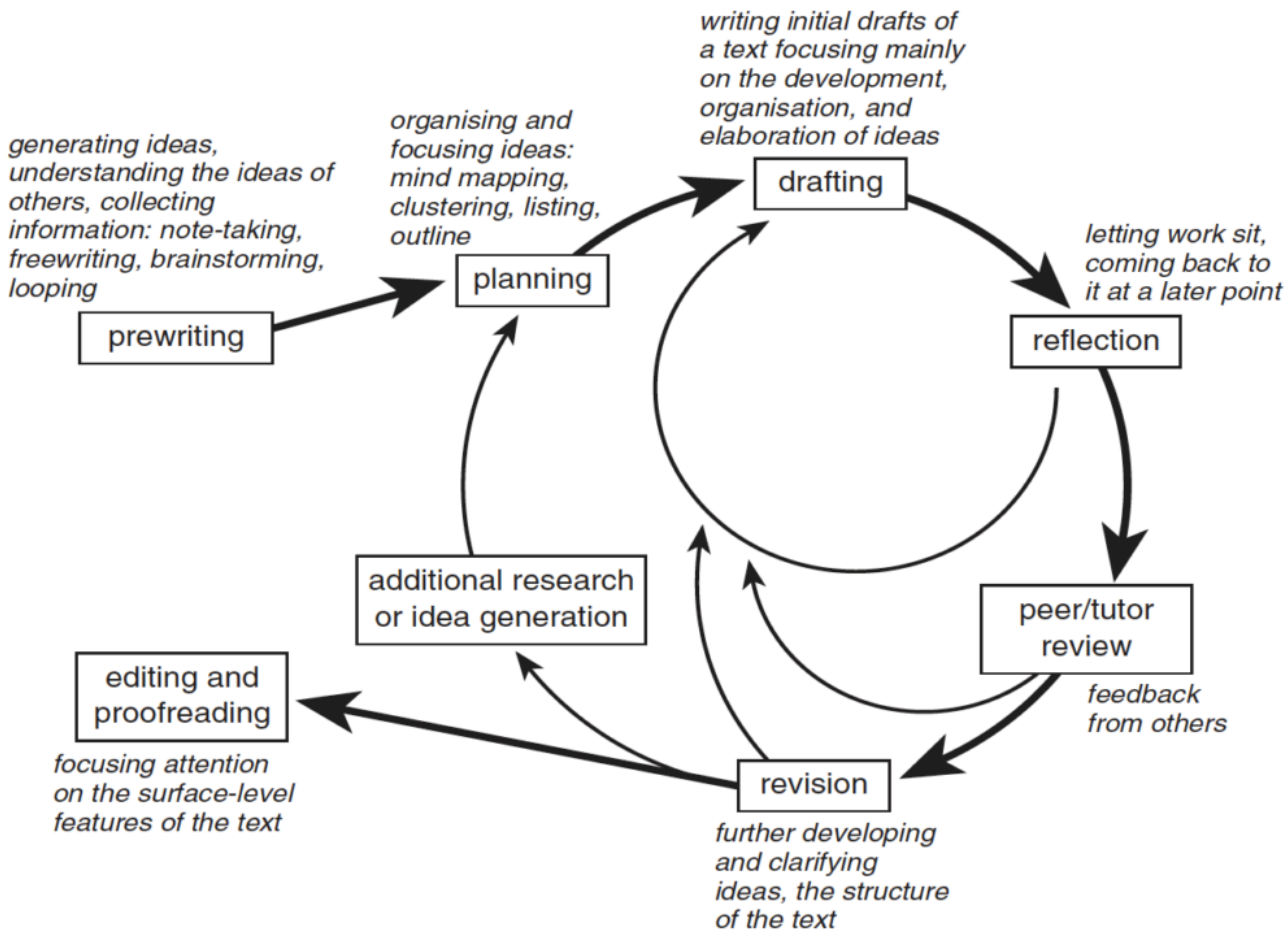


***Figure* 1.3.2** *Writing Process Diagram.* [2] [Image description]

You may have come across a "writing process" before, and it may or may not have worked well for you. There is no single process that works for everyone in every situation. The key is to recognize the various steps in a typical writing process and figure out how to use or adapt them most effectively for your situation.

For example, you may have come across the 40-20-40 writing process, which suggests that you should break up the amount of time you spend on the writing task into three distinct stages of planning, drafting and revising, and give each one a specific percentage of the time you have available.

40-20-40 Writing Process

Stage 1 – Planning: spend 40% of your time planning your document (task analysis, thinking, discussing, free-writing, researching, brainstorming, concept mapping, focusing ideas, outlining, *etc.*)

Stage 2 – Drafting: spend 20% of your time writing a rough draft (quickly getting all your ideas down in print, in more or less complete sentences and paragraphs, in more or less the right order, without agonizing over style or grammar choices)

Stage 3 – Revising: spend 40% of your time reviewing, revising, editing, and proofreading (polishing your draft, making sure the content is complete and well supported, ideas flow logically, formatting meets expectations, and the style uses the appropriate tone and vocabulary).

These percentages are a helpful guideline, as they emphasize the need to allot significant time for revision, but don't always work for all people in all situations (think of a final exam situation!). It also does not clearly account for collaboration processes or the need to iterate; sometimes while revising your draft (stage 3), you may have to go back to the planning stage (stage 1) to do additional research, adjust your focus, or reorganize ideas to create a more logical flow. Writing, like any kind of design work, demands an organic and dynamic process that is appropriate for the situation.

To help you develop writing processes that you can use in a variety of rhetorical situations, consider the elements of the **AWARE** framework in **Figure 1.3.3**. It includes the need to **analyze** (the problem, the task, the intended audience) and **arrange** or outline potential ideas; **write** (draft content); **assess** what you have so far, **revise** based on your assessment, and **edit** the final version. Not every writing task necessarily includes all of these elements, but the more complex that task, the more you need to consider how you will work these elements into your process.

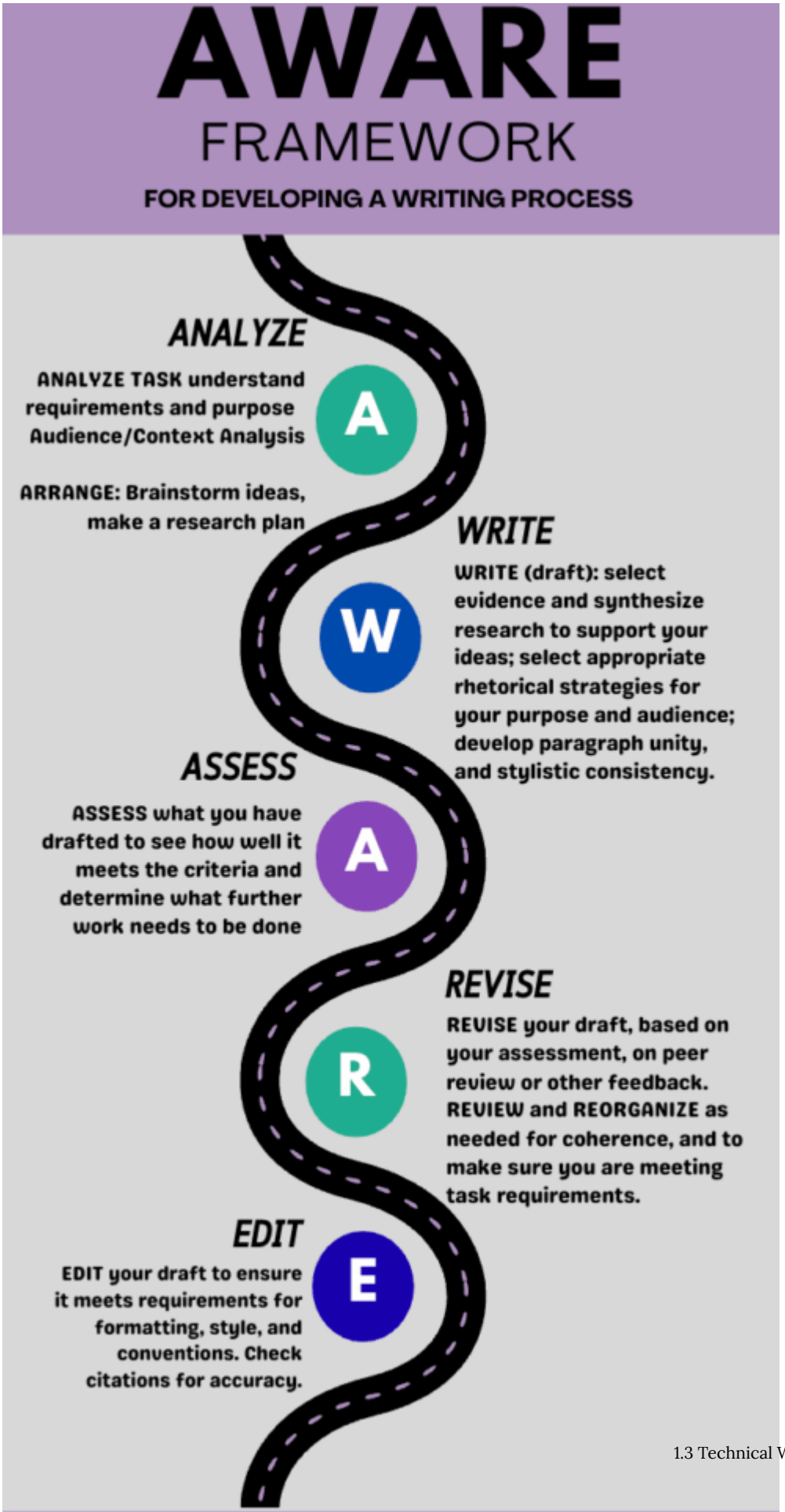


***Figure* 1.3.3** *The Aware Framework for developing a writing process*

As with the design process, the writing process must begin with an understanding of the problem you are trying to solve and why you are trying to solve it. In an educational context, this means understanding the assignment you've been given, the specifications of that assignment, the objectives you are meant to achieve, and the constraints you must work within (due dates, word limits, research requirements, *etc.*). This is often referred to as "Task Analysis." In professional contexts, you must also consider who your intended reader(s) will be, why they will be reading this document, and what their needs are, as well as deadlines and documentation requirements.

EXERCISE 1.6 *Plan your process for writing an assignment*

Consider an upcoming writing assignment or task you must complete. To avoid putting it off until the last minute (and possibly doing a poor job), try planning a writing process for this task, and build in milestones. Anticipate how long various sub-tasks and stages might take. Make sure to include time for "task and audience analysis" to fully understand what's involved before you start. Consider the following:

- What is the purpose of the document? What are the specific requirements? Who will read it and why?
- How much planning is needed? What will this entail? Will you need to do research? Do you need to come up with a topic or focus, or has one been assigned to you?
- How complicated will the document be? Will it have several sections? Graphics? How much revision will be needed to perfect your document? Will you have time for a peer/tutor review?

Now try using the **Assignment Calculator** to see if it offers something similar to your planned writing process.

Image descriptions

Figure 1.3.1 image description:

A design process flow chart that encourages you to revisit previous steps as needed.

1. **Define the problem.** This involves a needs assessment, problem statement, designing criteria and goals and background research.
2. **Generate possible solutions.** Brainstorming using the idea trigger method, thumbnail sketching, and creative thinking. At this point, you may need to revisit your problem

definition. Once you have a number of possible solutions, move on to the next step.

3. **Evaluate possible solutions.** Do ideas meet design criteria? List the advantages and disadvantages. Select the best design alternatives. Use a decision matrix to evaluation. At this point, you may need to revisit your problem definition or brainstorm some more. Once you have evaluated possible solutions, move on to the next step.
4. **Make and test a model.** Create detailed technical drawings, prototype or scale model, mathematical and computer models, Conduct performance and user tests. At this point, you made need to go back to brainstorming solutions or evaluating possible solutions. Once you have a model you are happy with, move on to the next step.
5. **Modify and improve design.** Fix problems, improve design, do more testing if needed. In the worse case, scrap the design. You may need to go back to evaluating possible solutions to making and testing the model. Once you have a design you are happy with, move on to the next step.
6. **Communicate final design.** Create final technical drawings, and technical manuals for assembly, operation, and maintenance.

[Return to Figure 1.3.1]

Figure 1.3.2 image description:

A writing process diagram that encourages constantly revisiting previous stages.

1. **Prewriting.** This stage is for generating ideas, understanding the ideas of others, and collecting information (note taking, free-writing, brainstorming, looping).
2. **Planning.** Here, you are organizing and focusing ideas. This may involve mind mapping, clustering, listing, and creating outlines.
3. **Drafting.** In the drafting stage you are writing initial drafts of a text focusing mainly on the development, organization, and elaboration of ideas.
4. **Reflection.** In the reflection stage, you can let the work sit and come back to it at a later point. You may cycle back between drafting a reflection a number of times before moving on.
5. **Peer/tutor review.** Now you can get feedback from others. This may require you to return to the drafting and reflecting stages.
6. **Revision.** Here you are further developing and clarifying ideas and the structure of the text. This may require you to return to the drafting and reflecting stages. If the work requires additional research or idea generation, return to the planning stage.
7. **Editing and proofreading.** Here the focus is on surface-level features of the text.

[Return to Figure 1.3.2]

Notes

1. "The Engineering design process," Tufts University, [Online]. Available: https://engineering.tufts.edu/ggs/designprocess.htm.
2. M.J. Curry and A. Hewings "Approaches to teaching writing," in *Teaching Academic Writing: A Toolkit for Higher Education*. New York: Routledge, 2003. Used with permission.

1.4 Gen AI and Technical Writing

NOTE: *AI technology is moving fast (and likely breaking things), so as I write this in spring 2026, I acknowledge that both AI technology and the research on the impacts of that technology will develop rapidly, and this chapter may soon require updating.*

Generative AI may well become a legitimate part of professional writing practice; indeed, it already has in some quarters. Given that technical writing often follows well-defined genre conventions and patterns, Large Language Models (LLMs), which are very good at replicating patterns, may be an effective tool to help technical writers work efficiently in some contexts. However, the need for precision and accuracy in technical writing means that humans need to exercise extreme caution and diligent oversight when using AI generated content. This textbook does not offer instruction on "how to use Gen AI" to help you with your professional communication. There are three main reasons for this:

- As students and aspiring professionals, it's crucial to develop the distinctly human competencies involved in professional communication practices, even if sometime in the future, you use Gen AI to help you do this work. Increasingly, research is showing that using AI at the early stages of developing these competencies can negatively impact your cognitive development, and over-reliance can result in "de-skilling" and cognitive decline.
- Content generated by AI is prone to biases, errors, and fabrications that require skilled human oversight (the kinds of skills you are meant to develop in a university writing course) to detect and correct.
- As an author and educator, I have ethical concerns about the social and environmental costs of using Gen AI as part of my professional teaching and writing practice. Many of my students have expressed similar concerns.

Since the free public release of Chat GPT and other commercial AI tools in 2022, many students have chosen to use Generative AI to help them complete assignments in school. At the university level, we are beginning to see serious problems resulting from students' over-reliance on these tools, in terms of eroding high-level cognitive skills [1] such as reasoning, critical thinking, problem-solving, brainstorming, researching, collaborating, and communicating. The development of these cognitive skills is necessary for success in our information ecology.

Students' inappropriate use of AI is also resulting in a dramatic increase in academic integrity

violations [2] These violations happen for a variety of reasons, but often result from a poor understanding of what Gen AI is and what its limitations are.

Whether or not you intend to use Gen AI, it is important to develop Gen AI literacy. Therefore, this chapter provides information to help you critically consider the following questions:

1. What is Gen AI? How does it work? What are its limitations?
2. How could using Gen AI impact your learning?
3. What are implications for Gen AI as part of professional practice?
4. What are the larger social and environmental impacts of using Gen AI?
5. How can Gen AI be used ethically and responsibly?

NOTE: You may choose **NOT** to use AI for a variety of reasons, and that is a perfectly valid choice. An increasing number of professionals and students are refusing to use AI. It is still important to understand how AI is being used and the impacts it is having, since your classmates and future colleagues may be using GenAI, and this might impact you in the classroom and workplace.

---

1. What is Generative AI?

Yuval Noah Harari, author of *Sapiens* and *Nexus: A Brief History of Information Networks from the Stone Age to AI*, defines AI in general as not just a "tool" we might use, but as an "agent," something that can "learn and change by itself and come up with decisions and ideas that we can't anticipate." He argues that instead of thinking of this as "artificial" intelligence (suggesting that we have some control over it) we should think of it as "alien" intelligence, one that works very differently from our own and can make unilateral decisions that may have serious impacts on us.[3] Mackenzie *et al.* (2024), in their comprehensive Generative Artificial Intelligence (Gen AI) Overview, define GenAI more specifically as a type of artificial intelligence that can generate new content such as text, code, images, audio, and video by extrapolating from its training data.

Gen AI is a **Large Language Model** (LLM) that analyzes vast amounts of training data to learn the statistical relationships between words and phrases occurring together, and uses the training data to generate "natural language" responses to prompts that rely on "probability" – somewhat like how your cell phone offers predictive text as you type, based on the probability of what your next word is likely to be. Therefore, it's not "thinking" or creating "meaning," but rather generating

probabilistic word chains to provide the most predictable and plausible-sounding response, based on the material in the training data. It can scan the training data very quickly, and confidently provide plausible-sounding results, but what it generates is simply based on the most commonly found combinations of words and phrases, not necessarily the most accurate information, making it necessary for ***you*** to review, fact-check, and likely revise the output.

Consider this quotation from the 2024 book, *AI Snake Oil*, that attempts to counteract some of the AI "hype" we are constantly exposed to.

> "Philosopher Harry Frankfurt defined bullshit as speech that is intended to persuade without regard for the truth. In this sense, chatbots are bullshitters. They are trained to produce plausible text, not true statements. ChatGPT is shockingly good as sounding convincing on any conceivable topic. But there is no source of truth during training. Even if AI developers were to somehow accomplish the exceedingly implausible task of filtering the dataset to only contain true statements, it wouldn't matter. The model cannot memorize all those facts; it can only learn the patterns and remix them when generating text. So, many of the statements it generates would be false."
>
> (Narayanan & Kapoor, *AI Snake Oil*, 2024).

Recent research on AI has highlighted several serious concerns discussed below.

Language Homogenization

There is significant worry that widespread use of LLMs will result in a homogenization of language and thought[4] based on the probabilistic model it uses. Increasingly, the training data used by LLMs will include content generated by LLMs, creating a vicious cycle of language homogenization where AI is simply regurgitating new versions of its own previously-generated content. A key goal in honing your communications skills is to develop your own "voice" and writing processes. While using AI may help you "sound more professional", it also robs you of the opportunity to develop your own voice and style, as well as a sense of how to adapt it for different audiences, and can have the effect of silencing student voices.[5]

Privacy Issues

LLMs like Chat GPT are trained on a wide range of sources including books, reports, datasets,

code, but increasingly, much of the training data is coming from websites and social media, especially sites like Reddit, which signed a lucrative contract[6] to allow its content to be used as training material. Many of the these "datasets" may not be considered sources of accurate or credible information, but they do provide examples of "natural language patterns" for AI to emulate. For a while, OpenAI was even using prompts and interactions created by users of ChatGPT as training material, resulting in private chats showing up in Google searches![7] Many users were outraged at the public release of their private chats. Data privacy is a major concern when using commercial AI tools. They may be "free to use" but these companies are collecting copious amounts of personal data from users! And it's been said that "data is the new oil." Also consider the possibility that every time you use AI, you are training it, possibly to take the job you hope to get when you finish university!

Bias

The content generated in response to a user's prompt is based on datasets that may not always present accurate or reliable information. They can also replicate and even amplify biases inherent in the training data the AI is learning from. Data that contains content that discriminates against or marginalizes underrepresented, minority, and equity-deserving groups may appear and be amplified in AI generated outputs. As a result, outputs may be racist, sexist, ageist, ableist, homophobic, transphobic, antisemitic, Islamophobic, xenophobic, deceitful, derogatory, culturally insensitive, and/or hostile. While companies like Open AI have made attempts to address this, the risks persist. For a visually illustrated example, watch this YouTube video on "How AI Image Generators Make Bias Worse."

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://pressbooks.bccampus.ca/technicalwriting2ed/?p=315#oembed-1

Errors, Inaccuracies, and "Hallucinations"

Probably the most concerning issue for you as students, and for professionals in any workplace, is the fact that content generated by LLMs can be highly unreliable, even though it *appears* plausible and professional. A lay person might not immediately spot any problems in the content

it generates, but an expert in the field would quickly notice information that contained errors, inaccuracies, and outright fabrications. Below are some recent examples that provide cautionary tales for why we must use Gen AI with extreme caution and exercise diligent human oversight:

> "Deloitte's AI Fallout Explained: The $440,000 Report That Backfired"[8] explains how the consulting company, Deloitte, had to refund money to the Australian government after a report they created for them (using ChatGPT) was found to contain "fabricated academic citations, false references, and a quotation wrongly attributed to a Federal Court judgment."
>
> AI Hallucination Cases[9] in legal court cases where lawyers were found to have include AI hallucinated content (fake case studies, citations and other arguments) in the documents they submitted to the court. Between Feb 2024 and Feb 2026, this databased tracked 54 cases in Canada alone! And 754 worldwide.
>
> An academic article proposing a method for using AI to diagnose Autism[10] published in *Nature* in Nov 2025 was retracted in December 2025 after many readers noticed that it contained a nonsensical AI-generated infographic (see link to Fig. 1) purporting to illustrate the methodology.

The professionals writing the report for Deloitte and the lawyers trying to build cases to defend their clients were (hopefully?) not aware of the potential for AI to hallucinate in this way – and it likely cost them in terms of professional reputation and financial penalties. *Nature* magazine's reputation for publishing high quality academic research suffered a blow for allowing AI generated nonsense to be published on its site.

This is why it is important for you to develop AI literacy – an understanding of how Gen AI works and what its limitations are – so you don't make the kinds of mistakes they did. Making those kinds of errors and including fabricated data in an academic context is a violations your institution's Academic Integrity Policy. Making them in the workplace can have dire legal and financial implications!

Here are some resources to help you understand why LLMs can be unreliable, and how to spot unreliable output:

- This YouTube video, "Why Large Language Models Hallucinate," provides a clear explanation for why Chat GPT and others generate hallucinations, factual errors, outdated information, and sometimes just plain nonsense.
- "How to Spot AI Hallucinations like a Reference Librarian"[11] is ***essential reading*** if you plan to use AI to help you conduct research and synthesize source material provided by AI into your argument.
- Given the fact that AI enables the creation of misinformation, disinformation and

malinformation (MDM) such as fake news, deep fakes and so on, many organizations have developed resources to help people vet the credibility of information. Here is information from Camosun College on how to Identify Misinformation, Disinformation, and Maliniformation.

---

2. How Does Using Gen AI Impact Learning?

Early in childhood, our brains produce an over-abundance of neurons and synapses to allow us to prepare for, adapt to, and thrive in a variety of environments. During childhood and adolescence, and even into our late twenties, a process of "synaptic pruning" takes place, where our brains reduce the excess neurons and synaptic connections based on a "use it or lose it" principle. The brain removes weak or unused synapses to focus on strengthening the ones that we use more frequently. Thus, turning to AI to deal with challenging and difficult tasks means missing out on the opportunity to strengthen important skills, and you may risk losing crucial cognitive abilities. See What You Need to Know about Brain Pruning and AI for more information.

Writing courses tend to focus on helping students develop The 4 Cs of 21st Century Learning Skills (communication, collaboration, critical thinking and creativity), and "habits of mind" as part of the process for communicating effectively and problem solving. One of the key habits of mind is "persistence" – the ability to keep trying, persevering even though something is difficult, confusing or even frustrating. This challenging phase — when you feel the most frustration — is when learning is actually happening! Using Gen AI to ***offload*** the cognitive labour of brainstorming, researching, planning, drafting, and revising circumvents the development of the very cognitive skills that courses like this are meant to help you develop.

Imagine being in an important meeting with colleagues, discussing an emergent issue; the chair of the meeting asks everyone to engage in a brainstorming session to start working on ways to address the problem. If you can't do this without AI, you won't be much use at this meeting! I have heard executives say that they would not trust someone who relies on Gen AI to communicate face-to-face with clients. Using AI to do the work for you is like skipping the "brain training" that helps you develop higher order thinking skills. It's like skipping the cardio part of your fitness training; AI can't do your cardio for you!

What does the research say? Recent studies examine how AI impacts learning

Klimova and Pikhart[12] reviewed 24 studies done between 2019-2024 on the impact of AI on learning. From this research, they concluded that "while AI offers benefits such as personalized learning, mental health support, and improved communication efficiency, it also raises concerns regarding digital fatigue, loneliness, technostress, and reduced face-to-face interactions. Over-reliance on AI may diminish interpersonal skills and emotional intelligence, leading to social isolation and anxiety." The research also raises serious concerns about over-reliance and dependence on AI leading to diminished creativity, critical thinking, collaboration, and problem-solving skills.

A 2025 study,**Your Brain on ChatGPT**,[13] used electroencephalography (EEG) to record participants' brain activity to assess their cognitive engagement, cognitive load, and neural activations while engaging in an essay writing task. They compared the levels of neural connectivity in three groups of students asked to write SAT style essays: one using only their brain, one group could use Google search to look up relevant information, and one group used ChatGPT. The EEG readings showed that the "brain only" students had strongest and most distributed neural networks, while those who used AI had weakest neural connectivity. In post writing tasks, those who use AI assistance showed poorer memory recall; they had a lower ability to quote from the essay they had just written minutes earlier. In follow up sessions, the group using AI "performed worse than their counterparts in the Brain-only group at all levels: neural, linguistic, scoring" (Kosmyna & Hauptmann, 2025).

Budzyn et al., in their 2025 *Lancet* article "Endoscopist deskilling risk after exposure to artificial intelligence in colonoscopy,"[14] found that using AI based imaging for reading endoscopy results lead to potential "deskilling" of physicians in their ability to identify lesions without AI assistance.

AI and Writing Skills

Writing skills are developed through deliberate practice. Just as workouts build your actual muscles, writing builds your cognitive muscles. And writing is hard work! It's a fantastic workout for your brain! If you don't use the muscles, they atrophy. When I was young, I had dozens of phone numbers memorized for my friends, family, and workplace. Now that I have a cell phone that does this for me, I don't even remember the phone numbers of my own children! I have lost this cognitive skill, not due to age, but to disuse (synaptic pruning).

As with anything related to algorithms, the saying "garbage in, garbage out" applies. To elicit useful

output from Gen AI, you have to be able to write clear, concise, concrete, and coherent prompts that include information about purpose, audience, context, and genre. If you don't have a clear understanding of the task, audience, and rhetorical situation to begin with, or don't have the requisite writing skills to design effective prompts, you won't be able to construct prompts that will generate useful content. Even if you do, you will need the knowledge and critical thinking skills to review, evaluate, and revise the generated output to ensure that the content

- Is accurate, reliable, and unbiased
- Meets the stated and implicit requirements of the task
- Follows the genre conventions and expectations
- Uses a suitable tone, style, and vocabulary for your intended audience.

If you plan to Gen AI, this is the "due diligence" required so that you can actively build your skills and knowledge and accurately demonstrate your learning in the course. This kind of vigilance may well be more work than simply writing the work yourself without AI.

3. Gen AI and Professional Practice

Many workplaces might require you to have proficient AI literacy, but also require you to have distinctly human competencies (the 4 Cs mentioned previously). Therefore, you cannot develop one at the expense of the other. But also consider that many organizations are developing policies to protect themselves from problematic AI use, and some organizations prohibit the use of Gen AI altogether. TFL maintains a "running list of key AI lawsuits" tracking all cases involving intellectual property and copyright violations. The sheer number of ongoing cases demonstrates the need for more robust regulations. Gen AI may nor may not live up to the hype currently being generated by the companies building and promoting it, and people are increasingly calling for regulations and even bans.

What do Professionals say about using AI Professionally?

Josh Anderson,[15] a senior software engineer, describes his experience of going "all in" on using AI to build code, only to discover that the MIT Study[16] – claiming that **95% of corporate AI initiatives fail** – was right! He used

AI to generate a complex code, launched the product much earlier than expected, and everything seemed great, until he needed to make a small change in the code and realized he "wasn't confident he could do it":

> "Twenty-five years of software engineering experience, and I'd managed to degrade my skills to the point where I felt helpless looking at code, I'd directed an AI to write. I'd become a passenger in my own product development."

Anderson warns that 100% adoption of AI may look successful and efficient at first, but months later, you realize that no one fully understand what the AI built, how it built it, or how to fix or modify it; they can't debug code they didn't write, can't explain decisions they didn't make, and can't defend or refine strategies they didn't develop.

Ethan Mollick[17] performed experiments in workplaces to see how AI impacted efficiency and quality of work. His findings were similar to Anderson's. At first, AI seemed to improve efficiency and quality, and even "levelled up" some employees' skills. However, he found that over time, over-reliance on AI made people "careless and less skilled in their own judgment." When workers let AI take over instead of using it as a tool, it negatively impacts human learning, skill development and productivity. Mollick defined two effective approaches to using AI:

> **Centaur Approach:** using the half human/half horse creature of Greek mythology, he asserts that humans should be the "head" of the centaur, making the strategic decisions to determine what "leg work" the AI should do.
>
> **Cyborg Approach**: this approach is more collaborative, where humans work in tandem with AI. He recommends this approach for writing tasks, and asserts that when this model is used effectively, the results are better than what either the human or the AI could achieve alone.

He warns against "going on autopilot" when using AI and "falling asleep at the wheel." This is when people fail to notice the mistakes that AI inevitably makes.

Cory Doctorow[18] warns about the "reverse centaur" approach, where AI is in charge, telling the humans what to do, and humans are scrambling to detect and fix all the errors that AI can make at superhuman speed. The fact that AI is prone to hallucinating makes it a very bad "head" of the centaur: "the one thing AI is unarguably *very* good at is producing bullshit at scale." He acknowledges that the centaur model could offer many benefits to workers, but warns that the path to profitability presented by most companies lies in the *reverse* centaur model, which will be brutal for workers (think Amazon packing warehouse!).

Michael Alley, offers some Strong examples of AI Writing in Engineering and Science,[19] but you'll note when reading that in each case, the humans involved needed to have the expertise and skill to fact check and revise the AI output to make it suitable for professional purposes and audiences.

Clearly, even in the most collaborative use of AI contexts, human oversight is required. And this oversight requires experience and expertise. Consider that every time you are using a commercial

AI product, you are contributing to its training, and potentially teaching it to do the job you hope to have someday! At the same time, learning how to use it to collaboratively create content that you are ultimately in control of and responsible for will likely be a useful skill in some workplace contexts.

4. Costs of Gen AI

Wait, isn't ChatGPT free?

Just because you are able to use GenAI for free does not meant that there are no costs. Indeed, you have to wonder why you are being inundated with advertisements that encourage you to use a product that you can access and use for free — for now, at least.

Many people are becoming increasingly concerned about the costs involved in creating the infrastructure and training necessary for AI to operate, as well as the current and potential costs that using these systems have on society and the environment. Some even see AI as a potential existential threat for humanity! The sections below provide some resources that discuss the current and potential costs of AI that we need to consider if we are going to use the technology for tasks like helping us with a writing task.

Environmental Costs

Data centres require enormous amounts of energy and water to run and cool the massive servers needed to process all the data and information we request from AI. No one really knows how much energy and water, because the AI companies tend to not want to disclose accurate information.

> Christopher Pollon argues that Big Tech Is Hiding the Environmental Cost of Chatbots[20] making it difficult to manage resources or measure and plan for the environmental impacts. Pollon cites a report calculating that 30% of the electricity used by data centres worldwide comes from coal powered plants. In the U.S. and China, the largest AI data centre markets by far, "most of the electricity consumed by data centres is produced from fossil fuels."
>
> Kate Crawford's 2024 article[21] focuses on the massive water requirements of AI data centres. Estimates of their water usage have been made by scientists, relying on lab-based studies combined with the limited information these companies actually report. AI companies are not legally required to disclose this information, and there is no incentive for them to do so.

For some additional context, read AI's Challenging Waters[22] (Privette, 2024) and watch this *YouTube* video, A 'Thirsty' AI Boom Could Deepen Big Tech's Water Crisis (CNBC International, Dec. 2023).

Social Costs

These environmental costs inevitably lead to social costs. Pollon (2025) describes one case where the environmental issues impacted a community:

> "Elon Musk's xAI shined a spotlight on the Wild West of backup data-centre power systems about a year ago, when it established dozens of portable methane gas generators at a big data centre in Memphis. Up to thirty-five generators were on site without a permit—until members of a poor downwind Black community rose up in response to the emissions."

Crawford (2024) reported that "in West Des Moines, Iowa, a giant data-centre cluster serves OpenAI's most advanced model, GPT-4. A lawsuit by local residents revealed that in July 2022, the month before OpenAI finished training the model, the cluster used about 6% of the district's water." That was just the training phase. Once fully operational, the "inferencing" stage may require substantially more resources.

The International Economic Development Council (IEDC) in March 2025, published a literature review examining how AI will impact labour markets.[23] They predict which jobs most likely to be lost and gained in the coming years, and discuss the pros and cons of integrating AI into the workplace. While AI might improve efficiency, job quality and innovation, it also will lead to job displacement, deskilling, inequality, and have a disproportionate effect on vulnerable groups.

We can already see serious labour issues in the current work required to train AI models.

> Billy Perrigo's 2023 *Time Magazine* article drew attention to labour exploitation in Kenya[24] where OpenAI hired workers for $2/hour to sift through the training material to identify and remove toxic language and images to make ChatGPT "safe" for users.
>
> Daxia Rojas, in a 2025 Bloomberg article, explains other instances of the "Gruelling low paid human work behind generative AI curtain."[25] As long as Generative AI models are based on automated learning, they rely on sub-contracting millions of human beings to verify and label the data that trains them. This can be anything from helping self-driving cars learn to distinguish between images of trees and pedestrians, to reviewing autopsy reports, to removing violent or obscene content from social media. Because the industry has no

significant regulation, data labellers tend to be young, work long hours for very low pay, and have precarious work conditions.

Lawsuits have been brought against companies claiming that workers are exposed to traumatizing content without adequate safeguards. For example, one worker claimed they were "required to converse with an AI chatbot about topics such as 'How to commit suicide?', 'How to poison a person?' or 'How to murder someone?'" Others are required to examine and tag pictures of dead bodies, sexually abusive and violent images and videos, and other traumatizing content for hours on end.

There is a worrisome tendency to "anthropomorphize" AI agents, that is, to attribute human characteristics, motivations, and emotions (such as empathy) to chatbots. Even though they are designed to seem "human-like," AI agents do not think, reason, or feel emotions as humans do. Current chatbots are designed to please, or even flatter the user, not interact in truly meaningful ways. While anthropomorphism can make technology *feel* more engaging and user-friendly, it can result in people trusting unreliable information and lead to unhealthy social relationships.

The Asilomar AI Principles suggest guiding principles that should be put in place to ensure that AI is intentionally developed in a way that will be ***beneficial*** and not simply an "undirected intelligence" motivated purely by profit.

Existential Threats

The rapid speed at which AI is being developed and released led over 100 leaders in AI technology to write an open letter in March 2023 urging a global pause on AI training of systems more powerful that GPT-4, or a government imposed moratorium. The purpose of this pause would be to temporarily halt the "arms race" of AI development in order to create a set of shared protocols, regulations, governance structures and oversight bodies for advanced AI development that would protect humanity from potential harm that we cannot even predict at this point, let alone control.

> "As stated in the widely-endorsed Asilomar AI Principles, Advanced AI could represent a profound change in the history of life on Earth, and should be planned for and managed with commensurate care and resources. Unfortunately, this level of planning and management is not happening, even though recent months have seen AI labs locked in a out-of-control race to develop ever more powerful digital minds that no one — not even their creators — can understand, predict, or reliably control."
>
> Excerpt from *Pause Giant AI Experiments: An Open Letter*

Yuval Noah Harari, in his speech at Davos (linked below) warns us about the consequences of AI taking over all aspects of society that is made up of words (legal systems, religious systems, *etc*) and especially of the dangers that might arise from AI agents being granted legal rights as persons who can own property, open bank accounts, run corporations, and contribute to political campaigns. You can watch his speech here:

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/technicalwriting2ed/?p=315#oembed-2

5. Ethical Approaches to Gen AI

Deciding whether or not to use Gen AI to help you with your assignments means undertaking a highly complex "cost/benefit analysis" that will, at least in part, be based on very personal ethical choices. If you do choose to use it, here are some guidelines to follow to help you use it responsibly and ethically.

Guidelines for Responsible and Ethical Use of Gen AI

1. Review your institution's policy on AI use; you might find this embedded in the Academic Integrity Policy in a university, or it might be a separate policy. This will apply to all members of the institution.
2. Review the Syllabus or Course Outline for course-based policies on AI use that may be more specific than the institutional polices (departments within organizations may have different expectations and regulations). If there is no policy in the syllabus, ask your instructor for guidance on what their expectations are around use of AI tools.
3. Carefully read the assignment instructions to see if there is any specific guidance on use of AI tools. Be sure to abide by the expectations provided. If there are none, again, ask your instructor or supervisor for guidance before using AI.
4. Attend workshops and seek instruction on how to use Gen AI effectively and ethically. For example, your library may offer workshops on **Prompt Design** and **Using AI for Research**.
5. Do your "due diligence" by reviewing any AI generated content for errors, inaccuracies, biases, hallucinations and any other form of "confidently presented bullshit." You are responsible for fact checking, evaluating, and revising the content to meet the needs of your task and audience. You are

responsible for the work you submit; this means that submitting work that contains errors and fabricated data — even if these were generated by AI — will lead to consequences for ***you***.

6. Be sure to cite and document how you have used AI in the creation of your assignment. You may be asked to include a "Use of AI Disclosure" statement appended to your work, so be prepared to include relevant information about which AI tools you used, how you used them, and how you adapted the AI output. Keep in mind that AI generated content **cannot be considered *your* work**, and you cannot ethically submit it as your work. You must cite it appropriately, using the citational practices required.
7. Never feed someone else's work (their intellectual property) into an AI prompt without their explicit permission. Some people do not want their intellectual property given away to commercial AI companies to use as free training data.

If you would like more guidance on how you might ethically and effectively use Gen AI as part of your professional writing practice, I suggest Potter and Hylton's Generative AI in Content Creation[26] (an adaptation of this textbook that includes instruction on how to use Gen AI as part of your writing process), as well as resources and workshops offered by your university's library.

Exercises and Activities

1. **AI Use Cases**: Form a group and discuss whether and how you have used Gen AI tools in the past to help you with various tasks. What AI tools have you used and how? For example, brainstorming, doing background research, planning/outlining, drafting content, revising content, getting feedback on your content, editing content, finding and integrating research sources, citing sources, creating graphics or data visualizations, other uses? Or do you refuse to use AI? Discuss amongst yourselves if and how you have used AI in these or other ways, and how effective it was, what kind of additional "human" work you had to do, and what you learned from the process.
2. **Use of AI Policy**: If you are working on a team project, develop a detailed "Use of AI Policy" that all team members agree to abide by while working on the project. Make sure your policy is consistent with your course and university policies.
3. **Cost/Benefit Analysis**: Conduct an informal cost/benefit analysis to determine whether the potential benefits of using Gen AI outweigh the known (and potential) costs.
4. **Learning Goals**: Identify 3 key learning goals that you have related to developing professional communication skills. How might using Gen AI tools either support or circumvent your achievement of those goals?
5. **SWOT Analysis**: Based on what you now know about Gen AI, conduct a SWOT Analysis to determine the Strengths, Weaknesses, Opportunities and Threats involved in using Gen AI as part of your writing process and work flow.
6. **AI Usage Label**: use this AI Usage Label generator to create a label (like a nutritional label on a food product) to indicate where and how you have used AI in a specific document.

AI Usage Facts

For Manuscript: **Technical Writing Essentials 2nd Ed.**

By: **Suzan Last, et al.**

Total AI Contribution 0%

% of stage with AI	
Conceptualization and Scoping (weight: 25%)	**0%**
Literature Review (weight: 25%)	**0%**
Investigation and Data Collection (weight: 17%)	**0%**
Writing and Editing (weight: 25%)	**0%**
Visualization (weight: 8%)	**1%**
Created conceptual diagrams or flowcharts	50%

AI Ingredients

Copilot

Controls

Human Verified
Yes

Plagiarism Check
Done

Citation Check
Done

Data Leak Check
Done

Ethics/IRB
Done

Warnings

Calculation: Stage % = (Yes × 100% + ¾ × 75% + ½ × 50% + ¼ × 25%) ÷ total tasks. Total = weighted average by stage importance. Model versions self-reported; journals may audit.

Scan for More Info

URL: https://pressbooks.bccampus.ca/technicalwriting2ed/

Notes

1. N. Kosmyna et al., “Your Brain on ChatGPT: Accumulation of Cognitive Debt when using an AI Assistant for Essay Writing Tasks." arXiv:2506.08872v2, Dec. 2025.
2. C. Flaherty, "AI and Threats to Academic Integrity: What to Do." *Inside Higher Ed*. 20 May, 2025.
3. Yuval Noah Harari: Why advanced societies fall for mass delusion, *Big Think*, Jan 2026
4. K. Chayka, "A.I. is Homogenizing our Thoughts: Recent studies suggest that tools such as ChatGPT make our brains less active and our writing less original." *The New Yorker*, 25 June 2025.
5. J. Kaiser and T.J. Richmond, "ChatGPT and the Homogenization of Language: How the Adoption of AI Silences Student Voices." Academic Senate for California Community Colleges, Nov 2024.
6. J. Jones, “Why Reddit is frequently cited by Large Language Models,” *Perrill* (online), 23 Sept. 2025. Available: https://www.perrill.com/why-is-reddit-cited-in-llms/
7. A. Belanger, “ChatGPT users shocked to learn their chats were in Google search results,” *Ars Technica*, 1 Aug. 2025. Available: https://arstechnica.com/tech-policy/2025/08/chatgpt-users-shocked-to-learn-their-chats-were-in-google-search-results/
8. A. Chaturvedi, “Deloitte’s AI fallout explained: The $440,000 report that backfired.” *NDTV World*, 8 Oct. 2025. Available: https://www.ndtv.com/world-news/deloittes-ai-fallout-explained-the-440-000-report-that-backfired-9417098
9. D. Charlotin, AI Hallucination Cases (online database). Available: https://www.damiencharlotin.com/hallucinations/
10. S. Jiang, RETRACTED ARTICLE “Bridging the gap: Explainable AI for autism diagnosis and parental support with TabPFNMix and SHAP.” *Nature*, 19 Nov. 2025 (retracted 5 Dec. 2025). Available: https://www.nature.com/articles/s41598-025-24662-9
11. H. L. Goldin, “How to spot AI hallucinations like a reference librarian,” *Card Catalogue*, 16 Dec. 2025. Available: https://cardcatalogforlife.substack.com/p/how-to-spot-ai-hallucinations-like
12. B. Klimova and M. Pikhart, "Exploring the effects of artificial intelligence on student and academic well-being in higher education: A mini-review." *Frontiers in Psychology*, vol. 3(16), 2025. doi: 10.3389/fpsyg.2025.1498132
13. N. Kosmyna, and E. Hauptman Eugene, “Your Brain on ChatGPT: Accumulation of Cognitive Debt when using an AI Assistant for Essay Writing Task" (online Summary). 2025
14. K. Budzyn, et al., (Oct 2025). "Endoscopist deskilling risk after exposure to artificial intelligence in colonoscopy: A multicentre, observational study." *The Lancet: Gastroenterology & Hepatology*, vol. 10 (10), 2025, pp. 896-903.
15. J. Anderson, "I went all in on AI. The MIT Study is right." *The Leadership Lighthouse* (Substack), Oct. 2025.
16. A. Challapally et al., "The GenAI Divide: State of AI in Business 2025." MIT Nanda, July 2025.
17. E. Mollick, "Centaurs and Cyborgs on the Jagged Frontier." *One Useful Thing*, 2023.
18. C. Doctorow, "Humans are not perfectly vigilant, and that’s bad news for AI." *Medium*, April 2024.
19. M. Alley, "Strong examples of AI Writing in Engineering and Science." *Writing as an Engineer or Scientist*, Penn State, 2025.

20. C. Pollon, (2025) "Big Tech Is Hiding the Environmental Cost of Chatbots." *The Walrus*, Oct 2025
21. K. Crawford, "Generative AI's environmental costs are soaring — and mostly secret," *Nature*, Feb 2024.
22. A. Privette, "AI's challenging waters," University of Illinois - Civil and Environmental Engineering, Center for Secure Water, Oct 2024.
23. IEDC (March 2025). *Artificial Intelligence Impacts on Labour Markets: Literature Review*, March 2025.
24. B. Perrigo, "OpenAI Used Kenyan Workers on Less Than $2 Per Hour to Make ChatGPT Less Toxic." *Time Magazine*, Jan 2023.
25. D. Rojas, "Gruelling, low-paid human work behind generative AI curtain." BNN Bloomberg, Oct 2025.
26. R.L. Potter and T. Hylton, "Generative AI in Content Creation," *Technical Writing Essentials NCSS Edition*,

1.5 Case Studies: The Cost of Poor Communication

No one knows exactly how much poor communication costs business, industry, and government each year, but estimates suggest billions. In fact, Josh Bernoff estimated that the costs in the U.S. alone are close to $400 billion annually![1] Poorly-worded or inefficient emails, careless reading or listening to instructions, documents that go unread due to poor design, hastily presenting inaccurate information, sloppy proofreading — all of these examples result in inevitable costs. The problem is that these costs aren't usually included on the corporate balance sheet at the end of each year; if they are not properly or clearly defined, the problems remain unsolved.

You may have seen the Project Management Tree Cartoon before (**Figure 1.5.1**); it has been used and adapted widely to illustrate the perils of poor communication during a project.

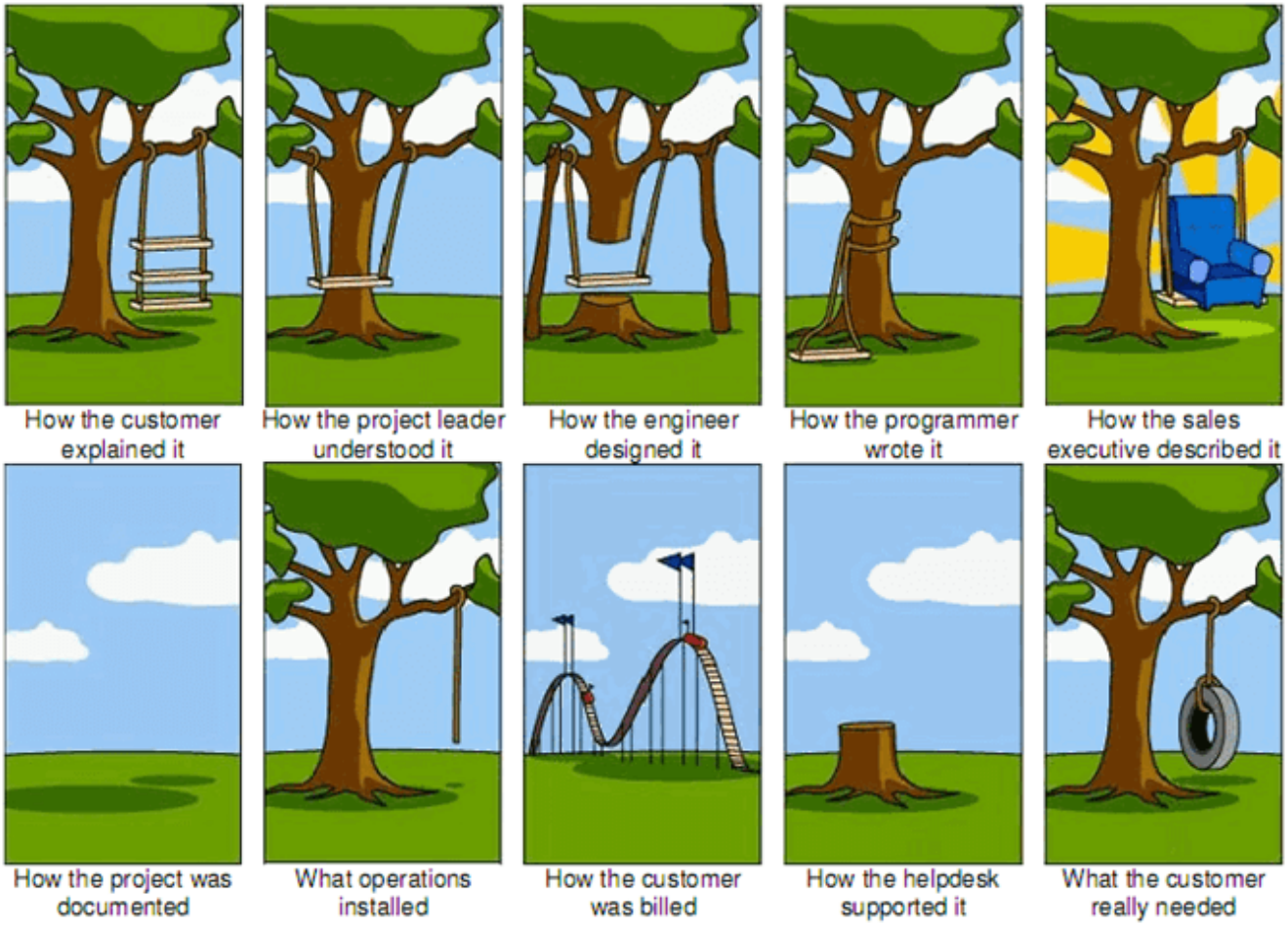


Figure 1.5.1 *Project Management Tree Swing Cartoon.* [2]

The waste caused by ambiguously worded regulations, unclear instructions, confusing emails,

long-winded memos, vague contracts, and other examples of poor communication is not as easily identified as the losses caused by a bridge collapse or a flood. But the losses are just as real—in reduced productivity, inefficiency, and lost business. In more personal terms, the losses are measured in wasted time, work, money, and ultimately, professional recognition. In extreme cases, losses can be measured in property damage, injuries, and even deaths.

The following examples show how poor communications can have real world costs and consequences. For example, consider the "Comma Quirk" in the Rogers Contract that cost $2 million.[3] A small error in spelling a company name cost £8.8 million.[4] Examine Edward Tufte's discussion of the failed PowerPoint presentation that attempted to prevent the Columbia Space Shuttle disaster.[5] The failure of project managers and engineers to communicate effectively resulted in the deadly Hyatt Regency walkway collapse.[6] The fictional case studies below offer a few more examples that might be less extreme, but much more common.

In small groups, examine the case studies below and determine the following:

- Define the **rhetorical situation**: Who is communicating to whom about what, how, and why? What was the goal of the communication in each case?
- Identify the **communication error** (poor task or audience analysis? Use of inappropriate language or style? Poor organization or formatting of information? Other?)
- Explain what **costs/losses** were incurred due to this error.
- Identify **possible solution**s or strategies that could remediate the problem, or better yet, would have prevented the problem. What benefits would be derived from implementing solutions or preventing the problem in the first place?

CASE 1: The Promising Intern

As an intern working for an established local business, Blake was fully expecting to get a permanent well-paying job within a few months. His supervisor asked him to do some background research on a key client project, and find some sources to support the proposal they would be presenting to the client next week. Although the company policy prohibited using commercial AI tools when dealing with client information, Blake thought he could save some time by using ChatGPT to do the research. He fed the information into ChatGPT as a prompt. ChatGPT generated a dozen sources that looked like exactly what he needed for the proposal, and even provided brief summaries and fully formatted bibliography. Blake was thrilled that what might have taken him many hours to complete was done so quickly! He sent the report to his supervisor, and called it day.

When he came in to work the next day, he was shocked to learn that he was fired! His supervisor had reviewed the research, and found some information that simply did not make sense to her as an expert in this field. In trying to follow up on the sources, she found that some of them did not exist! Others existed, but were not

accurately summarized. A prominent local business owner had been quoted as saying something he had never said. Essentially, the research was useable, and if his supervisor had included it in her presentation to a client, she would have not only lost the account, but likely her job as well. Indeed, the company might have been sued, because Blake had violated the company privacy policy by sharing sensitive client information with a non-secure commercial AI, which then used the information as part of its training data.

CASE 2: The Rejected Proposal

The Ace Electric Company worked day and night to develop a new system for storing electricity generated by solar panels. They knew that, although the competition was fierce, their system could be store more power and do it more affordably than the competition, and could be easily adapted for a variety of business uses.

The owner, eager to capture the market, personally but somewhat hastily put together a 100-page proposal and sent it to the several major businesses in the area, recommending that the new Ace solar collection and battery storage system be installed.

She devoted the first 75 pages of the proposal to the mathematical theory and engineering design behind this new system, and the next 25 to descriptions of the new assembly line she planned to set up to produce the necessary equipment quickly. Buried in an appendix were the test results that compared her system's performance with competitor models, and a poorly drawn graph showed the potential cost savings over 3 years.

The proposals did not receive any response. Ace Electric didn't get the contracts, despite having a superior product. Six months later, the company filed for bankruptcy.

CASE 3: The Instruction Manual that Scared Customers Away

Superb Software, Inc. had built a reputation for designing high-quality and user-friendly database and accounting programs for business and industry. When they decided to enter the word-processing market, their engineers designed an effective, versatile, and powerful program that the company felt sure would outperform any competitor.

To be sure that their new word-processing program was accurately documented, Superb tasked the senior program designer with writing the instruction manual. The result was a thorough, accurate and precise description of every detail of the program's operation.

When Superb began marketing its new word processing software to businesses, cries for help flooded in from office workers who were so confused by the massive instruction manual that they couldn't even find out how to turn the program on! Then several business journals reviewed the program and judged it "too complicated" and "difficult to learn." After an impressive start, sales of the new word processing program plummeted.

Superb eventually put out a new, clearly written training guide that led new users step by step through introductory exercises and told them how to find commands quickly. User surveys reported very high satisfaction rates. But the rewrite cost Superb $350,000, a year's lead in the market, and its reputation for producing easy-to-use business software.

CASE 4: The Incomprehensible Memo

Diane supervised 35 professionals in 5 city libraries. To cut the costs of unnecessary overtime, she issued this one-sentence memo to her staff:

> When workloads increase to a level requiring hours in excess of an employee's regular duty assignment, and when such work is estimated to require a full shift of eight (8) hours or more on two (2) or more consecutive days, even though unscheduled days intervene, an employee's tour of duty shall be altered so as to include the hours when such work must be done, unless an adverse impact would result from such employee's absence from his previously scheduled assignment.

After the 35 copies were sent out, Diane's office received 25 phone calls asking what the memo meant. What the 10 people who didn't call about the memo thought is uncertain. It took a week and several follow-up emails to clarify the new policy.

CASE 5: The Co-op Student Who Mixed Up Genres

Kris was simultaneously enrolled in a university writing course and working as a co-op student at the Widget Manufacturing plant. As part of her co-op work experience, Kris shadowed her supervisor on a safety inspection of the plant, and was asked to write up the results of the inspection in a **compliance memo**. In the same week, Kris's writing instructor assigned the class to write a narrative essay based on some personal experience. Kris, trying to be efficient, thought that the plant visit experience could provide the basis for her essay assignment as well.

She wrote the essay first, because she was used to writing essays and felt confident she could do a good job. She had never even seen a compliance memo, much less written one, so was not as confident about that task. She began the essay like this:

> On June 1, 2018, I conducted a safety audit of the Widget Manufacturing plant in New City. The purpose of the audit was to ensure that all processes and activities in the plant adhere to safety and handling

> rules and policies outlined in the Workplace Safety Handbook and relevant government regulations. I was escorted on a 3-hour tour of the facility by supervisor and learned a lot of fascinating things…

Kris finished the essay and submitted it to her writing instructor. She then revised the essay slightly, keeping the introduction the same, and submitted it to her co-op supervisor. She did well on the essay, getting an B grade, but her supervisor told her that the report was unacceptable and would have to be rewritten – especially the beginning, which should have clearly indicated whether or not the plant was in compliance with safety regulations. Kris was aghast! She had never heard of putting the "conclusion" at the **beginning**. She had to miss the company softball game that Saturday so she could rewrite the report to the satisfaction of her supervisor.

CASE 6: *The Hyperbolic Pitch*

Sam and Dav worked for weeks to perfect their pitch to their local community version of Dragon's Den, hoping to get one of the judges interested in investing in their start up. They made sure that their presentation projected confidence and enthusiasm in their product, and designed flashy graphics to supplement their pitch. They promised their product would generate tremendous profits with astoundingly low overhead costs, provide amazing benefits for users, and take over a phenomenal percent of the market share at an unbeatable price point. When the first judge asked about current materials and promotional costs, Sam said they were "super low." When the second judge asked about the reliability of supply chains and labour, Dav said they had "no worries." The third judge starting asking about "return on investment," but stopped part way through and said "never mind." The remaining two judges did not bother to ask any further questions and did not make any offers to invest in their idea. Sam and Dav were shocked and disappointed that the pitch they worked so hard on garnered no interest whatsoever from the judges.

CASE 7: Big Science – Little Rhetoric

The following excerpt is from Carl Sagan's book, *The Demon-Haunted World: Science as a Candle in the Dark*,[7] itself both a plea for and an excellent example of clear scientific communication:

> The Superconducting Supercollider (SSC) would have been the preeminent instrument on the planet for probing the fine structure of matter and the nature of the early Universe. Its price tag was $10 to $15 billion. It was cancelled by Congress in 1993 after about $2 billion had been spent — a worst of both worlds outcome. But *this* debate was not, I think, mainly about declining interest in the support of science. Few in Congress understood what modern high-energy accelerators are for. They are not for weapons. They have no practical applications. They are for something that is, worrisomely from the point of view of many, called "the theory of everything." Explanations that involve entities called quarks, charm, flavor, color, etc., sound as if physicists are being cute. The whole thing has an aura, in the view

of at least some Congresspeople I've talked to, of "nerds gone wild" — which I suppose is an uncharitable way of describing curiosity-based science. No one asked to pay for this had the foggiest idea of what a Higgs boson is. I've read some of the material intended to justify the SSC. At the very end, some of it wasn't too bad, but there was nothing that really addressed what the project was about on a level accessible to bright but skeptical non-physicists. If physicists are asking for 10 or 15 billion dollars to build a machine that has no practical value, at the very least they should make an extremely serious effort, with dazzling graphics, metaphors, and capable use of the English language, to justify their proposal. More than financial mismanagement, budgetary constraints, and political incompetence, I think this is the key to the failure of the SSC.

Gen AI Case Studies

Thanks to Leann Nicholson (Algonquin College) for providing these scenarios.

The scenarios below describe professionals using generative AI in ways that led to significant problems. Discuss what sort of human "due diligence" and oversight was needed in each case to prevent the problems that arose.

Scenario 1: *Jasmine's Time Saving Strategy*

A civil engineering firm was preparing a structural assessment for a small municipal infrastructure project: the retrofitting of a pedestrian bridge. The project had a tight deadline. The bridge was expected to open at the beginning of the tourist season. Budgets were constrained, and senior engineers were stretched across multiple projects.

To save time, the management encouraged junior staff to use generative AI tools to help draft technical reports, summarize standards, and explain calculations in clear language for non-technical users.

Jasmine, a newly hired junior civil engineer was responsible for drafting the structural assessment report which would be reviewed by city officials and used to decide whether the bridge can safely reopen. She used an AI tool to summarize load requirements, analyze fatigue and corrosion risks, and reference relevant engineering standards and prior use cases.

The AI produced confident, professional-sounding explanations and cited several standards and prior studies. Pressed for time, Jasmine integrated this material into the report without fully cross-checking the referenced standards or validating calculations.

During a later peer review, a senior engineer discovered that the report cited outdated standards, referred to a

case study that did not exist, and the descriptions were oversimplified and misrepresented load combinations and peak stresses.

The report was withdrawn before submission, delaying the project and triggering an internal review of AI usage and governance for the firm.

Scenario 2: *A Model Design?*

Mei is a mechanical engineer working for a mid-sized manufacturing firm that designs custom enclosures for industrial automation equipment. Her team is responsible for monitoring a newly designed electrical enclosure to ensure it remains within safe operating temperatures after its installation in a food processing facility. The project timeline is tight. Management expects a preliminary thermal assessment by the end of the week so procurement decisions can move forward.

Mei knows that running a full computational fluid dynamics (CFD) simulation would provide the most reliable results, but setting up the model and running multiple scenarios would take several days. Instead, she uses an AI tool to generate a written explanation of heat transfer and airflow patterns based on similar enclosure designs.

The AI output clearly explained how natural convection and ventilation openings should dissipate heat effectively under expected operating conditions. Mei incorporates this explanation into the report, along with basic temperature estimates derived from traditional calculations. It looked professional and technically sound. She did not include graphs or simulation outputs, but the language and tone closely resembled reports that normally accompany valid models.

When the project manager asked Mei why the overheating was not anticipated, she realized that these decision-makers assumed she had conducted a full CFD; the AI generated explanation did not provide sufficient data to allow them to make a decision and move the project forward.

Scenario 3: *Uncertain Edits*

David, a junior structural engineer, was preparing a design memo for a retaining wall in a residential development project. The project site is located in an area known for variable soil conditions, and geotechnical data had not yet been finalized. David composed a cautious memo emphasizing the assumptions and uncertainties around the soil data.

Before submitting the memo, he used an AI tool to improve the clarity and professionalism of the content. The tool rewrote several sections, refined his sentences and removed uncertain language. Pressed for time, David determined the revisions sounded professional and submitted the memo to the project manager.

The following day, the project manager tells David that the project is ready to proceed. David was surprised at how quickly the decision was made without addressing the uncertainties in the soil data he discussed but assumed that the experienced engineers shared his concerns and would correct the issues.

David intended the memo message to be provisional, but the AI tool edited the content to communicate certainty and confidence. Construction began early and when the soil tests later revealed weaker conditions, part of the work had to be removed and redesigned.

Notes

1. J. Bernoff, "Bad writing costs business billions," *Daily Beast*, Oct. 16, 2016 [Online]. Available: https://www.thedailybeast.com/bad-writing-costs-businesses-billions?ref=scroll
2. J. Reiter, "The 'Project Cartoon' root cause," Medium, 2 July 2019. Available: https://medium.com/@thx2001r/the-project-cartoon-root-cause-5e82e404ec8a
3. G. Robertson, "Comma quirk irks Rogers," *Globe and Mail*, Aug. 6, 2006 [Online]. Available: https://www.proofreadnow.com/hubfs/docs/2.1Mcomma.pdf
4. "The £8.8m typo: How one mistake killed a family business," (28 Jan. 2015). *The Guardian* [online]. Available: https://www.theguardian.com/law/shortcuts/2015/jan/28/typo-how-one-mistake-killed-a-family-business-taylor-and-sons
5. E. Tufte, "Powerpoint does rocket science," The Work of Edward Tufte and Graphics Press, 2005 [Online]. Available: https://www.inf.ed.ac.uk/teaching/courses/pi/2016_2017/phil/tufte-powerpoint.pdf
6. C. McFadden, "Understanding the tragic Hyatt Regency walkway collapse," *Interesting Engineering*, July 4, 2017 [Online]: https://interestingengineering.com/understanding-hyatt-regency-walkway-collapse
7. C. Sagan, *The Demon-Haunted World: Science as a Candle in the Dark*, New York, NY: Random House, 1995.

2. PROFESSIONAL STYLE

In the previous chapter, we defined technical writing as a "transactional" and primarily "problem-solving" genre and described some of the key conventions and considerations technical writers must keep in mind. In this chapter, we will look more deeply into the style of writing expected in professional contexts.

Chapter 2 Learning Objectives

2.1 Reader-Centered Writing: Understand how to take a reader-centred approach (rather than a writer-centred one) that focuses on knowing your audience and writing specifically to meet their needs and expectations.

2.2 Writing to Persuade: Understand and apply rhetoric in a professional context to win the hearts, minds and trust of your reader, while avoiding logical fallacies and inappropriate marketing language.

2.3 Communicating with Precision: Review and practice techniques to make your writing more precise and concise, and avoid wordiness, vagueness or ambiguity.

2.4 The Importance of Verbs: Understand how to choose strong verbs as the "engines" that drive efficient and effective sentences; revise passages to improve clarity, concision, and coherence.

For review of grammar basics, see **Appendix E: Sentence Structure** and **Appendix F: Punctuation Rules**.

When engaging in technical writing, your style might change significantly from how you write in an academic context. To start thinking about how different rhetorical situations might require you to shift or adapt your style, complete the exercise below.

EXERCISE 2.1 *Describe some differences between writing for school vs. writing for work*

	Writing for School	Writing for Work
Purpose		
Audience		
Content		
Document Life Span		
Liability		
Format & Design Elements		
Writing Style		

What key differences do you note between the two writing contexts? What do you think accounts for those differences?

2.1 Reader-Centred Writing

Writing can be conceptualized as **writer-centred** or **reader-centred**. Things like diaries, reflections, and journals are primarily writer-centred, in that they are written for the benefit of the writer. Your schoolwork may also be somewhat writer-centred, in that often your goal is to "show what you know" and thereby "get a good grade." For example, when writing a paragraph response to an exam question, you might try to include everything you can think of about the topic in order to get maximum points, even if some of the idea you include are not totally relevant. The reader obviously already knows all this, so you are not writing to inform them; you are writing to show what you know, and they are reading to assess your knowledge.

Technical communications require that you shift this mindset and write for the benefit of your reader—or design the content and structure of your communication to benefit your "user." Clearly you also have your own purpose in writing, but you must align this with the reader's purpose in reading. In this situation, you will not bombard the reader with everything you know about a subject; instead, you will carefully select only the information that you think the reader wants or needs to know. This mindset should be informed by an understanding of your audience. Use these guidelines and ask yourself the following questions:

> **Who is my target audience?** Are they internal or external readers? Upstream, downstream or lateral from me? Do I have multiple potential readers?
>
> **What is their perspectives on the topic, on me, and on the document I will write?** What are they expecting to do with the document? Is it meant to help them make a decision? Understand a policy or procedure? What is the document meant to accomplish? Why has it been requested? What is my role and relationship to my readers? What does the reader need to know? Already know? What does my reader NOT need to have explained?
>
> **What is my goal or purpose in writing to these readers?** What am I trying to communicate? What do I want them to do as a result of reading this document? What information do I need to give them, and in what format, to get them to do this? How can I plan the content to meet my readers' needs?
>
> **What is my reader's goal?** Why does this audience want or need to read this document?

Achieving a clear understanding of your audience is crucial to communicating effectively.

EXERCISE 2.2 *Audience Analysis*

Choose one of the topics below. Then perform an audience analysis, using the questions above to gain an understanding of the needs of different audiences. Write audience profiles for each situation (or create a fictional "persona" that represents the audience in each case) and consider what sort of information they will need and why?

1. You have been asked to write a report on **Maintaining Internet Privacy for**
   a) A new internet user who just signed up for internet service
   b) A start up e-commerce website developer
2. Prepare a document on **Food-born Diseases** for
   a) Restaurant workers (servers and kitchen staff)
   b) For a health inspector training course
3. Provide information on a proposed **New Bus Shelter Design** to
   a) Mayor's office
   b) Contractor
   c) Newspaper reporter writing an article on the issue

Professional Tone

"Tone" refers to the attitude that a document conveys towards the topic and/or the reader. You have likely read something that sounded angry, or optimistic, or humorous, or cynical, or enthusiastic. These words characterize the tone. Technical communication tends to avoid displaying an obvious emotion, and instead strives for a neutral and objective tone.

Tone is created through word choice (diction), word order (syntax), sentence construction, and perspective. Consider a piece of academic writing that you may have read. It likely created a formal tone through its use of specialized terminology, sophisticated vocabulary, complex sentence structures, and third person voice. This style suits the genre because it is directed at experts and scholars in the field, and seeks to convey complex information densely and objectively, with an emphasis on reason, logic, and evidence.

Now consider a piece of business writing that you may have read. The tone may be sightly less formal but probably not quite colloquial. The language is direct and plain, and the sentences are shorter and more straightforward. It may make use of the second person ("you") to build connection with the reader, but likely avoids slang. This style suits business writing because it is directed at colleagues, management, or clients who are seeking information clearly and quickly and who may need to take action on it.

Writing Constructively

Striking the appropriate tone involves understanding your purpose, context, and audience. It also involves an understanding that workplaces are often hierarchical, and that cooperation and collaboration are required. Therefore, it is important to consider how you want your reader to feel, and what may make your reader feel that way. Your goal is to write constructively, which means to use positive phrasing to convey your message to your reader. **Table 2.1.1** illustrates the differences between destructive/negative and constructive/positive feelings the reader may experience as a result of the tone used in a document.

TABLE 2.1.1 Differences between destructive/negative and constructive/positive

Negative	Constructive
misunderstood, judged	understood
outraged	conciliatory
disgusted	pleased
guilty	capable
belittled	empowered
patronized	respected
defensive	proud
chastised	valued
humiliated	honoured
excluded	a sense of belonging
resentment	contentment

Considering how your reader may feel after reading your document is an important part of revision. Did your tone come across like you hoped it would? Could it be misconstrued? Often this is where peer reviewing can be helpful. Asking a colleague to review your document before sending it to its intended audience is a common professional practice, as we can sometimes miss things in our own writing.

Sometimes, you will need to communicate information that is unpleasant, such as delivering bad news or rejecting a request. Communicating constructively is even more important in these situations. Regardless of message, how can you ensure you are communicating constructively?

> **Adopt an adult-to-adult approach:** that is to say, avoid talking down to your reader in a patronizing tone, and likewise avoid sounding petulant or unwilling to take responsibility.

Aim to communicate respectfully, responsibly, confidently, and cooperatively — as one responsible adult to another.

Be courteous: focus on the reader as much as possible. Use "you" unless it results in blaming (one effective use of passive verbs is to avoid assigning blame; for example, "mistakes were made"). Use typically accepted forms of courtesy and politeness. Use gender-neutral phrasing and plural forms, unless you are referring to a specific person and you know their gender.

Focus on the positive: emphasize what you *can* do rather than what you can't. Try to avoid negative wording and phrasing whenever possible (*no*, *not*, *never*, *none*, *cannot*, *etc.*). Focus on what *can* be done or improved.

Be genuine: apologize if you have made a mistake. Take responsibility, be accountable, and promise to do better. Be authentic in your expression. Avoid sounding like marketing material. Make reasonable claims that can be backed with evidence.

Consider the following perspectives:

Writer-Centred (I, we)	Reader-Centred (you)
If I can answer any questions, I'll be happy to do so.	If you have any questions, please ask.
We shipped the order this morning.	Your order was shipped this morning.
I'm happy to report that …	You'll be glad to know that …

Negative Phrasing	Constructive Phrasing
We cannot process your claim because the necessary forms have not been completed	Your claim can be processed as soon as we receive the necessary forms
We do not take phone calls after 3:00pm on Fridays	*You try …*
We closed your case because we never received the information requested in our letter of April …	

EXERCISE 2.3 *Revise an email for appropriate tone and constructive content*

A classmate has asked you to review his email before sending. What revisions to content, tone, style and structure would you suggest?

From: Dogboy.zzzzz@me.com
To: Suzan Last
Date: 12 Feb 2026
Subject: Two Problems

Hey Professor

I've been trying to deal with this problem on my own, but I just can't take it anymore!!! As I'm sure you're aware, my teammate JR has been absent from our class meetings. Not only that, he's refused to communicate or submit any work on the team project. And our 2nd deliverable is due TOMORROW!! Basically he's being a COMPLETE JERK and driving the rest of the team TOTALLY BONKERS! There is no way that this slacker is going to ruin my grade! You need to do something about this FAST!!!!

By the way, I've also had some problems accessing the course site, and some emailed course announcements seem to going astray. Mei told you you sent an announcement about a quiz for tomorrow, but I didn't get the message. It would be great if you could check into this for me ASAP. I'm super busy with midterms coming up and don't have time to wait around at the Help Desk.

thx

J

For further reading, see "Communication in the Workplace: What Can NC State Students Expect?" a study based on the responses of over 1000 professionals from various fields, including engineering, on how important business, technical and scientific communication is to their work.

2.2 Writing To Persuade

Some people have the impression that technical writing is "unbiased," neutral or purely objective, simply describing facts or providing instructions. While it's true that the writing should be free from bias (see APA's Bias Free Language guidelines), that does not mean that it isn't trying to influence the reader. Being persuasive and being biased are not the same thing. Persuading a client to choose a certain design based on well-defined and objective criteria is different from encouraging them to select the option that will most benefit yourself — the latter is bias. Sometimes, you may want to persuade your reader to take a particular action or position on an issue or take a particular approach to solving a problem. Indeed, technical writing typically arises from the need to solve a problem, and generally uses an "evidence-based approach" to persuade the reader to address the problem in a particular way. You also may need to select strategic rhetorical approaches when trying to persuade different kinds of audiences. It is crucial to have an understanding of the rhetorical situation in order to determine the most effective way to frame your argument and convince your audience.

Understanding the Rhetorical Situation

It is common knowledge in the workplace that people generally don't really *want* to read what you write, and even if they want to or have to read it, they will likely not read all of it. People don't tend to consider technical writing as "recreational reading." Reading it is necessary to help them do their job. So how do you get your reader to understand what you need quickly and efficiently? Start by doing a detailed **Task and Audience Analysis** — make sure you understand the "rhetorical situation." Before you begin drafting a document, determine the needs of your rhetorical situation (See **Figure 2.2.1**).

Figure 2.2.1 *The five components of the Rhetorical Situation.*

The "rhetorical situation" is a term used to describe the components of any situation in which you may want to communicate. To define a "rhetorical situation," ask yourself this question: ***"who is talking to whom about what, how, and why?"*** There are five main components:

- Purpose
- Writer
- Audience
- Message
- Context/Culture

WRITER refers to you, the writer/creator/designer of the communication. It is important to examine your own motivation for writing and any biases, past experiences, and knowledge you bring to the writing situation. These elements will influence how you craft the message, whether

positively or negatively. This examination should also include your role within the organization, as well as your position relative to your target audience.

PURPOSE refers to *why* you are writing. Determining your purpose requires that you engage in ***Task Analysis*** — that is, have a clear sense of what problem has instigated the need to communicate (sometimes called the "exigence") and what you want to accomplish by writing this document. Ask yourself what you hope the reader(s) will do/think/decide or how they will behave as a result of reading it. For example, your purpose may be to propose an innovative solution to a specific problem. In this case, you want the reader to agree to explore the idea further, approve funding for further research and development, or even hire you to implement the solution directly.

AUDIENCE refers to your readers/listeners/viewers/users. ***Audience Analysis*** is possibly the most critical part of understanding the rhetorical situation. Consider **Figure 2.2.2** below. Is your audience internal (within your organization) or external (such as clients, suppliers, customers, other other interested parties)? Are they lateral to you (at the same position or level), upstream from you (management), or downstream from you (employees, subordinates)? Who is the primary audience? Who are the secondary audiences? Why are they reading this document? What do they need or want to get from it? These questions, and others, help you to create an understanding of your audience that will allow you craft a message that is designed to effectively communicate specifically to them.

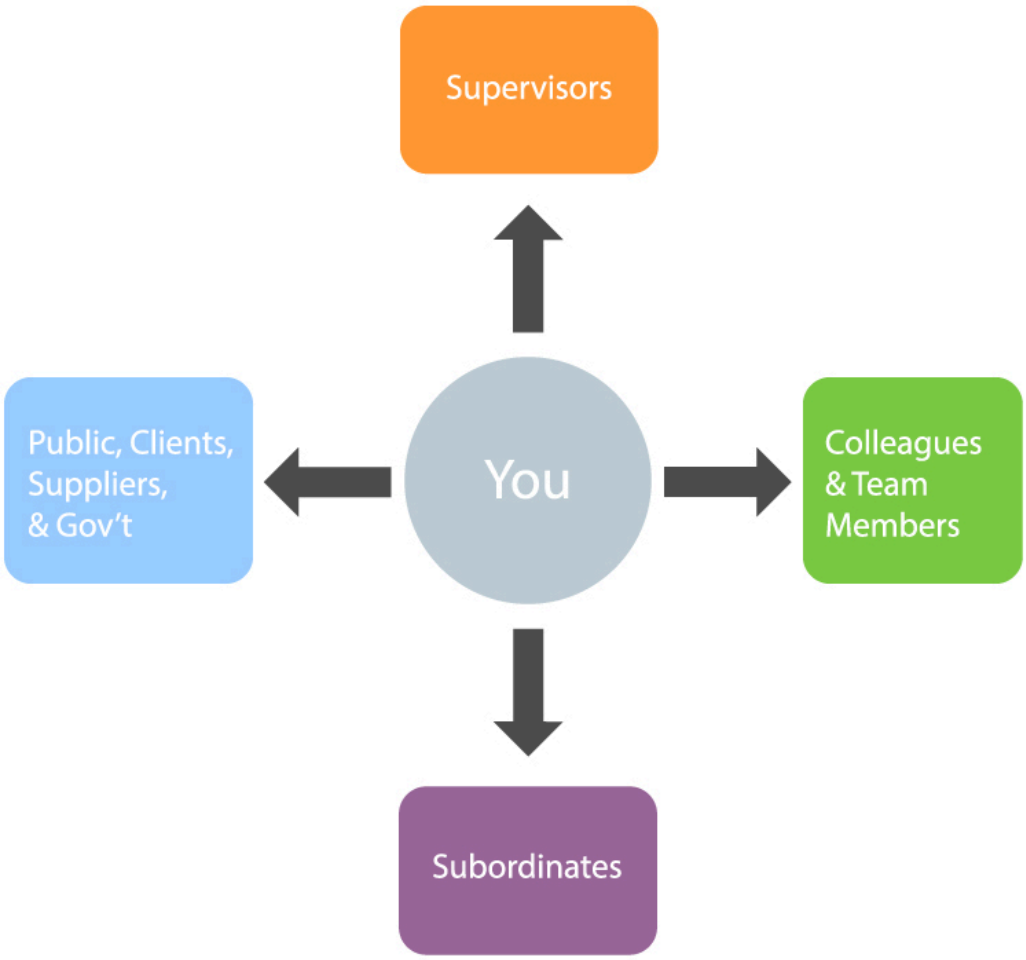


***Figure* 2.2.2** *Understanding your relationship to your audience.*

Keep in mind that your different audiences may also have different purposes in reading your document. Consider what their various purposes might be, and how you can best help them achieve their goals. What do they already know? What do they need to know? Considering what they are expected to do with the information you provide will help you craft your message effectively. Consider also that technical writing often has a long "life-span" – a document you write today could be filed away and reviewed months or even years down the road. Consider the needs of that future audience who might be less familiar with the current context in which you are writing.

Audience	Purpose for Reading
Executives	Make decisions
Supervising Experts/Managers	Advise decision makers; direct subordinates
Technical Experts/Co-workers	Implement decisions; advise
Lay People/Public/Clients	Become informed; choose options; make purchasing decisions
Future Readers	Understand how things came to be as they are

Some companies develop audience profiles or even fictional "user personas" to help understand their audience and guide their communications. This is a helpful exercise whenever you have something to communicate, especially if the information is complex. Here are some questions to consider as part of the audience profile:

Developing an Audience Profile

- Who are your primary readers? (specific names and titles, or general roles)
- What is their purpose or goal in reading this?
- Are they above you in the organizational hierarchy? Lateral, subordinate? Outside of your organization?
- Who else might read this document? (secondary readers)
- Do you know what their attitude towards the topic is?
- How might cultural differences affect their expectations and interpretations?
- How much technical background do the readers have?
- How much do they already know about the topic?
- What situation gave rise to this document?

MESSAGE refers to the information you want to communicate (and the medium or genre you use to present that information — because as Marshall McLuhan famously asserted, "the medium IS the message"). The content of your message, as well as the form it takes, should be aligned to your purpose and targeted to your audience. While it is important to carefully choose what content your audience needs, it is equally important to present that information in a format that is suitable and meets the expectations of the audience; there is a symbiotic relationship between your form and content. It is also critical to cut content that your audience does not need or want. "Time is money" may be a tired old cliché, but it is important to avoid wasting your audience's time with information that is unnecessary or irrelevant to them. Your message should be professional, and expressed in an appropriate form and tone for the audience, purpose, and context.

CONTEXT refers to the situation that creates the need for the writing and the constraints you need to consider in responding. In other words, what has happened or needs to happen that

creates the “exigence” or need for communication? The context is influenced by timing, location, current events, and culture, which can be organizational or social. Ignoring the context for your communication could result in awkward situations, or possibly offensive ones; it will almost certainly impact your ability to clearly and credibly convey your message to your audience.

Consider the subtle (and not so subtle) similarities and differences in the rhetorical situation when you offer feedback on Student Experience of Learning Surveys vs when you evaluate an instructor on Ratemyprofessor.com.

EXERCISE 2.4 *Identify the differences in the rhetorical situations*

	Learning Experience Survey	Ratemyprofessor.com
Purpose		
Audience		
Writer		
Message		
Context		

EXERCISE 2.5 *Task and Audience Analysis*

Download Task and Audience Analysis Exercises (.docx)

The table below contains a collection of details about a research project you have just completed on rising sea levels. Imagine that you are writing documents for each of the 5 following audiences:

1. **Your supervisor/boss**
2. **Scientists**
3. **The general public**
4. **Politician**
5. **High school students**

What information about rising sea levels might each audience be interested in? As you go down the list, consider which detail would be most interesting and relevant to each audience.

Consider what kind of document might contain that information for that audience.

Interested Audience and Genre	Categories of Information on Sea Level Rise
	The dollar damage caused by sea level increases each year.
	A literature review of previous research on rising sea levels.
	Descriptions of calibration procedures for your instruments.
	Some basic physics of how tides and currents work.
	How much your project costs.
	A log of all your measurements during the whole project.
	A list of people who worked on the project.
	Specifications of a new instrument to measure water conditions.
	A new result showing a connection between sea level and coastal developments.
	Procedures you used to avoid statistical biases in your data.
	Your plans for further measurements.
	Your recommendations for future research.

Rhetoric as Problem Solving

Problem solving often requires a distinctly persuasive — or rhetorical — approach. Consider the various interlocking aspects of persuasion presented in **Figure 2.2.3**. You might first have to convince someone that a problem exists (exigence) and that is should be addressed. You will need to understand your audience in order to know what might motivate them. You will need to craft your message with an understanding of what genre will most effectively convey your purpose, and what rhetorical strategies will best appeal to your audience.

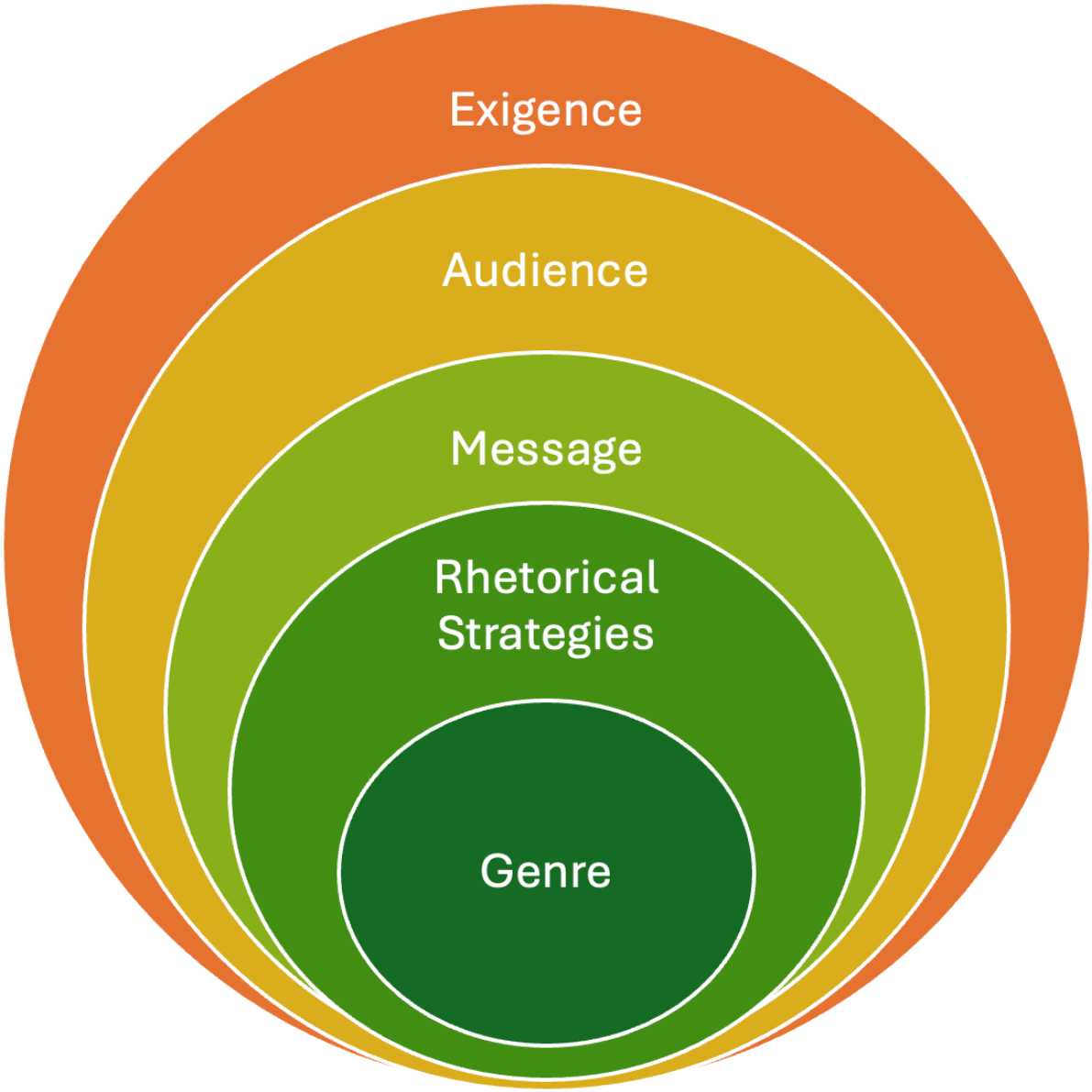


Figure 2.2.3 *Rhetoric as Problem Solving*

There is a wide range of tools to persuade your reader in a professional manner; these include choosing an appropriate genre to convey your message, using rhetorical appeals effectively to convince your intended audience, avoiding inappropriate language, and maintaining an ethical approach, all of which are discussed in more detail below.

Understanding Genre

The word "genre" is often used to describe and categorize standardized forms of communication. We think of poetic forms like a sonnet, musical forms like jazz, theatrical forms like tragedy or comedy, or movie genres like science fiction or romantic comedy. Each of these is made up of standardized conventions that people expect to find in each form (we expect to find horses in Westerns, not in Science Fiction). However, we can think of genre as more than that. Genres can describe conventionally agreed-upon guidelines for behaving or communicating in frequently recurring situations. In following the conventions of that situation, we are meeting the expectations of those with whom we are communicating.

For example, meeting a work colleague for the first time is a situation that recurs frequently, and so we have developed conventions for how to behave and communicate in that situation. Shaking hands is a standard Canadian convention; bowing is a standard Japanese convention. These conventions might vary depending on context. The COVID 19 pandemic resulted in a new convention: the elbow bump. A job application letter has standardized formats, but writing one is also the expected way of handling the situation in which you want to be hired, and the employer wants to hire someone. There are certain expectations about what content should be included and the style and tone it should adopt. If you fail to meet these genre expectations, you likely won't be hired for the job.

Choosing the most appropriate genre to convey your message and negotiate your persuasive purpose, and then following the expected conventions of that genre, is important if you want to successfully convince your audience. To do this, you must have a clear understanding of the cultural context and the genre conventions that best apply to it.

Rhetorical Appeals

When we talk about Rhetorical appeals, we are classifying the various strategies we use to persuade people into specific types of persuasive strategies. Think about times when someone was able to get you to change your mind about something. How did they do it? Did they change how you felt emotionally about the issue (make you feel angry or guilty), or get you to care about it more than you had previously? Did they present you with startling statistics or a clear rationale? Did they refer to someone you respect or admire who agrees with their position? Did they select the right time and place when you would be most likely to agree with them?

Convincing your audience requires that you select the rhetorical appeals that you think will be most effective for your particular audience in the particular situation. Aristotle's 4th century BC

Treatise on Rhetoric defined rhetoric as the ability to see the available means of persuasion in a particular situation. He outlined a classification of rhetorical appeals that we still use today: the Greek words are *ethos*, *pathos*, and *logos*.

> ***Ethos* – Appeal to Credibility/Authority:** this rhetorical strategy involves establishing your credibility, expertise, or authority to be making the argument. What experience or expertise do you have? What knowledge or skills do you possess? What's your role within the organization, and/or in relation to the reader? Why should the reader trust you as a reliable, knowledgeable, authoritative, and ethical source of information? If you do not have inherent credibility (you do not yet have experience, expertise or reputation), then you may need to "borrow" ethos by referring to reputable sources and including the perspectives of experts.
>
> ***Pathos* – Appeal to Emotion/Interest/Values:** this strategy involves appealing to the emotions, values, and/or interests of the reader. How does your proposal benefit them? Why should they care about it? How does it relate to the goals of the organization? How can you build "common ground" with your reader? What will make your reader feel "good" about your project? How can you evoke emotions such as pride or outrage?
>
> ***Logos* – Appeal to Reason/Logic:** this strategy involves grounding your argument in logic, reason, and evidence — things that "make sense" to your your reader. What evidence supports your claims? On what facts and data is your reasoning based? Arguments grounded in reason and evidence are often considered the strongest. Government organizations and companies alike generally like to make "evidence-based decisions."

A fourth appeal, ***Kairos***, is often added. *Kairos* is the appeal to timeliness or appropriateness. Using this appeal means being aware of what is appropriate and timely in a given rhetorical situation. Sometimes, a well-crafted argument can fail because it comes at the wrong time or place. *Kairos* involves knowing what is "in" or "hot" right now, what is an important topic or issue, and how best to discuss it; knowing when it is the "right time" to broach a topic or propose an idea; knowing how to use the appropriate tone, level of formality and decorum for the specific situation.

Finding the appropriate blend of rhetorical appeals is critical to making a successful argument. Consider that when making your case, you often have to "win the hearts, minds, and trust" of your audience. Thus, you'll need to appeal to emotions, logic, and credibility to show the reader why they should care about the topic, why your idea is reasonable, and that you are a trustworthy source of information. In addition to these elements, you should also be mindful of the word choice and tone so that you are presenting a persuasive argument that appropriate for your intended audience, message, and purpose. If you happen to be writing ***about*** rhetoric, for example, writing a rhetorical analysis, you might find this sample essay, Choosing Rhetorical Appeals for your Audience, helpful as a model for using this potentially new vocabulary. **Figure 2.2.4** maps these appeals.

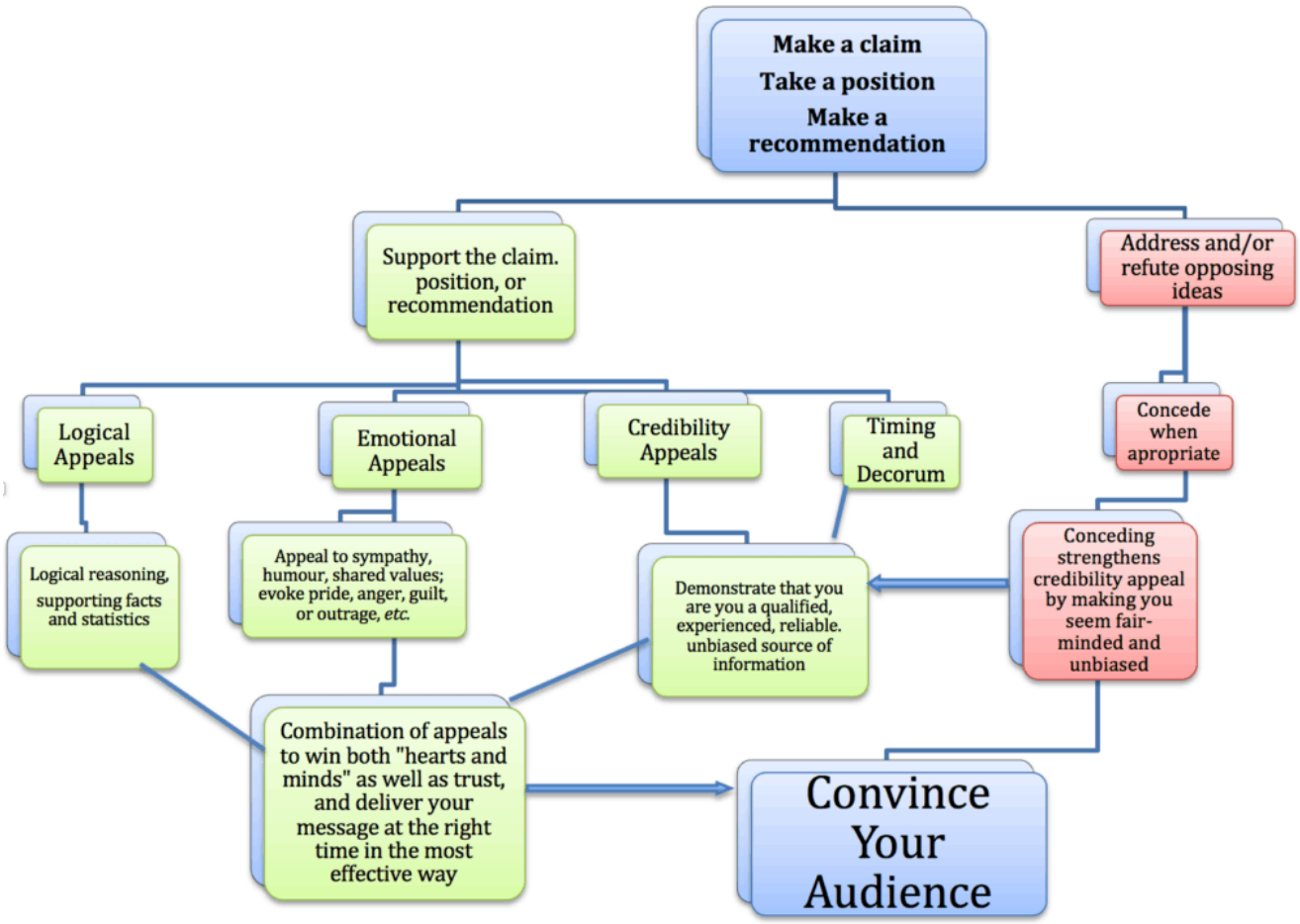


Figure 2.2.4 *Using the rhetorical appeals to convince an audience [Image description]*

Avoiding Ad-Speak

"Ad-speak" refers to the kind of language often used in advertisements. Its aim is to convince consumers to buy something, regardless of whether they need it or whether it is effective, hopefully without thinking too much about it. Because we hear this kind of rhetoric all the time, it easily becomes habit to use it ourselves. We must break this habit when communicating persuasively in professional contexts.

Ad-Speak tends to distort the appeals described above by using strategies such as

- Emotional manipulation
- Logical fallacies
- Hyperbole, exaggeration, or dishonesty
- Vague claims

- Incomplete or cherry-picked data
- Biased viewpoints
- Hired actors rather than professionals or experts as spokespeople.

As a student in a professionalizing program learning the specialized skills and developing the sense of social obligation needed to become a trusted professional, you should avoid using "sensational" terms characteristic of marketing language. Instead, when trying to persuade your reader, make sure you use **quantifiable, measurable descriptors** and objective language in your writing. You cannot determine how many units of "amazing-ness" something has, or its quantifiable amount of "awesomeness," "fantastic-ness," or "extraordinariness." Describing something as "incredible" literally means it's unbelievable. So avoid using these kinds of words shown in **Figure 2.2.5**.

***Figure* 2.2.5** *Ad-Speak Word Cloud.*

Find measurable terms like "efficiency" (in time or energy use), "effectiveness" at fulfilling a specific task, measurable benefits and/or costs, or even "popularity" as measured by a survey.

Communicating Ethically

When writing persuasively in a professional context, communicating ethically is critically

important. Ethical communications involves communicating from a place of accountability, integrity, and values. If you are communicating ethically, you are demonstrating respect for your reader, the organizations you work for and with, and the culture and context within which you work. Failure to maintain integrity and ethics can result in consequences ranging from damage to reputation, loss of work, lawsuits, criminal charges, and even tragic loss of life.

This is precisely why many professional associations have standards that govern the ethical behaviour of their membership. For example, the Faculty of Engineering and Computer Science at the University of Victoria outlines its expectations for staff, students and faculty in this document: "Standards for Professional Behavior." Engineers and Geoscientists of BC also has a Code of Ethics. Take note of the portions of the Code of Ethics that relate specifically to ethical communication in the box below.

Excerpt from the Engineers and Geoscientists of BC Code of Ethics

"Registrants must uphold the values of truth, honesty, and trustworthiness and safeguard human life and welfare and the environment. In keeping with these basic tenets, registrants must:

- Provide accurate information in respect of qualifications and experience
- Provide professional opinions that distinguish between facts, assumptions, and opinions
- Present clearly to employers and clients the possible consequences if professional decisions or judgments are overruled or disregarded
- Clearly identify each registrant who has contributed professional work, including recommendations, reports, statements, or opinions
- Undertake work and documentation with due diligence and in accordance with any guidance developed to standardize professional documentation for the applicable profession."

It is important to become familiar with the standards of practice in your field, and to consider how they impact your communication practices in the workplace. Remember that you are communicating in a professional context, and that comes with responsibility. Failure to uphold these responsibilities can have grave consequences.

Consider the different rhetorical situations diagrammed in **Figure 2.2.6**, one for a marketer and one for an engineer.

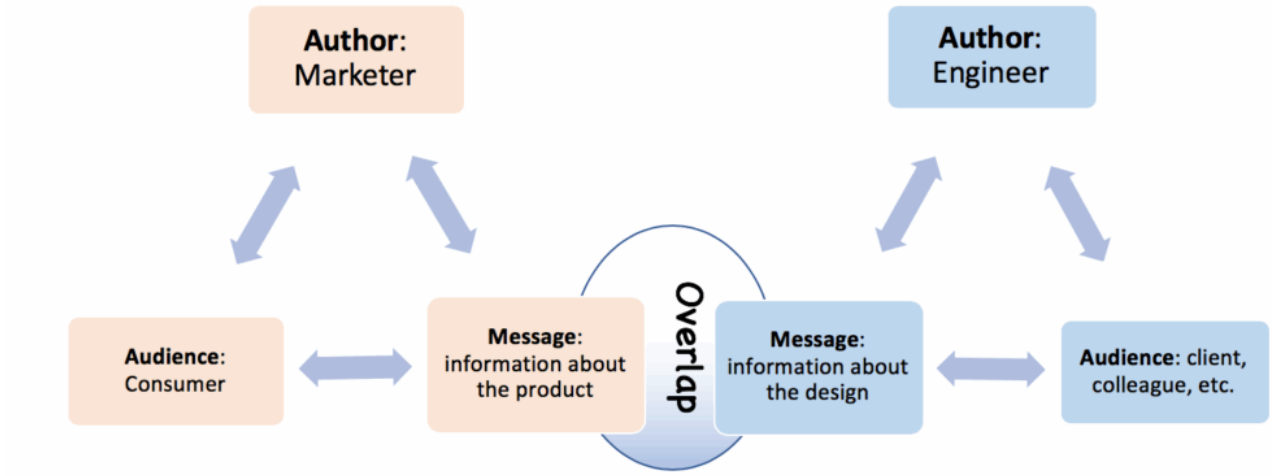


Figure 2.2.6 *Comparison of the rhetorical situation for a marketer vs. an engineer.* [*[Image Description]*]

Clearly, there may be some overlap, but there will also be significant differences based on the needs and expectations of the audience and the kind of message being delivered. When an engineer provides information about a design, we expect it to be accurate. When a marketer provides information about a product, we do not necessarily have the same expectation. In fact, we are likely to be somewhat cynical about the veracity of the claims (will this shampoo really make me irresistible?). We hear marketing language so often that it is easy to fall into the habit of using it, even when it's not appropriate. Make sure you are not using "ad-speak" when trying to persuade in a professional context.

Image descriptions

Figure 2.2.4 image description:

Use rhetorical appeals to convince your audience of a claim or recommendation you've made or a position you've taken. From there, you can support your claim using different types of appeals or address and refute opposing ideas.

To support the claim, position, or recommendation, you can use different types of appeals:

- Logical appeals: Use logical reasoning, supporting facts and statistics.
- Emotional appeals: Appeal to sympathy, humour, shared values, evoke pride, anger, guilt, or

outrage, etc.
- Credibility appeals: Demonstrate that you are qualified, experienced, reliable, and an unbiased source of information.
- Timing and Decorum.
- Use a combination of appeals to win both “hearts and minds” as well as trust, and deliver your message at the time in the most effective way.

When addressing and/or refuting opposing ideas, it’s okay to concede where appropriate. Conceding strengthens credibility appeal by making you seem fair-minded and unbiased. You may need to draw on credibility appeals to show that you are qualified, experienced, and a reliable, unbiased source of information.

Supporting your position using different types of appeals and addressing opposing ideas will allow you to convince your audience.

[Return to Figure 2.2.4]

Figure 2.2.6 image description:

When the marketer is the author, their audience is the consumer and their message is information about the product. When the engineer is the author, their audience could be a client or colleague, and their message is information about the design. There may be some overlap between the messages of the marketer and the engineer.

[Return to Figure 2.2.6]

2.3 Communicating with Precision

So far we have discussed the importance of being reader focused and on understanding how to select genres and rhetorical strategies that are appropriate for your reader and context. With these foundations firmly in place, we can explore more specific characteristics of the actual writing. Two key characteristics of professional technical communication are that it is **precise** and **concise**. Writing that is overly wordy, vague, or ambiguous can lead to irritation and confusion for your reader. If something is vague or ambiguous, readers may need to follow up for clarification, wasting time and resources. Or they may simply misinterpret, causing implementation problems or other issues. Readers of technical writing expect precision and concision to be evident at all levels, from the overall document design, to paragraphing, to sentence structure, to word choice, and even to punctuation (see Punctuation Matters!). You should be able to articulate a rationale for every word you choose.

The 7 Cs of Professional Writing

The 7 C's are simply seven words that begin with C that characterize strong professional style:

- Clear
- Coherent
- Concise
- Concrete
- Correct
- Complete
- Courteous.

CLEAR writing involves having a clear sense of what you want to say before you say it, because often a lack of clarity comes from unclear thinking or poor planning; this, unfortunately, can lead to confused or annoyed readers. Clear writing conveys the purpose of the document immediately to the reader; it matches vocabulary to the audience, avoiding jargon and unnecessarily technical or obscure language while at the same time being precise. In clarifying your ideas, ensure that each sentence conveys one idea, and that each paragraph thoroughly develops one unified and coherent concept. It is also worth noting that the physical act of writing can help to clarify and develop our ideas as you go.

COHERENT writing ensures that the reader can easily follow your ideas and your train of thought. One idea should lead logically into the next through the use of transitional words and phrases, planned repetition, sentences with clear subjects, and headings that clearly preview the content. Writing that lacks coherence often sounds "choppy" and ideas seem disconnected or incomplete. Coherently connecting ideas is like building bridges between islands of thought so the reader can easily move from one idea to the next and see how they connect and build upon each other.

CONCISE writing uses the least words possible to convey the most meaning while still maintaining clarity. Avoid unnecessary padding, awkward phrasing, overuse of "to be" forms (*is*, *are*, *was*, *were*, *am*, *be*, *being*), numerous prepositional phrases, vagueness, and unnecessary repetition. Use active verbs whenever possible, and take the time to choose a single word rather than a long phrase or cliched expression. Think of your word count like a budget; be cost effective by making sure every word you choose does effective work for you. Cut a word, save a buck! As William Zinsser asserts, "the secret of good writing is to strip every sentence to its cleanest components."[1]

CONCRETE writing involves using specific, precise language to paint a picture for your readers so that they can more easily understand and even create a mental image of your ideas. If you have to explain an abstract concept or idea, try to use specific examples, analogies, and precise language to illustrate it. Use measurable descriptors whenever possible; avoid vague terms like "big" or "good." Try to get your readers to visualize your ideas by using specific terms and descriptions.

CORRECT writing, in a technical context, generally uses Standard English punctuation, sentence structure, usage, and grammar; however, what is considered "correct" might change from one context to another (grammar and punctuation in texting might be different than in emails). Being correct also means ensuring that you are fact-checking and providing accurate information. Choosing an appropriate genre for your task and adhering to the conventions of that genre also qualify as correctness.

COMPLETE writing includes all requested information and answers all relevant questions. The more concrete and specific you are, the more likely your document will be complete as well. Review your checklist of specifications before submitting your document to its intended reader.

COURTEOUS writing entails designing a reader-friendly, easy-to-read document; using tactful language and appropriate modes of addressing the audience; and avoiding potentially offensive terminology, usage, and tone. As we have discussed in an earlier section, without courtesy you cannot be constructive. The APA's Bias Free Language guide offers advice and examples for how to maintain courtesy in various contexts.

Keep in mind that context and audience matter! Writing that is clear and coherent to an expert might be confusing or even incomprehensible to a lay person. My fangirl treatise on *Firefly* may seem concise to me, but a non-fan might find it a bit long-winded. In some cases, some of these might come into conflict: being too concise may result in a tone that sounds terse, or an idea that seems incomplete or disconnected from the ideas around it.

Be mindful of the tradeoffs, and always give priority to being **clear**: writing that lacks clarity cannot be understood and therefore cannot achieve its purpose. Writing that adheres to the 7 C's not only communicates effectively and efficiently, but also helps to establish your **credibility** as a technical professional.

EXERCISE 2.6 *Revise for clarity*

Remember the librarian's one-sentence memo from the Case Studies in Chapter 1.5? Try revising it so that it adheres to the 7 Cs; make it clear, coherent, concrete and concise, while also being complete, courteous and correct.

MEMO

When workloads increase to a level requiring hours in excess of an employee's regular duty assignment, and when such work is estimated to require a full shift of eight (8) hours or more on two (2) or more consecutive days, even though unscheduled days intervene, an employee's tour of duty shall be altered so as to include the hours when such work must be done, unless an adverse impact would result from such employee's absence from his previously scheduled assignment.

Sentence Variety and Length

While variety makes for interesting writing, too much of it can also reduce clarity and precision. Technical writing tends to use simple sentence structures more often than academic writing does. That said, simple does not necessarily mean "simplistic," short, or lacking in density. Remember that in grammatical terms, simple just means that it has one main clause (one subject and one predicate). You can convey a lot of information in a simple sentence.

The other consideration for precise writing is length. Your sentences should vary in length just as they can vary in type. However, you want to avoid having too many long sentences because they take longer to read, are often more complex, and can lead to confusion. Long sentences with multiple clauses may be appropriate in academic writing but are less so in technical writing. The goal is to aim for an average of around 20 to 30 words per sentence. Reserve the short sentences for main points and use longer sentences for supporting points that clarify or explain cause and effect relationships or comparisons. If you feel the sentence is too long, break it into two sentences. You do not want your reader to have to read a sentence twice to understand it.

When you make compound or complex sentences, ensure that you use appropriate coordinating or subordinating strategies to make the relationship between clauses perfectly clear. Sentence structures are not simply arbitrary grammar rules; these structures have a kind of built-in rhetorical structure.

Simple Sentences are often "declarative" and provide clear information in a straightforward manner. They are good for emphasizing a main point.

Compound sentences, made up of two independent clauses, combine two related ideas in a way that gives them roughly equal weight. This is an effective structure for discussing pros and cons. If you start a paragraph with a compound sentence, the reader will expect the paragraph to contain a balanced discussion of both ideas, without necessarily "taking a side."

Complex sentences, which combine dependent with independent clauses (using a subordinating conjunction such as "while" or "although"), show a more complicated relationship between ideas, usually giving the idea in the main (independent) clause more weight or importance than the idea in the dependent clause. Starting your paragraph with a complex topic sentence will lead your reader to expect you to focus more on the idea in the independent clause.

EXERCISE 2.7 *The Rhetorical Aspects of Sentence Structure*

Think about ways of combining these two simple sentences into either a **compound** sentence (using a coordinating conjunction like "but") or a **complex** sentence (using a subordinating conjunction such as "although" or "while"), and then consider what expectations these topic sentences might convey to the reader:

- Nuclear power plants can pose significant environmental dangers.
- Nuclear energy is a clean and efficient way to generate power and transition away from fossil fuels.

What do you expect the author's argument will be based on this complex topic sentence:

> "While nuclear energy is a clean and efficient way to generate power and transition away from fossil fuels, they can pose significant environmental dangers."
>
> The last clause is given more rhetorical power, right? It builds the expectations that the paragraph will focus on the dangers more than the benefits.
>
> Note what happens to the rhetorical power of the sentence when you place the *subordinate* clause last:
>
> > "Our proposed solution will provide unique benefits for the target users, *although two other organizations in the community are doing something similar*."
>
> Does it undercut the power of the first clause? Does it seem like a bit of an unplanned after-thought? What happens when we switch them around?
>
> > "Although two other organizations in the community are doing something similar, our proposed solution will provide unique benefits for the target users."

See Appendix E to review specific information on simple, compound, and complex sentence structures.

Precise Wording

Technical writing is precise writing. Vague, overly general, hyperbolic or subjective/ambiguous terms are simply not appropriate in this genre. You want to avoid choose words or phrasing that could be interpreted in more than one way. For example, if you asked someone to define what makes a "good dog," you might get responses like *obedient*, *hunter/retriever*, *well-behaved*, *affectionate*, *loyal*, *therapeutic*, *goofy*, or "all dogs are good!" Similarly, if you asked a group of people what makes a "good salad," you might get a variety of different responses, based on their personal tastes.

Choose words that most precisely, concisely, and accurately describe the idea you want to convey. Below are some guidelines and examples to follow for using precise wording.

1. Avoid clichés.

Clichés are expressions that you have probably heard and used hundreds of times. They are over-used expressions that have largely lost their meaning and impact. Try to replace them with something more original and specifically related to your context.

Clichés	**Alternatives**
as plain as day	plain, obvious, clear
ballpark figure	about, approximately, estimate
few and far between	rare, infrequent
needless to say	of course, obviously
last but not least	finally, last
as far as ___ is concerned	*what does this phrase even mean?*

2. Avoid cluttered constructions.

When speaking, we tend to emphasize ideas by adding in redundant words or phrases to make our point. In written form, however, these can just seem cluttered and unnecessary. Note where they can be deleted below.

Redundancies		
join ~~together~~	~~completely~~ fill	unite ~~as one~~
finish ~~entirely~~	refer/return/revert ~~back~~ to	emphasize ~~strongly~~
examine ~~closely~~	~~suddenly~~ interrupt	~~better/further~~ enhance
~~eventually~~ evolve ~~over time~~	~~strictly~~ forbid	rely/depend ~~heavily~~
plan ~~ahead~~	~~harshly~~ condemn	protest ~~against~~
~~completely~~ surround ~~on all sides~~	~~rough~~ estimate	gather ~~together~~
~~clearly~~ articulate	~~carefully~~ consider	~~successfully~~ prove
~~future~~ plan	~~mutual~~ agreement	years ~~of age~~
in ~~actual~~ fact	~~positive~~ benefits	~~end~~ result/product

3. Use accurate wording.

Sometimes this requires *more* words instead of fewer, so do not sacrifice clarity for concision. Make sure your words convey the meaning you intend. Avoid using words that have several possible meanings; do not leave room for ambiguity or alternate interpretations of your ideas. Keep in mind that readers of technical writing tend to choose literal meanings, so avoid figurative language that might be confusing. For example, some people use the word “decent” colloquially to

mean good (he makes a "decent" cappuccino!). Decent literally means "appropriately dressed" and is the opposite of "indecent." So it would be more accurate to say he makes a *delicious* (or *strong* or *authentic*) cappuccino.

Separate facts from opinions by using phrases like "we recommend," "we believe," or "in our opinion." Use consistent terminology, even it if seems repetitive, rather than looking for synonyms that may be less precise. Qualify statements that need qualifying, especially if there is possibility for misinterpretation. Do not overstate through the use of absolutes and intensifiers. Avoid overusing intensifiers like "extremely," and avoid absolutes like "never, always, all, none" as these are ***almost*** never accurate (see what I did there?). Remember Obiwan Kenobi's warning:

"Only a Sith deals in absolutes."[2]

We tend to overuse qualifiers and intensifiers, so below are some that you should be aware of and consider whether you are using them effectively.

Overused Intensifiers				
absolutely	actually	certainly	clearly	completely
definitely	drastically	extremely	fundamentally	highly
interestingly	incredibly	inevitably	indeed	markedly
naturally	of course	particularly	really	significantly
surely	totally	tremendously	utterly	very

Overused Qualifiers					
apparently	arguably	basically	essentially	generally	hopefully
in effect	in general	kind of	overall	perhaps	quite
rather	relatively	seemingly	somewhat	sort of	virtually

For a comprehensive list of words and phrases that should be used with caution, see Kim Blank's "Wordiness, Wordiness, Wordiness List." [3]

4. Prefer the active voice.

The active voice emphasizes the person/thing doing the action in a sentence. It is a more *direct* way of describing an action. For example, *The outfielder throws the ball.* The subject, "outfielder" actively performs the action of the verb "throws." Conversely, the passive voice emphasizes the

recipient of the action. In other words, something is being done *to* something *by* somebody: *The ball was thrown (by the outfielder).* Passive constructions, by expressing the action *indirectly*, are generally wordier and can often leave out the person/thing doing the action.

Active	Passive
S →V →O	**S ←V ←O**
Subject → actively does the action of the verb → to the object of the sentence	Subject ← passively receives the action of the verb ← from the object
Subject → acts → on object	Subject ← is acted upon ← by the object

The passive voice has a place, particularly if you want to emphasize the receiver of an action as the subject of the sentence, or the action itself, or you want to avoid using first person or identifying the doer of the action ("mistakes were made"). However, its overuse results in writing that is wordy, vague, and stuffy. When possible, use the active voice to convey who or what performs the action of the verb. Stress the **doer**, not *what was done*.

Precise writing encapsulates many of the 7 C's; it is clear, concise, concrete, and correct. But it is also accurate and active. To write precisely and apply the 7 C's, it is important to look critically at how you are choosing words and designing sentences, perhaps in a way you may not have done before.

Notes

1. W. Zinsser, "Simplicity," [Online]. Available: http://www.geo.umass.edu/faculty/wclement/Writing/zinsser.html
2. *Star Wars*: *Episode III - Revenge of the Sith* (2005). [Film]. Directed by G. Lucas
3. K. G. Blank, "Wordiness list," Department of English, University of Victoria [Online]. Available: http://web.uvic.ca/~gkblank/wordiness.html

2.4 The Importance of Verbs

Much of the style advice given so far revolves around the importance of verbs. Think of your sentence as a machine, and the verb as the engine that makes the machine work. Like machines, sentences can function efficiently or inefficiently, and the use of a strong verb is one way to make them work effectively. Also like machines, sentences can be simple or complex. Below are some key principles regarding the effective use of verbs in your sentences. While effective sentences may occasionally deviate from these principles, try to follow them as often as possible.

Guidelines for Using Strong Verbs to create Strong Sentences

Keep the subject and the verb close together; avoid separating them with words or phrases that could create confusion

Place the verb near the beginning of the sentence (and close to the subject)

Maintain a high verb/word ratio in your sentence

Prefer active verb constructions over passive ones

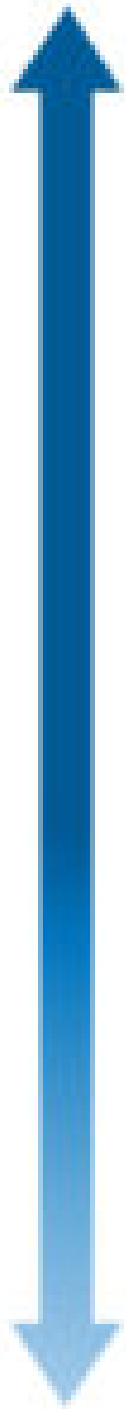
Avoid "to be" verbs (am, is, are, was, were, being, been, be) whenever possible; choose more descriptive verbs that describe what something ***does*** rather than what it ***is***.

Try to turn nominalizations (abstract nouns that end in *–tion* or *–ment*) back into verbs; move up the verb strength chart seen in **Table 2.4.1**.

Use the verb strength chart in **Table 2.4.1** as a guide to "elevate" weaker verbs (or words that are not technically verbs but contain an implied action) to stronger forms. This may require rewriting your sentence entirely.

TABLE 2.4.1 Verb strength chart

[Skip Table]		
Verb Forms	**Verb Strength**	**Examples**

Command/Imperative	**STRONG** 	**Maintain** the machine properly! **Write** the report!
Active Indicative* (Subject performs the action of the verb)		He **maintains** the machine regularly. She **writes** reports frequently.
Active conditional		She **would maintain** the machine **if** he would let her. He **would write** reports if he had more training.
Gerunds (*verb* -ing) Infinitives (to *verb*) (*these do not function as verbs in your sentence; actual verbs are highlighted in yellow*)		**Maintaining** the machine is dirty work. Report **writing** takes skill. It takes a lot of time **to maintain** this machine. **To write** effectively, one must get a sense of the audience.
Passive (Subject receives the action of the verb) Passive Conditional Expressing a state of being (is, seems, appears)		The machine **is maintained** by him. It **would be maintained** by her if... The report **was written** by her. Reports **would be written** by him if... The report seems fine.
Nominalizations (*verbs turned into abstract nouns*) Participles (*nouns or adjectives that used to be verbs*)	**WEAK**	Machine **maintenance** is dirty work. A well-**maintained** machine is a thing of beauty. **Written** work must be free of errors.

While you are not likely to use the command form much unless you are writing instructions, the

second strongest form, **Active Indicative,** is the one you want to use most often (say, in about 80% of your sentences). In the indicative form, the subject carries out the action of the verb. This makes the sentence more direct, and often more concise because you are saying "*who does what*" (instead of "*what is being done by whom*").

Part of the skill of using active verbs lies in choosing the verbs that precisely describes the action you want to convey. English speakers have become somewhat lazy in choosing a small selection of verbs most of the time (*to be*, *to do*, *to get*, *to make*, *to have*, *to put*); as a result, these often-used verbs have come to have so many possible meanings that they are almost meaningless. Try looking up "make" or "have" in the dictionary; you will see page after page of possible meanings! Whenever possible, replace these **bland** verbs with more precise, descriptive verbs, as indicated in **Table 2.4.2**. Note that commonly used "signal verbs," or verbs used to signal a quotation or paraphrase of someone else's ideas, can also vary in how precise and descriptive they are. Saying "she writes" does not really indicate the purpose for the writing, whereas saying "she claims" suggests she is making an argument, and "she describes" makes her rhetorical purpose more evident.

TABLE 2.4.2 Bland vs. descriptive verbs

[Skip Table]	
Avoid Bland Verbs	**Replace with Descriptive Verbs**
Signal Verbs: Says States Talks about Discusses Writes	Describe the rhetorical purpose behind what the author/speaker "says": Explains, clarifies Describes, illustrates Claims, argues, maintains Asserts, stresses, emphasizes Recommends, urges, suggests
Is, are, was, were being been Is *verb*-ing	Instead of indicating what or how something "**is**," describe what it **DOES**, by choosing a precise, active verb. Replace progressive form (*is* ___*ing*) with indicative form *She is describing* → *She describes*
Get, gets	Usually too colloquial (or passive); instead you could use more specific verbs such as Become, acquire, obtain, receive, prepare, achieve, earn, contract, catch, understand, appreciate, *etc.*
Do, does	Avoid using the *emphatic* tense in formal writing: It *does* work → it **works**. I *do* crack when I see apostrophe errors → I **crack** when I see apostrophe errors. Instead: Perform, prepare, complete, *etc.*
Has, have Has to, have to	This verb has many potential meanings! Try to find a more specific verb than "have/has" or "has to": • She **owns** a car • They **consume/eat** a meal • The product **includes** many optional features • The process **entails** several steps Instead of "have to" try: **must, require, need,** *etc.*
Make	Build, construct, erect, devise, create, design, manufacture, produce, prepare, earn, *etc.* Make a recommendation → recommend Make a promise → promise Make a plan → plan

For more detailed information on using signal verbs when introducing quotations, see Using Signal Phrases in Ch. 5.4 Synthesizing and Integrating Sources.

EXERCISE 2.8 *Improve the following sentences by elevating the verb and cutting clutter*

1. Market share **is being lost** by the company, as **is shown** in the graph in Figure 3.
2. A descrip**tion** of the product **is given** by the author.
3. An investiga**tion** of the issue **has been conducted** by her.
4. His task is **regional database systems troubleshooting handbook preparation.** (*what word contains the implied action here?*)
5. While a recommendat**ion to proceed has been made** by the committee, an agree**ment to increase** the budget will have **to be approved** by the committee. (*find the nominalizations and infinitive verb forms, and move them up the scale*)

EXERCISE 2.9 *Revision Practice*

The following paragraph on **The Effects of Energy Drinks** does not conform to the 7Cs and contains far too many "to be" verbs. Revise this paragraph so that it has a clear topic sentence, coherent transitions, correct syntax, and concise phrasing. In particular, try to eliminate all "to be" verbs (*am*, *is*, *are*, *was*, *were*, *being*, *been*, *be*), and rephrase using strong, descriptive, active verbs. The first 7 "to be" verbs are highlighted for you. Try to cut the word count (currently 260 words) by at least 50%

> Energy Drinks are able to be consumed in many varied and different ways by people all over the world. Moreover, drinking these energy drinks is able to provide people in today's society with the helpful benefits of increased awareness and energy. Besides, even though there are enhancements that may be present from drinking an energy drink, the negative side effects are posing more of a threat to a person than the energy boost that is able to be achieved. In a survey that was taken in the United States at an American university, it was reported that fifty one percent of participants were consuming greater than three energy drinks each month in the semester [1]. Looking at this statistic, it can be seen that a majority of students in university are drinking energy a large amount of drinks on a very regular basis. Which can be the cause of some health problems experienced by students. In the same study, it was also shown that energy drinks are capable of helping to increase energy and athletic endurance; for those who drank it. Despite the fact that there are some benefits to be had from drinking energy drinks, there is the problem of the negative side affects that are caused by the drinking of these energy drinks. However, the side affects that were commonly reported in the study are: headaches, and "energy crashes" (Smith 5). Being a potentially more severe problem than the minor problems of headaches and "crashes;" there is definitely the possibility of people which

are becoming addicted to caffeine.

Here is the exercise in a Word document for you to download and revise:

Revision Exercise – Energy Drinks (.docx)

After trying the exercise, click on the link below to compare your revision to effective revisions of this passage done by other students:

Sample Revisions of Exercise 2.7 (.docx)

Table 2.4.3 sums up many key style characteristics that you should try to avoid (*poor style*) and style characteristics you should implement (*effective style*) while writing technical documents.

TABLE 2.4.3 Key characteristics of effective professional style

Poor Style	Effective Style
Low VERB/WORD ratio per sentence	High VERB/WORD ratio per sentence
Excessive 'is/are' verbs or other bland verbs	Concrete, descriptive verbs that convey a clear sense of action
Excessive passive verb constructions	Active verb constructions
Abstract or vague nouns	Concrete and specific nouns
Many prepositional phrases	Few prepositional phrases
Subject and verb are separated by words or phrases	Subject and verb are close together
Verb is near the end of the sentence	Verb is near the beginning of the sentence
Main idea (subject-verb relationship) is difficult to find	Main idea is clear
Sentence must be read more than once to understand it	Meaning is clear the first time you read it
Long, rambling sentences	Precise, specific sentences

3. INFORMATION DESIGN

Information design is the "nuts and bolts" of technical writing. No matter how brilliant or important the content, if it is not formatted and presented in way that enhances readability, it will likely not receive the attention it deserves. This section includes the information on how technical writers use formatting features to optimize readability and enhance effectiveness of their messages.

Chapter 3 Learning Objectives

This chapter covers the following topics:

3.1 Readability: Understand the importance of "readability" to your technical audience, and what that looks like in technical communication.

3.2 Headings and Lists: Understand how to use headings and lists to organize information logically, emphasize key information, and facilitate comprehension and accessibility for the reader.

3.3 Figures and Tables: Understand how to integrate various kinds of figures and tables into documents to effectively present visual data and illustrative images.

3.4 Visual Rhetoric: Understand how to apply principles of visual design to enhance the persuasiveness of your communication.

3.5 Revision Strategies: Apply revision strategies to enhance clarity and readability.

3.1 Readability

All written communication has a specific purpose—to persuade, to inform, to instruct, to entertain—but the first and foremost purpose is to be ***read***. Choosing effective information design enhances the ***readability*** or ***usability*** of your document, infographic, presentation, or website so that the target audience is more likely to get the message you want them to receive, and your writing is more likely to achieve your intended purpose.

Choosing effective design elements helps to make your writing "user friendly" and accessible for the target audience. Keep in mind that people do not read technical writing for pleasure; they read it because they have to as part of their job. And since "time is money," the longer it takes to read the document, the higher the "cost." Your job as the information designer is to make the reading process as useful and efficient as possible by using all the tools at your disposal and following the conventions that readers have come to expect.

Designing written communication is like designing anything else; you have to

> **Define Your Purpose**: you must understand the need you are addressing, define the main goals and specific objectives you hope your writing will achieve, as well as the constraints (such as word count and format) that you must abide by
>
> **Understand Your Audience:** who will read this communication and why? In what context?
>
> **Choose an Approach**: determine which genre and form will be most appropriate for conveying your message to your intended audience, and understand how to use the conventions of that genre effectively
>
> **Select Strategies**: choose design features that will best achieve your purpose and best suit the target audience.

In essence, you must understand the **Rhetorical Situation** (see Chapter 2.2) in which you find yourself: *Who is communicating with whom about what, how and why*? What kind of design and formatting can help you most effectively convey the desired message to that audience? You want to use the most effective rhetorical strategies at your disposal; they way you visually design the information is one of those strategies.

Genres and Conventions

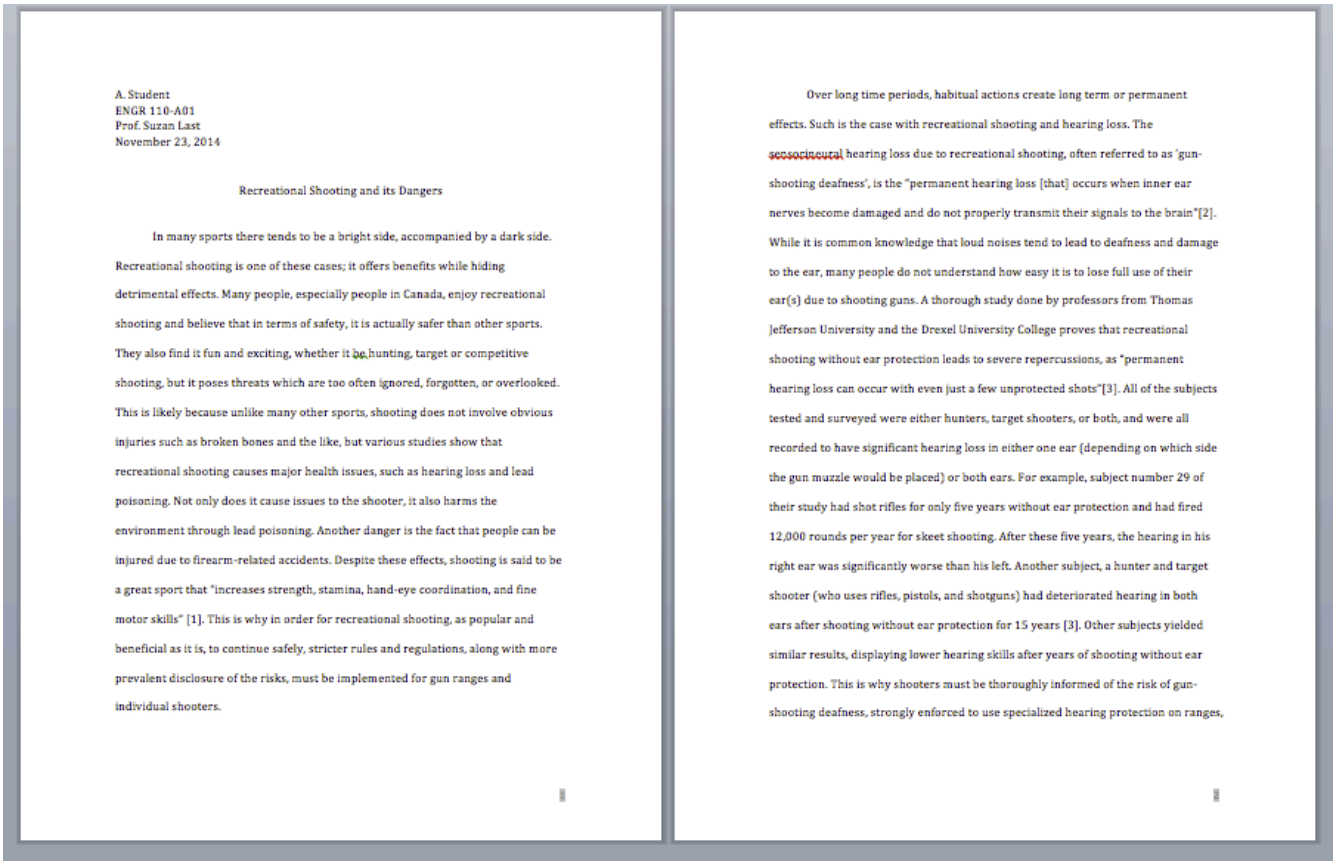
Readers in different contexts expect different textual features, depending on the type of media they are reading and their purpose in reading it. A reader of an online editorial might be initially drawn in by a provocative headline, perhaps using alliteration, exaggeration, or rhyme to catch attention (i.e. "clickbait"). The reader will likely expect strongly-worded arguments that may rely on inflammatory emotional language expressed in short paragraphs with frequent use of ALL CAPS and exclamation marks; but they won't expect the argument to be backed up with much empirical evidence. We do not expect an online editorial to cite reliable sources in a scholarly format. In contrast, an academic reader expects the opposite: neutral, unemotional language, and plenty of empirical evidence to logically and validly support claims, with detailed paragraphs developing complex ideas and sources cited in an appropriately academic bibliographical formats. A scholarly article that does not abide by these conventional expectations would likely not be seen as credible.

As a student writing an academic essay, you are typically expected to indent the first line of each paragraph and double space the body text. Why is this? Well, double spacing is a convention that arises from the need to make it easier for your instructor to add feedback directly on the page. And indenting the first line of each paragraph means you don't have to quadruple space to indicate a new paragraph.

Technical writing also uses formatting conventions strategically to ease the process of reading information that may be highly complex and technical, and perhaps not overly interesting to the reader. However, these conventions differ somewhat from those you've learned to use in your academic writing. For example, body text is typically ***not*** double spaced (to avoid scrolling fatigue). To break up "walls of text," the format makes extensive use of headings, lists, figures and tables to help convey information in an efficient and reader-friendly manner.

EXERCISE 3.1 *List some conventions of academic formatting*

Examine the formatting in **Figure 3.1.1** below and list some of characteristics that adhere to academic writing format requirements that you are familiar with. It does not matter if you cannot read the text; simply examine the formatting.



A. Student
ENGR 110-A01
Prof. Suzan Last
November 23, 2014

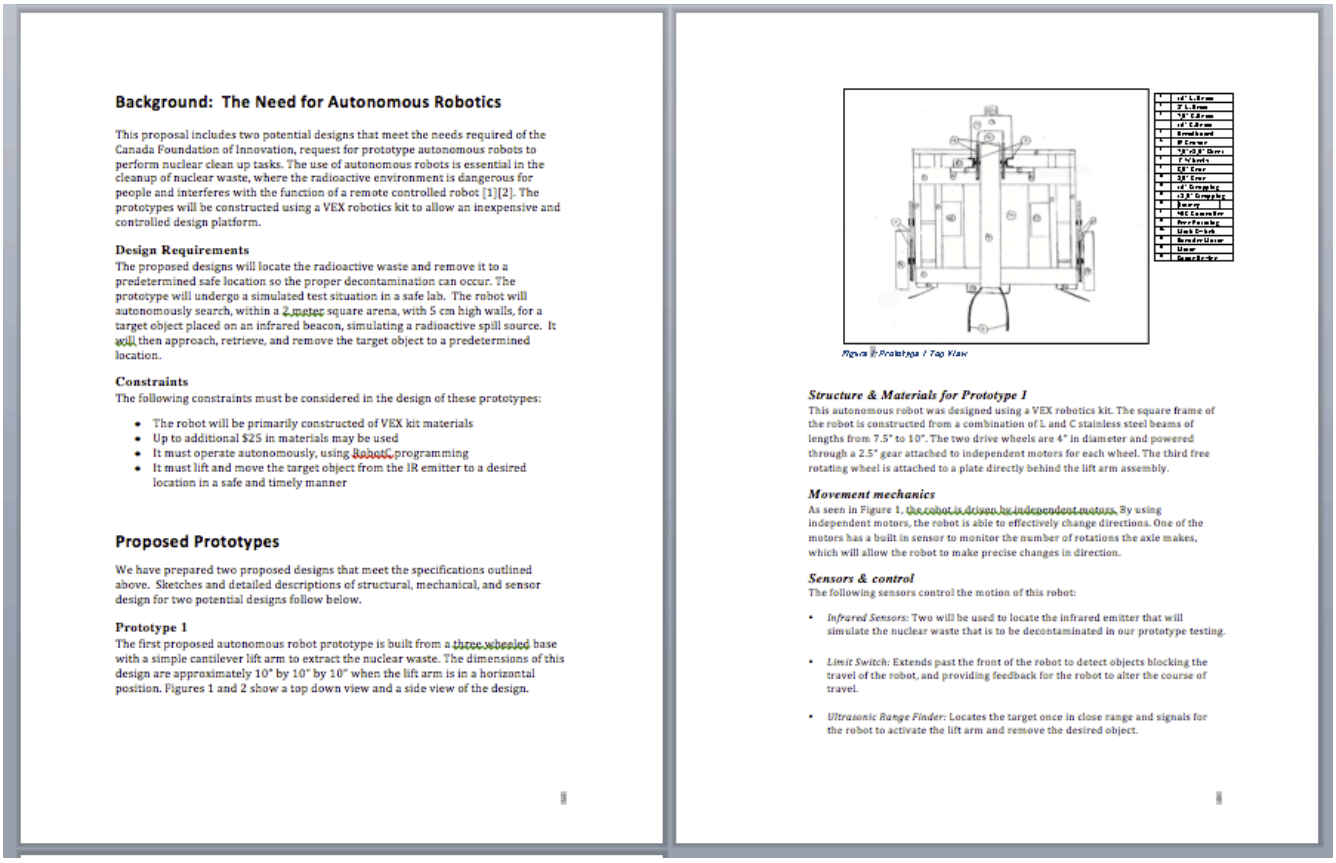
Recreational Shooting and its Dangers

In many sports there tends to be a bright side, accompanied by a dark side. Recreational shooting is one of these cases; it offers benefits while hiding detrimental effects. Many people, especially people in Canada, enjoy recreational shooting and believe that in terms of safety, it is actually safer than other sports. They also find it fun and exciting, whether it be hunting, target or competitive shooting, but it poses threats which are too often ignored, forgotten, or overlooked. This is likely because unlike many other sports, shooting does not involve obvious injuries such as broken bones and the like, but various studies show that recreational shooting causes major health issues, such as hearing loss and lead poisoning. Not only does it cause issues to the shooter, it also harms the environment through lead poisoning. Another danger is the fact that people can be injured due to firearm-related accidents. Despite these effects, shooting is said to be a great sport that "increases strength, stamina, hand-eye coordination, and fine motor skills" [1]. This is why in order for recreational shooting, as popular and beneficial as it is, to continue safely, stricter rules and regulations, along with more prevalent disclosure of the risks, must be implemented for gun ranges and individual shooters.

Over long time periods, habitual actions create long term or permanent effects. Such is the case with recreational shooting and hearing loss. The sensorineural hearing loss due to recreational shooting, often referred to as 'gun-shooting deafness', is the "permanent hearing loss [that] occurs when inner ear nerves become damaged and do not properly transmit their signals to the brain"[2]. While it is common knowledge that loud noises tend to lead to deafness and damage to the ear, many people do not understand how easy it is to lose full use of their ear(s) due to shooting guns. A thorough study done by professors from Thomas Jefferson University and the Drexel University College proves that recreational shooting without ear protection leads to severe repercussions, as "permanent hearing loss can occur with even just a few unprotected shots"[3]. All of the subjects tested and surveyed were either hunters, target shooters, or both, and were all recorded to have significant hearing loss in either one ear (depending on which side the gun muzzle would be placed) or both ears. For example, subject number 29 of their study had shot rifles for only five years without ear protection and had fired 12,000 rounds per year for skeet shooting. After these five years, the hearing in his right ear was significantly worse than his left. Another subject, a hunter and target shooter (who uses rifles, pistols, and shotguns) had deteriorated hearing in both ears after shooting without ear protection for 15 years [3]. Other subjects yielded similar results, displaying lower hearing skills after years of shooting without ear protection. This is why shooters must be thoroughly informed of the risk of gun-shooting deafness, strongly enforced to use specialized hearing protection on ranges,

***Figure* 3.1.1** *Page excerpt from an academic essay.*

Now examine the document in **Figure 3.1.2**. What differences do you notice? List some of the features that differ from the academic writing sample above. Consider why typical readers of technical writing would find these features desirable. Which document would you rather read? Why?



Background: The Need for Autonomous Robotics

This proposal includes two potential designs that meet the needs required of the Canada Foundation of Innovation, request for prototype autonomous robots to perform nuclear clean up tasks. The use of autonomous robots is essential in the cleanup of nuclear waste, where the radioactive environment is dangerous for people and interferes with the function of a remote controlled robot [1][2]. The prototypes will be constructed using a VEX robotics kit to allow an inexpensive and controlled design platform.

Design Requirements

The proposed designs will locate the radioactive waste and remove it to a predetermined safe location so the proper decontamination can occur. The prototype will undergo a simulated test situation in a safe lab. The robot will autonomously search, within a 2 meter square arena, with 5 cm high walls, for a target object placed on an infrared beacon, simulating a radioactive spill source. It will then approach, retrieve, and remove the target object to a predetermined location.

Constraints

The following constraints must be considered in the design of these prototypes:

- The robot will be primarily constructed of VEX kit materials
- Up to additional $25 in materials may be used
- It must operate autonomously, using RobotC programming
- It must lift and move the target object from the IR emitter to a desired location in a safe and timely manner

Proposed Prototypes

We have prepared two proposed designs that meet the specifications outlined above. Sketches and detailed descriptions of structural, mechanical, and sensor design for two potential designs follow below.

Prototype 1

The first proposed autonomous robot prototype is built from a three wheeled base with a simple cantilever lift arm to extract the nuclear waste. The dimensions of this design are approximately 10" by 10" by 10" when the lift arm is in a horizontal position. Figures 1 and 2 show a top down view and a side view of the design.

Structure & Materials for Prototype 1

This autonomous robot was designed using a VEX robotics kit. The square frame of the robot is constructed from a combination of L and C stainless steel beams of lengths from 7.5" to 10". The two drive wheels are 4" in diameter and powered through a 2.5" gear attached to independent motors for each wheel. The third free rotating wheel is attached to a plate directly behind the lift arm assembly.

Movement mechanics

As seen in Figure 1, the robot is driven by independent motors. By using independent motors, the robot is able to effectively change directions. One of the motors has a built in sensor to monitor the number of rotations the axle makes, which will allow the robot to make precise changes in direction.

Sensors & control

The following sensors control the motion of this robot:

- *Infrared Sensors:* Two will be used to locate the infrared emitter that will simulate the nuclear waste that is to be decontaminated in our prototype testing.
- *Limit Switch:* Extends past the front of the robot to detect objects blocking the travel of the robot, and providing feedback for the robot to alter the course of travel.
- *Ultrasonic Range Finder:* Locates the target once in close range and signals for the robot to activate the lift arm and remove the desired object.

Figure 3.1.2 *Excerpt from a technical report.*

It is important for writers to understand the conventions of the genre in which they are writing. Conventions are the "rules" or expectations that readers/viewers have for communicating in that particular genre or medium. If you do not follow the target readers' expectations in this particular type of situation or context, you run the risk of confusing them—or worse, damaging your credibility by being seen as someone who lacks understanding or expertise in this context. Document design is a kind of "visual rhetoric" in that the visual design of your information helps you to persuade the reader and present the information in a way that will have the desired impact. Making design choices that conform to the expectations of the genre and your audience will help your message have the impact you want it to have.

Style Guides and Templates

In many writing contexts, style guides and templates will be available to help you organize and format information according to expected conventions. Style guides dictate the general rules and

guidelines that should be followed; templates offer specific content and formatting requirements for specific kinds of documents. Academic publishers make style guides available to prospective authors so that they know how to appropriately format documents they submit to that publication. Newspapers, academic journals, organizations, and businesses often have their own "in house" style that must be followed by all writers within that organization.

A company may have specific templates, for example, a Memo template, that all employees must follow, in order to ensure consistency of messaging within the organization. You likely had a style guide to help you format your bibliographies and term papers in many of your classes (e.g. APA or MLA Style Guides), and in Science classes, you likely had a template to help you organize Lab Reports.

Technical writing makes use of several typical design features to organize information efficiently and enhance readability. These include headings, lists, figures, and tables, as well as strategic use of passive space around all of these features. Consider the style requirements you are expected to follow in your course, in a particular assignment you are working on, or even in creating your own "graphics charter" or "company brand." Could you create a Style Guide that provides the details other contributors will need to know? Use the template below to create your own Style Guide

Defining Your Style Guide

Since Microsoft Office products (Word, Excel, and PowerPoint) are industry standard, your Style Guide might indicate how your formatting adheres to and diverges from the defaults in Word. Include details about the following document design elements:

TYPOGRAPHY: What font sizes and styles will you use for headings (specify for each level of heading), for body text, captions, table text, and any other elements you might use (like pull quotes or text boxes). Provide examples of each type of text.

MARGINS and SPACING: How much space will you leave on each margin (left, right, top and bottom of page)? Will you single space your body text? double space? something in between? Will you left align all text, or will you indent the first lines of paragraphs? Will you fully justify paragraphs, or leave a "ragged" right margin? Do you have a guideline for minimum or maximum length of paragraphs?

COLOUR: What colours will you use consistently in your document? How? Ensure colour schemes are consistent with your thematic message, and that colour contrasts are effective and accessible.

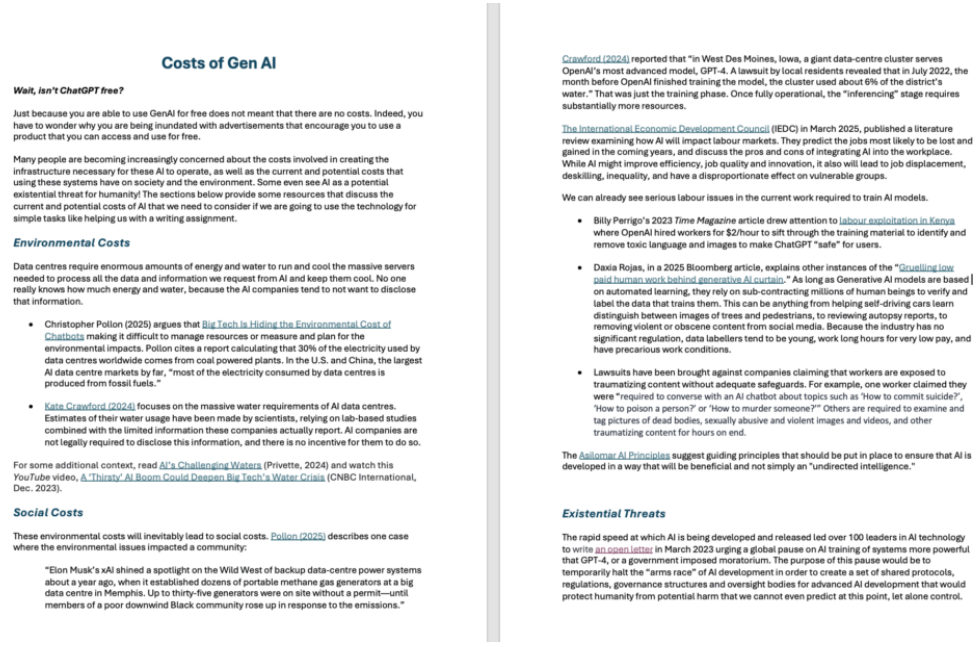
VISUALS: will you design a logo? a recurring graphic element in the header or footer? How will you deal with embedded visual elements like figures and tables? Is there a specific design you will use for tables (e.g. colour of header row should be consistent with your colour palette). Will figures be left aligned? centred? Will you wrap text around figures or not?

The rest of this chapter offers specific and detailed information on how and why technical writers use the following design features:

- **Headings**: headings and subheadings provide a clearly visible organization and structural cues that allow readers to understand the structure, preview information, and read selectively.
- **Lists**: lists provide a way to concisely and efficiently convey information and emphasize ideas. There are several kinds of lists, each used for specific purposes.
- **Figures and Tables**: visual representations of data and concepts offer a reader a break from sentence and paragraphs, and provide additional ways to illustrate and understand information.
- **Passive Space:** leaving blank space (also called "passive" or "negative" space) strategically on the page (around lists, figures, and headings, and between paragraphs) helps the reader to absorb the information in the "active" space more effectively, and helps create a visually appealing look.
- **Visual Rhetoric**: Using visual design to help enhance the persuasive appeal of your document.

3.2 Headings and Lists

Headings and lists are standard features of technical writing that, if used effectively, can enhance readability in numerous ways, but if used poorly, can create confusion or irritation. Headings and lists help to break up text in meaningful ways that makes the reader's journey through the information smoother and easier. For example, look at the differences between the formatting of information in **Figure 3.2.1**, which uses headings and lists to format the information for enhanced readability, and **Figure 3.2.2**, which presents the same information, but without headings and lists. It is just a series of paragraphs or "wall of text."



Costs of Gen AI

Wait, isn't ChatGPT free?

Just because you are able to use GenAI for free does not meant that there are no costs. Indeed, you have to wonder why you are being inundated with advertisements that encourage you to use a product that you can access and use for free.

Many people are becoming increasingly concerned about the costs involved in creating the infrastructure necessary for these AI to operate, as well as the current and potential costs that using these systems have on society and the environment. Some even see AI as a potential existential threat for humanity! The sections below provide some resources that discuss the current and potential costs of AI that we need to consider if we are going to use the technology for simple tasks like helping us with a writing assignment.

Environmental Costs

Data centres require enormous amounts of energy and water to run and cool the massive servers needed to process all the data and information we request from AI and keep them cool. No one really knows how much energy and water, because the AI companies tend to not want to disclose that information.

- Christopher Pollon (2025) argues that Big Tech Is Hiding the Environmental Cost of Chatbots making it difficult to manage resources or measure and plan for the environmental impacts. Pollon cites a report calculating that 30% of the electricity used by data centres worldwide comes from coal powered plants. In the U.S. and China, the largest AI data centre markets by far, "most of the electricity consumed by data centres is produced from fossil fuels."
- Kate Crawford (2024) focuses on the massive water requirements of AI data centres. Estimates of their water usage have been made by scientists, relying on lab-based studies combined with the limited information these companies actually report. AI companies are not legally required to disclose this information, and there is no incentive for them to do so.

For some additional context, read AI's Challenging Waters (Privette, 2024) and watch this *YouTube* video, A 'Thirsty' AI Boom Could Deepen Big Tech's Water Crisis (CNBC International, Dec. 2023).

Social Costs

These environmental costs will inevitably lead to social costs. Pollon (2025) describes one case where the environmental issues impacted a community:

> "Elon Musk's xAI shined a spotlight on the Wild West of backup data-centre power systems about a year ago, when it established dozens of portable methane gas generators at a big data centre in Memphis. Up to thirty-five generators were on site without a permit—until members of a poor downwind Black community rose up in response to the emissions."

Crawford (2024) reported that "in West Des Moines, Iowa, a giant data-centre cluster serves OpenAI's most advanced model, GPT-4. A lawsuit by local residents revealed that in July 2022, the month before OpenAI finished training the model, the cluster used about 6% of the district's water." That was just the training phase. Once fully operational, the "inferencing" stage requires substantially more resources.

The International Economic Development Council (IEDC) in March 2025, published a literature review examining how AI will impact labour markets. They predict the jobs most likely to be lost and gained in the coming years, and discuss the pros and cons of integrating AI into the workplace. While AI might improve efficiency, job quality and innovation, it also will lead to job displacement, deskilling, inequality, and have a disproportionate effect on vulnerable groups.

We can already see serious labour issues in the current work required to train AI models.

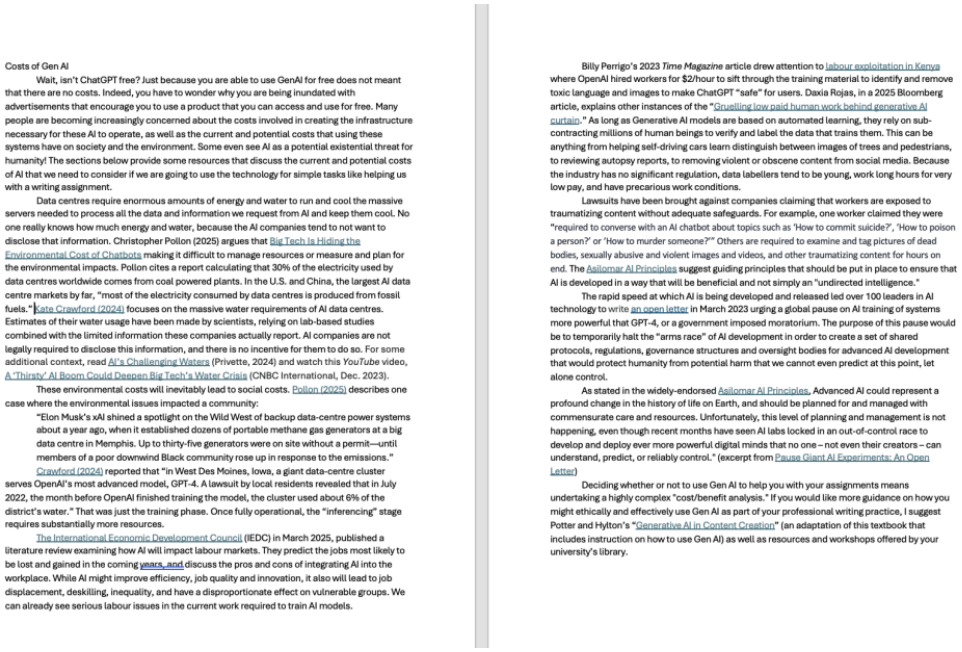
- Billy Perrigo's 2023 *Time Magazine* article drew attention to labour exploitation in Kenya where OpenAI hired workers for $2/hour to sift through the training material to identify and remove toxic language and images to make ChatGPT "safe" for users.
- Daxia Rojas, in a 2025 Bloomberg article, explains other instances of the "Gruelling low paid human work behind generative AI curtain." As long as Generative AI models are based on automated learning, they rely on sub-contracting millions of human beings to verify and label the data that trains them. This can be anything from helping self-driving cars learn distinguish between images of trees and pedestrians, to reviewing autopsy reports, to removing violent or obscene content from social media. Because the industry has no significant regulation, data labellers tend to be young, work long hours for very low pay, and have precarious work conditions.
- Lawsuits have been brought against companies claiming that workers are exposed to traumatizing content without adequate safeguards. For example, one worker claimed they were "required to converse with an AI chatbot about topics such as 'How to commit suicide?', 'How to poison a person?' or 'How to murder someone?'" Others are required to examine and tag pictures of dead bodies, sexually abusive and violent images and videos, and other traumatizing content for hours on end.

The Asilomar AI Principles suggest guiding principles that should be put in place to ensure that AI is developed in a way that will be beneficial and not simply an "undirected intelligence."

Existential Threats

The rapid speed at which AI is being developed and released led over 100 leaders in AI technology to write an open letter in March 2023 urging a global pause on AI training of systems more powerful that GPT-4, or a government imposed moratorium. The purpose of this pause would be to temporarily halt the "arms race" of AI development in order to create a set of shared protocols, regulations, governance structures and oversight bodies for advanced AI development that would protect humanity from potential harm that we cannot even predict at this point, let alone control.

Figure 3.2.1 *An excerpt from chapter 1.4 on the Costs of Gen AI, using headings and lists to enhance readability.*



Costs of Gen AI

Wait, isn't ChatGPT free? Just because you are able to use GenAI for free does not meant that there are no costs. Indeed, you have to wonder why you are being inundated with advertisements that encourage you to use a product that you can access and use for free. Many people are becoming increasingly concerned about the costs involved in creating the infrastructure necessary for these AI to operate, as well as the current and potential costs that using these systems have on society and the environment. Some even see AI as a potential existential threat for humanity! The sections below provide some resources that discuss the current and potential costs of AI that we need to consider if we are going to use the technology for simple tasks like helping us with a writing assignment.

Data centres require enormous amounts of energy and water to run and cool the massive servers needed to process all the data and information we request from AI and keep them cool. No one really knows how much energy and water, because the AI companies tend to not want to disclose that information. Christopher Pollon (2025) argues that Big Tech Is Hiding the Environmental Cost of Chatbots making it difficult to manage resources or measure and plan for the environmental impacts. Pollon cites a report calculating that 30% of the electricity used by data centres worldwide comes from coal powered plants. In the U.S. and China, the largest AI data centre markets by far, "most of the electricity consumed by data centres is produced from fossil fuels."Kate Crawford (2024) focuses on the massive water requirements of AI data centres. Estimates of their water usage have been made by scientists, relying on lab-based studies combined with the limited information these companies actually report. AI companies are not legally required to disclose this information, and there is no incentive for them to do so. For some additional context, read AI's Challenging Waters (Privette, 2024) and watch this *YouTube* video, A 'Thirsty' AI Boom Could Deepen Big Tech's Water Crisis (CNBC International, Dec. 2023).

These environmental costs will inevitably lead to social costs. Pollon (2025) describes one case where the environmental issues impacted a community:

> "Elon Musk's xAI shined a spotlight on the Wild West of backup data-centre power systems about a year ago, when it established dozens of portable methane gas generators at a big data centre in Memphis. Up to thirty-five generators were on site without a permit—until members of a poor downwind Black community rose up in response to the emissions."

Crawford (2024) reported that "in West Des Moines, Iowa, a giant data-centre cluster serves OpenAI's most advanced model, GPT-4. A lawsuit by local residents revealed that in July 2022, the month before OpenAI finished training the model, the cluster used about 6% of the district's water." That was just the training phase. Once fully operational, the "inferencing" stage requires substantially more resources.

The International Economic Development Council (IEDC) in March 2025, published a literature review examining how AI will impact labour markets. They predict the jobs most likely to be lost and gained in the coming years, and discuss the pros and cons of integrating AI into the workplace. While AI might improve efficiency, job quality and innovation, it also will lead to job displacement, deskilling, inequality, and have a disproportionate effect on vulnerable groups. We can already see serious labour issues in the current work required to train AI models.

Billy Perrigo's 2023 *Time Magazine* article drew attention to labour exploitation in Kenya where OpenAI hired workers for $2/hour to sift through the training material to identify and remove toxic language and images to make ChatGPT "safe" for users. Daxia Rojas, in a 2025 Bloomberg article, explains other instances of the "Gruelling low paid human work behind generative AI curtain." As long as Generative AI models are based on automated learning, they rely on sub-contracting millions of human beings to verify and label the data that trains them. This can be anything from helping self-driving cars learn distinguish between images of trees and pedestrians, to reviewing autopsy reports, to removing violent or obscene content from social media. Because the industry has no significant regulation, data labellers tend to be young, work long hours for very low pay, and have precarious work conditions.

Lawsuits have been brought against companies claiming that workers are exposed to traumatizing content without adequate safeguards. For example, one worker claimed they were "required to converse with an AI chatbot about topics such as 'How to commit suicide?', 'How to poison a person?' or 'How to murder someone?'" Others are required to examine and tag pictures of dead bodies, sexually abusive and violent images and videos, and other traumatizing content for hours on end. The Asilomar AI Principles suggest guiding principles that should be put in place to ensure that AI is developed in a way that will be beneficial and not simply an "undirected intelligence."

The rapid speed at which AI is being developed and released led over 100 leaders in AI technology to write an open letter in March 2023 urging a global pause on AI training of systems more powerful that GPT-4, or a government imposed moratorium. The purpose of this pause would be to temporarily halt the "arms race" of AI development in order to create a set of shared protocols, regulations, governance structures and oversight bodies for advanced AI development that would protect humanity from potential harm that we cannot even predict at this point, let alone control.

As stated in the widely-endorsed Asilomar AI Principles, Advanced AI could represent a profound change in the history of life on Earth, and should be planned for and managed with commensurate care and resources. Unfortunately, this level of planning and management is not happening, even though recent months have seen AI labs locked in an out-of-control race to develop and deploy ever more powerful digital minds that no one – not even their creators – can understand, predict, or reliably control." (excerpt from Pause Giant AI Experiments: An Open Letter)

Deciding whether or not to use Gen AI to help you with your assignments means undertaking a highly complex "cost/benefit analysis." If you would like more guidance on how you might ethically and effectively use Gen AI as part of your professional writing practice, I suggest Potter and Hylton's "Generative AI in Content Creation" (an adaptation of this textbook that includes instruction on how to use Gen AI) as well as resources and workshops offered by your university's library.

Figure 3.2.2. *The same text as in figure 3.2.1, but with no formatting to break up the "wall of text"*

This textbook uses headings, lists, typographical cues like bold and italics, and visuals to help illustrate the information in the paragraphs in reader-friendly ways. Imagine if all the information in this book were presented only in paragraphs, with no additional formatting to break up the wall of text. Would you have gotten this far?

The following sections describe the typical conventions of **headings** and **lists** to help you use them to format information in ways that will be effective for your purpose and audience.

Headings

Headings are generally created using the **Styles** tool in MS Word (or similar tool in other programs) in order to "code" them as headings within the document or webpage and distinguish them from body text. This allows you to auto-generate a table of contents based on the headings, and allows screen readers to identify headings for the listener.

Heading serve several important functions:

Provide organizational overview of the document and the logical development of ideas

Show hierarchical relationship of ideas (headings, sub-headings)

Allow the reader to scan and read selectively

Increase readability of the document by providing breaks and passive space

Allow screen readers to recognize headings, thereby enhancing the accessibility of your text for readers with visual disabilities.

Effective headings use concrete, descriptive language to tell the reader what to expect from the content of each section. Avoid vague or function-based headings when writing technical reports. Function-based headings are a convention used in documents that have highly consistent structures, such as science lab reports, where each section must fulfill a particular function. For example,

1. Introduction
2. Materials
3. Procedure/Methodology
4. Data/Results
5. Discussion/Conclusions
6. References

Technical reports are usually not so strictly organized or predictable. Readers will find it much more helpful if headings concretely describe the **content** of each section rather than the **function**. You can craft descriptive headings by pulling key words or phrases from the section they head to give the reader a preview of what to expect.

Note the differences in the two Tables of Contents in **Figure 3.2.3**, each generated automatically from headings and captions within their respective documents. Which one gives a clearer idea of what the report is about?

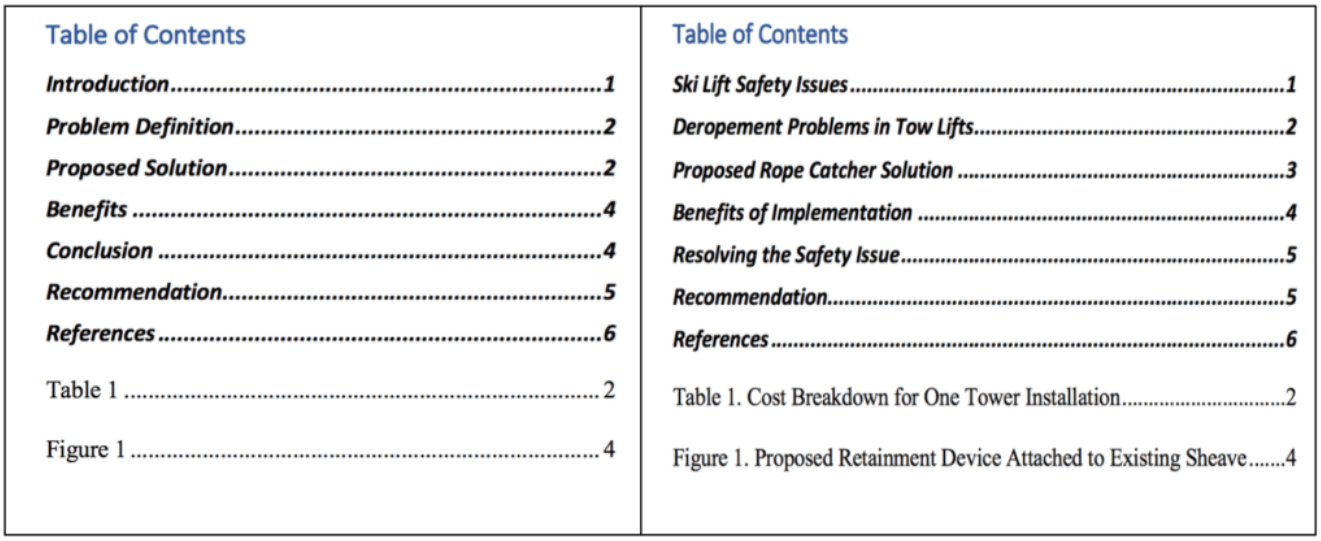


Figure 3.2.3 *Function-based vs Descriptive Headings.* *[Image description]*

General Principles for Designing Headings

When designing the headings in your document or online space, keep in mind these general principles:

- **Hierarchical Relationship of Ideas**: use typography (font size and type), boldness, italics, indentation, and colour to indicate the relative importance of ideas and how they inter-connect. In general, first level headings are larger and bolder than second and subsequent level headings.Headings should help the reader see how information is organized.
- **Consistency**: if you use headings, every section must have a relevant heading. Make sure your headings at each level are consistent in design (font, size, colour, indentation, etc.) Use the STYLES function in Word to help design and maintain effective and consistent headings throughout your document. You can modify the default styles to suit your preferences.
- **Readability**: leave passive space above and below headings. There should be slightly more space above the heading than below it (so the heading is closer to the section it relates to).
- **Frequency**: Avoid overusing headings; use them strategically to delineate specific sections of your document (every paragraph does not necessarily need its own heading). Too many headings actually impedes readability by separating ideas that should be coherently connected. For example, a Problem Definition is one idea, and should not have elements split up under separate headings.
- **Specificity**: use descriptive heading text to inform the reader of the content of each section. Avoid vague or generic headings, unless these are expectations of the genre you are using.

Make sure the content in each section is appropriately described by its heading.

SUMMARY: DOs *and* **DON'T** *s for designing headings*

DO the following:

- Use a *sans serif* font for your headings
- Use font sizes of 12-20 point for headings in documents
- Use descriptive words or short phrases in the heading that indicate the content of the section
- Make sure there is slightly more passive space *above* a heading than below it
- A heading should have a block of body text below it; avoid adding a heading directly below a previous heading with no intervening body text (known as "stacked headings")
- Use the **Styles** function in MS Word to create your headings (see this helpful video on "How to Create and Customize Headings" using Styles

AVOID the following:

- **"Stacked" headings.** Avoid stacking one heading directly below another. A heading is like a chapter title; it must have *at least* a sentence of information below it, and can often have several paragraphs of content. Stacked headings can indicate inefficient organization of information that you might consider revising.
- **Overuse of headings.** Keep in mind that every sentence does not require its own heading, nor does every paragraph or figure. Ideally, a heading should have at least one, often several, paragraphs of text below it. A heading defines a **section** of the document. Overuse of headings indicates an inefficient organization of ideas that needs revision.
- **Do not use a heading to introduce a table, figure, or list.** You should have text below a heading that introduces and explains the figure or table. A list requires a lead-in sentence to explain what it is a list of.
- **Avoid creating "widows and orphans"** –that is, leaving a heading at the bottom of the page with no body text below it. Insert a hard page break before your heading to avoid this.
- **Don't refer to a heading as "this"** in the body text below it. Begin your sentence as if the heading were not there, even if this seems repetitive. Avoid starting a new section with a pronoun that refers to a previous idea.
- **Avoid manually designing** your headings by simply bolding and enlarging body text (unless you do **not** want them to appear in your Table of Contents).

Using the **Styles** function in MS Word, rather than simply making text larger or bold manually, offers you may advantages. For example, the algorithm created using Styles allows you to

- Enable Screen Reading software to identify your heading hierarchy
- Create and automatic Table of Contents (TOC) from your headings and sub-headings
- Create hyperlinks to other sections in your document (or bookmarks in a .pdf document)

- Use Word's Navigation Pane
- Use Word's "outline" feature when drafting your document

Enabling screen reader software helps make your documents more accessible. Creating an automatic table of contents will save you tons of time! Nobody should ever type all those dots manually…. In addition, the TOC can be updated as you revise your document and add sections, which will help when you are collaborating with other writers. Similarly, you can also create an automatic **List of Figures** if you use the **Caption** function. Learning how to use the Styles formatting tool will make your report writing much easier, and will allow you combine sections written by different team members easily and effectively (figure and table numbers will automatically update). Use the tutorials in Word, or search for current online video tutorials showing how to use these tools.

EXERCISE 3.2 *Review questions*

Answer the following review questions:

1. What is an acceptable size range and font style for headings in a document?
2. What are "widows and orphans" in the context of document design?
3. What are several functions that headings can serve in a document?
4. What are "stacked headings?" Should you use them?
5. What is the difference between a "function-based" heading and a concrete or "descriptive" heading?
6. True or False: You should have more white space above a heading than below it.
7. True or False: A heading can be used to introduce a figure or a list.

Further practice:

Review a document you have written, such as a research essay, and see if you can divide it into logical sections introduced by concrete, descriptive headings.

Lists

Lists, when used effectively, can be a technical writer's—and reader's—best friend. Lists allow you to cut a lot of verbiage, emphasize important ideas, and make them stand out from the body text.

Using SmartArt in MS Word to create these lists can provide additional interest to your design and make the list pop! But be careful not to overuse this feature. Lists increase the readability of text by simplifying long sentences or paragraphs and adding aesthetic passive space to make reading more pleasant. They can also allow you to present information more efficiently. However, using the wrong kind of list or poorly formatting a list can create confusion rather than enhance readability. Overusing lists can make your ideas seem underdeveloped. Therefore, it is important to understand the various types of lists and how and why to use them.

Guidelines for Creating Lists

Adhere to the following guidelines when creating lists of any kind:

- **Include** between 2-8 items in a list. You must have at least two items in a list (or it's not a list; it's just an item). Having more than 8 items in a list can have the reverse effect. If you emphasize too many ideas, you end up emphasizing nothing. Use 8 items as a guideline (not a rule)
- **Avoid** splitting a list over two pages, if possible.
- **Avoid overusing** lists. A list should always have explanatory text around it to indicate what this is a list of and its purpose. A series of lists does not give a reader adequate information and context, and makes your document look like a rough outline rather than a polished final product.
- **Adjust** spacing before, after, and within lists to enhance readability. Avoid having a list of information all scrunched up into a dense block of text; this defeats the purpose of enhancing readability.
- **Capitalize** the first letter of each list item (or don't; just be consistent).
- **Use** parallel phrasing for each listed item (note that each item in this list starts with a verb; these verbs are bolded only to catch your attention, not as a style you must follow).
- **Do not use** a heading to introduce a list. A list needs a lead-in sentence that contains a subject and a verb.

Each kind of list is suited for specific purposes, and generally conforms to a set of rules of construction and formatting. Learning to use the **Paragraph** formatting tool in Word (see **Figure 3.2.4**) is crucial to designing lists that are effective and accessible to assistive technology like screen readers.

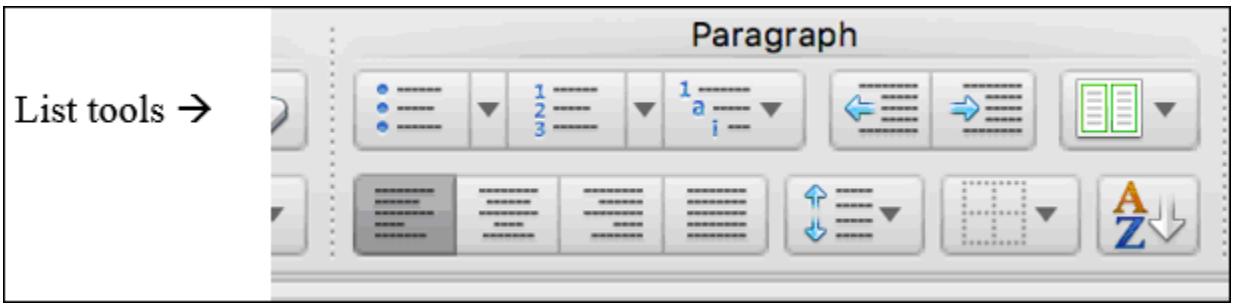


Figure 3.2.4 *Screenshot of* ***Paragraph*** *tools in Word that allow you to make lists*

NOTE: Avoid making lists by hitting ENTER then TAB and then a dash; this may make future editing difficult, and your list may not be recognized by a screen reader, creating confusion for the person trying to understand your document. Especially when writing documents collaboratively that will need extensive revision and editing, make sure to use the appropriate formatting tools consistently.

Common Types of Lists

Just as bar graphs serve a different purpose than pie charts, different kinds of lists also serve different purposes. This section will describe when and how to use the following five commonly used types of lists:

- **Numbered Lists**: use when order is important, such as steps in instructions
- **Bullet Lists**: use when order of listed items is not important
- **Labelled Lists**: use when the listed items require some explanation or amplification (like this one)
- **In-sentence Lists**: use when you want to maintain sentence and paragraphing structure, and have a short list (2-4 items)
- **Nested Lists**: use when listed items have sub-lists (list within a list).

NUMBERED or ORDERED LISTS

Use numbered lists (also called “ordered lists”) when the order of the listed items is important and ideas must be expressed in chronological order. For example, use a numbered list when you must enumerate a series of steps in instructions, or when you are introducing ideas that will be

discussed in a certain order in the following text. If you have a list of more than 8 items, consider breaking up the list in two or more stages or categories (Steps in Stage 1, Steps in Stage 2, *etc.*).

Sample Numbered List

Revision of your document should be undertaken in 4 stages done in the following order:

1. Check formatting for readability
2. Review content to ensure the document contains all necessary information
3. Edit sentence style and structure to ensure ideas are clearly and correctly expressed in a formal and precise manner
4. Proofread for grammar, spelling, punctuation and usage errors.

NOTE: The 4 steps in the sample numbered list each begin with a verb (*check*, *review*, *edit*, and *proofread*), indicating what the reader should **do**, and the numbers indicate the order in which these steps should be performed.

BULLET LISTS

Bullet lists are the most commonly used kind of list. They are effective when

- You want to emphasize two or more items
- You can place the items in any order (no particular order is required)
- You want to add white space to your document to enhance readability.

Bullet list items should generally be short (a word or a phrase). If you find your bulleted items are longer than this, consider using another kind of list, such as a labelled list or a nested list.

LABELLED LISTS

Use a labeled list when you are listing items that need further explanation. This may be the most common type of list you will use, as they allow you to present a lot of detailed information in a concise and clearly delineated format. These can be bulleted, numbered, or maintain paragraph format but use a bolded label. Use bold and/or italicized text to convey the list item, the word or

term (the "label" portion) you want to emphasize. Place a a colon after the list item, and after the colon, write the explanation or amplification of the term or concept in normal body text.

Sample Labelled Lists : one numbered, one bulleted, and one in paragraph format

The course assessment plan includes three main written assignments given in the following order:

1. *Report One*: an internal proposal written in Memo format
2. *Report Two*: an internal proposal written in Short Report format
3. *Report Three*: A comparative recommendation report written in Long Report format.

The plan also includes two oral presentations:

- **Presentation 1**: Individual presentation on a technical writing topic
- **Presentation 2**: Team presentation giving a progress report on Report 3

Keep in mind that argument and synthesis are not the same:

> **ARGUMENT** is a complex writing move that might include any or all of the above strategies. An argument is intended to persuade or influence the reader's thinking or behaviour in some way. An effective argument should define a context or controversy, present a clear position or claim, explain why this position is valid, and provide compelling supporting evidence.
>
> **SYNTHESIS** entails combining and summarizing ideas from different sources and perspectives in order to enhance your own perspective. Like summarizing, synthesis must accurately and objectively represent the ideas of other, and should offer a comprehensive and proportional representation of the sources relevant to the topic. Synthesis might be used to show significant consensus on a topic, reveal the complexity and variety of perspectives on an issue, identify trends in the research, point to gaps in existing research, or even create new understanding by linking different ideas together.

Make sure the label portions (before the colon) are phrased consistently and either italicized or bolded (or both!) for emphasis; try to make the explanations that follow similar in length and detail.

IN-SENTENCE LISTS

Use in-sentence lists when you want to (a) keep paragraph style, (b) to avoid having too many lists on one page, and (c) when the list items are relatively short and can be expressed in a sentence clearly without creating a run-on. The previous sentence is an example of an in-sentence list. Note that a bracketed, lower-case letter introduces each listed item.

Typically, in-sentence lists have 2-4 items. Generally avoid putting more than 4 items in this kind of list (unless they are very short), or your sentence might become difficult to read.

NESTED LISTS

A "nested" list is a list-within-a-list or a list with sub-listed items. These can be useful for avoiding overly long bullet lists by categorizing items into sub-lists. Note the long bullet list on the left does not effectively categorize items, so emphasis is lost. The Nested List on the right is more effective.

Sample Bullet List (too long)	**Sample Nested List**

Every restaurant should contain the following beverage containers:
 	
• Coffee cups/mugs
• Latte bowls
• Tea cups
• Travel mugs
• Water glasses
• Red Wine glasses
• White wine glasses
• Beer glasses
• Beer steins
• Cocktail glasses
• Shot glasses
• Reusable plastic cups.
 	
(12 items is too many for one list!)
	Every restaurant should contain the following kinds of beverage containers:
	
	• Hot beverage containers
	  ◦ Coffee mugs/cups
	  ◦ Latte bowls
	  ◦ Tea cups
	  ◦ Travel mugs
	• Cold beverage containers
	  ◦ Water glasses
	  ◦ Red wine glasses
	  ◦ White wine glasses
	  ◦ Beer glasses
	  ◦ Beer steins
	  ◦ Cocktail glasses
	  ◦ Shot glasses
	  ◦ Reusable plastic cups.

This is not an exhaustive list of the kinds of lists you may run across in your technical reading. These are simply the most common kinds of lists, and ones you should be able to identify and use effectively in your technical writing assignments to enhance readability.

EXERCISE 3.3 *Rewrite the following paragraph so that in incorporates a labeled list*

Writers often use three rhetorical appeals to persuade their audience. These appeals are referred to in Greek as *logos*, the appeal to logic or reason; *pathos*, the appeal to emotion, and *ethos*, the appeal to credibility or authority. When writers appeal to logic, they ground their claims in reasoning, facts, statistics and formal definitions. When appealing to emotion, authors try to evoke specific emotions in their readers, such as

hopefulness, anger, nostalgia, pride or even guilt. Authors appeal to credibility in order to gain the trust of the reader and get them to see that author as a knowledgeable and reliable source of information on the topic. Writers must determine which appeals will be most effective for their particular audience, purpose and content.

Note how much more concise you can make this paragraph by incorporating a list.

A Note on Punctuating the End of List Items

Conventions for punctuating list items vary depending on the context. Legal writing and policy documents tend to use more punctuation than technical writing (list items often end in semicolons and the final item is introduced by an "and" in legalistic writing). In technical documents, because this style favours simplicity and brevity, you typically place a period only after the final item in your list. If each listed item has complete sentences within it, then you will place a period at the end of each list item. If you have a simple bullet list, you may omit the final period.

EXERCISE 3.4 *Identify the design errors in the following example*

Five Kinds of List:

1. Bullet lists
2. numbered lists.
3. Lists can be written within a sentence using bracketed letters to introduce the list items.
4. nested list
    - Also called a "list within a list"
5. Labelled List

Integrating Lists into Body Text

Just as there are rules for constructing lists, there are rules for how to incorporate them into your text. Most importantly, a list must be introduced by a lead-in sentence (or clause) that contains both a subject and a verb. Technical writers often use the expression "the following" somewhere in the lead-in sentence to clearly indicate that a list of items will follow.

If the lead-in is a complete sentence that contains both a subject and verb (*ie*. it could end in a period), it should end in a colon that introduces the listed items. If the sentence is not a complete thought, (*ie*. you could *not* put a period there) the lead-in should not end in any punctuation, and each listed item must be able to grammatically complete the lead-in sentence.

Example Lead-in Sentences for Lists

COMPLETE LEAD-IN SENTENCE (*ends in a colon*)

The term's design project must allow students to incorporate **the following** elements into their solution:

- Mechanical engineering principles
- Electrical engineering knowledge
- Software/programming basics.

PARTIAL LEAD-IN SENTENCE (*no punctuation after lead-in*)

The term's design project must allow students to design a solution using

- Mechanical engineering principles
- Electrical engineering knowledge
- Software/programming basics.

Note how each listed item can complete the lead-in sentence.

EXERCISE 3.5 *Which of the follow lead-ins should end in a colon? Which should end with no punctuation?*

1. Our solution aims to meet the following objectives
2. The design constraints that must be considered are
3. All proposed designs must abide by the following constraints
4. The proposed solutions offers many tangible benefits, such as
5. The proposed solution offers the following tangible benefits

EXERCISE 3.6 *Identify the types of lists below*

1. List type:	**2. List type:**
Revision of your document should be undertaken in 4 stages: 1. Check formatting for readability 2. Review content to ensure the document contains all necessary information in a logical order 3. Edit sentence style and structure to make sure it is formal, clear, and correct 4. Proofread for grammar, punctuation, spelling, and format errors.	The assessment plan for this course includes three main writing tasks: • *Report 1*: an internal proposal written in memo format • *Report 2*: an internal proposal written in short report format • *Report 3*: an external Comparative Recommendation Report, written in long report format.
3. List type:	**4. List type:**
The 7 Cs refers to seven characteristics of effective professional writing. This writing should be • Clear • Concise • Concrete • Coherent • Correct • Complete • Courteous.	The term design project tests your knowledge of the following principles: • Mechanical engineer ◦ Forces ◦ Torque ◦ Gear trains • Electrical engineering ◦ Sensors ◦ Circuits.

EXERCISE 3.7 *Practice using the Paragraph Tools in Word to make a list*

Create your own list, using the Paragraph Tools in Word. For example, make a list of as many kinds of vehicles as you can think of, being as creative as you can. If you can think of more than 8, consider what kind of list would be most suitable.

1. Could you categorize them into nested lists? What kind of categories?
2. Consider what text would introduce and follow your list.
3. What kind of document would contain a list of vehicle types? Who would read it?

Image descriptions

Figure 3.2.1 image description:

Function-based headings:

- Introduction
- Problem Definition
- Proposed Solution
- Benefits
- Conclusion
- Recommendation
- References
- Table 1
- Figure 1.

Descriptive headings:

- Ski Lift Safety Issues
- Deropement Problems in Tow Lifts
- Proposed Rope Catcher Solution
- Benefits of Implementation
- Resolving the Safety Issues
- Recommendation
- References.
- Table 1. Cost breakdown for one tower installation.
- Figure 1. Proposed Retainment Device

[Return to Figure 3.2.1]

3.3 Figures and Tables

Visual elements such as graphs, charts, tables, photographs, diagrams, and maps capture your readers' attention and help them to understand your ideas more fully. They are like the illustrations that help tell the story. These visuals help to augment your written ideas and simplify complicated textual descriptions. They can help the reader understand a complicated process or visualize trends in the data.

The key concept to remember here is that visuals *clarify*, *illustrate*, and *augment* your written text; they are not a *replacement* for written text. The old adage, "a picture is worth a thousand words" may not always not hold true in technical writing, but adding a visual may save you a hundred words or so of additional explanation or follow-up clarification.

If you have visual elements in your document, they must be based on and supplement your written content. Throwing in "gratuitous graphics" just to decorate or take up space can confuse your reader.

It is important to choose the right kind of visual to clearly convey the story you want your reader to understand. If visuals are poorly chosen or poorly designed for the task, they can actually confuse the reader rather than clarify ideas. For example, it's very likely that the first thing you noticed when you opened this page was the image above. Did you wonder why is it there? Has it distracted you?

Conventions for Integrating Visuals

Each style of visual has its own conventions that you will recognize after you have seen enough of them. In addition, different publications have different style guides that dictate the specifics of

how to format and integrate visual elements. In general, however, whenever you integrate any kind of visual, you should adhere to five key conventions.

Five Conventions for Integrating Visual Elements into your Document

1. **CAPTION**: Give each visual a numbered caption that includes a clear descriptive title (For example, if the image above had a caption, it would be something like this: ***Figure 1***. *Yin Yang image as example of a gratuitous graphic element*)
2. **DISCUSS**: Refer to the caption number within the body text and discuss its content (don't leave a figure or table to "speak for itself"). For example, in the body paragraph, I might add ***Figure 1*** *is meant to be an example of a gratuitous graphic that serves no purpose.*
3. **LABLEL**: Clearly label all units (x and y axes, legends, column box heads, parts of diagrams, *etc.*)
4. **CITE:** Provide the source of the data and/or visual image if you did not create it yourself. You can include the citation in the body text where you refer to the image or at the end of the caption.
5. **ACCURACY**: Make sure you are not misrepresenting or distorting the data or image. Represent data accurately and use high quality images.

In addition, visual elements should be surrounded with sufficient passive space to emphasize the image and enhance its readability. If copying and pasting an image, make sure all elements are clear and the print size is readable. A visual that has been shrunk down to an unreadable size does not help the reader understand your ideas. Similarly, a poor quality image that pixelates when expanded will seem amateurish. Whenever possible, try to orient the visual image in the same direction as the body text.

Examine **Figure 3.3.1** below. Do you understand what information it conveys? What story it's trying to tell? What is missing? Which of the five conventions have not been followed?

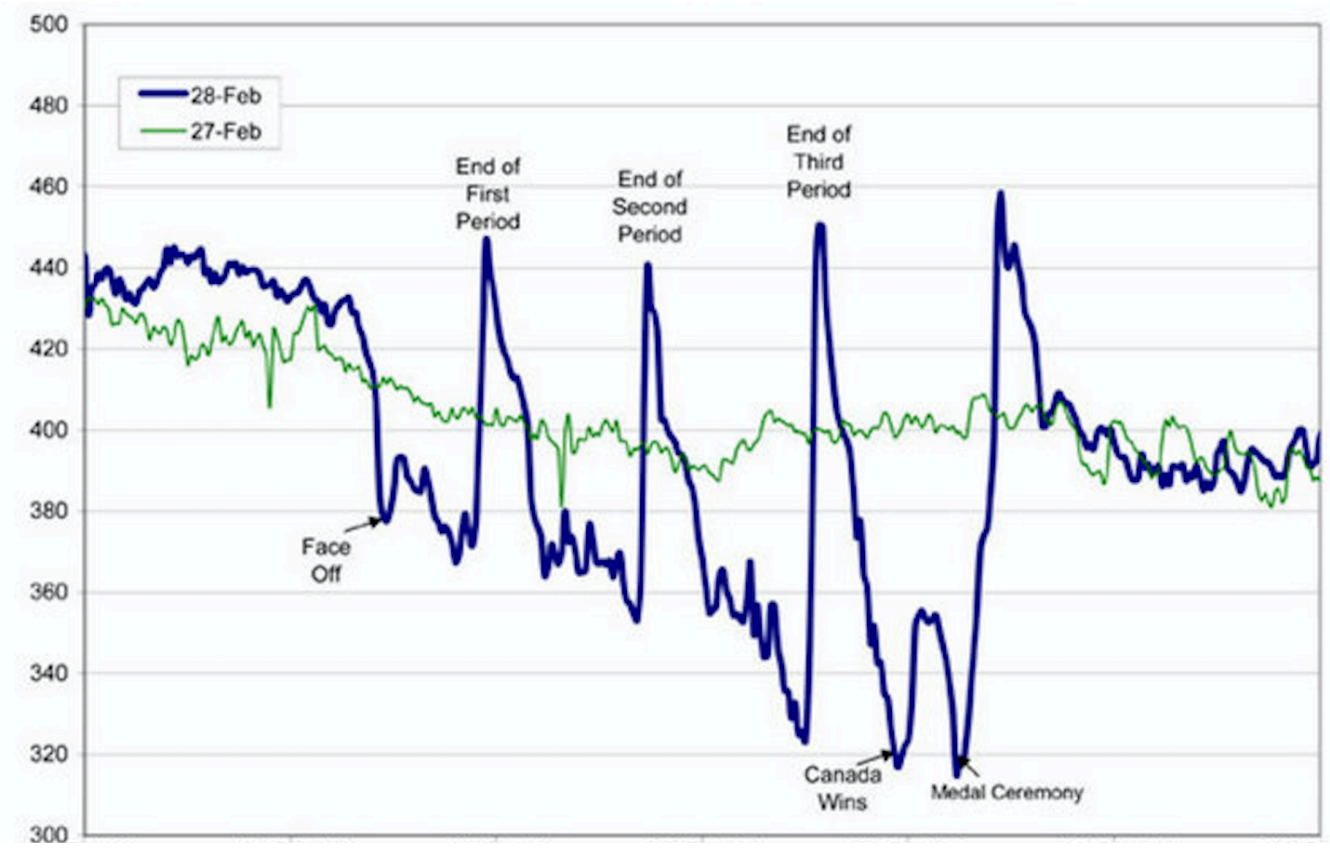


***Figure* 3.3.1** *[Image Description]*

If you look carefully, you might be able to guess something about the story this graph is telling. However, the lack of a descriptive caption and labelling of axes makes it impossible to know the full context. It also lacks a citation, so the reader cannot go to the source or know where the data came from. Compare it to **Figure 3.3.2** below.

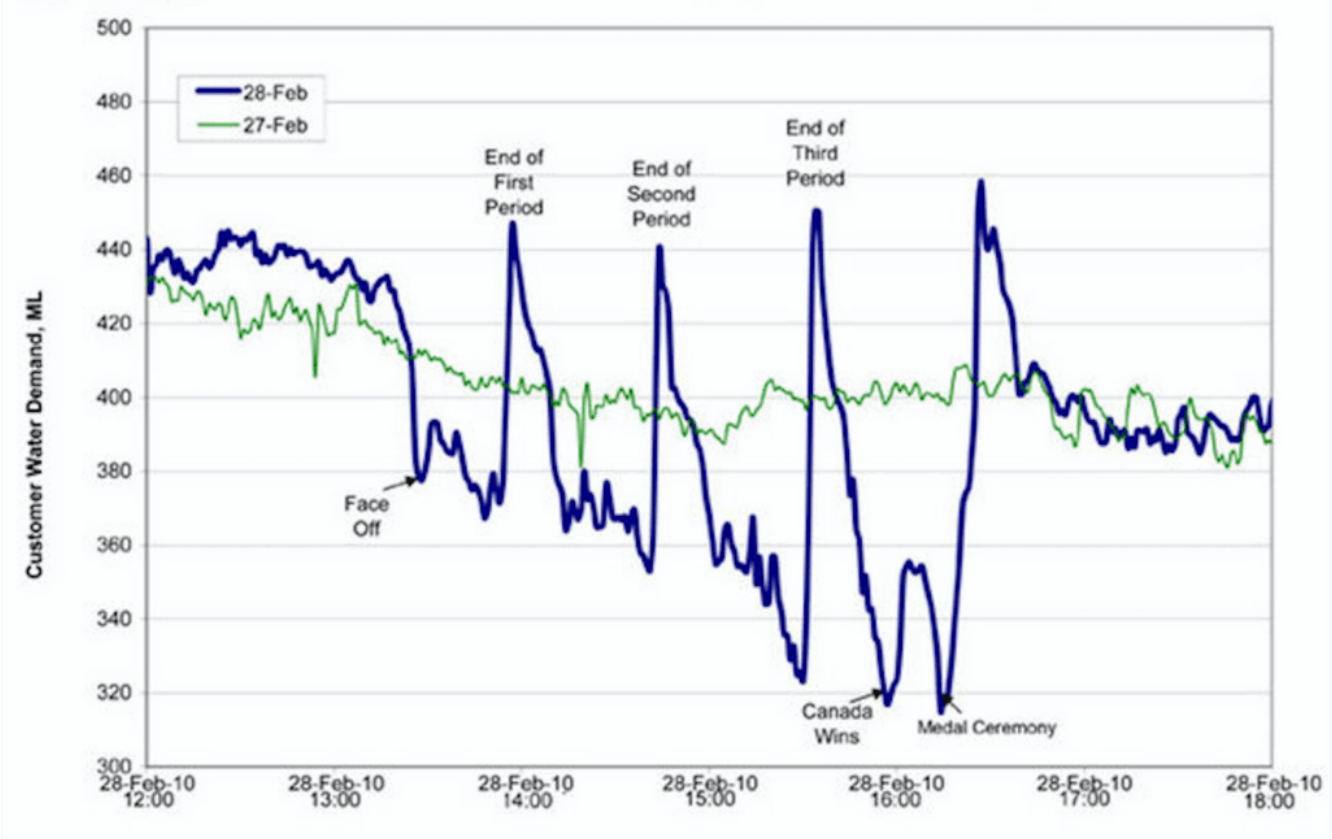


***Figure* 3.3.2** *Water Consumption in Edmonton during the 2010 Gold Medal Hockey Game.* [1] [Image description]

Figure 3.3.2 has a numbered caption (which I have just referred to in my paragraph), a descriptive title indicating what the data visualization is about, and properly labelled x and y axes and legends. With this added information, the story starts to take shape. The graph tells the story of the fluctuating water demand in Edmonton during the 2010 Olympic gold medal hockey game. If you add some context that flushing of toilets is one of the main drivers of water demand, the story comes into focus. We can imagine hockey fans enjoying beverages during each period, and "holding it" until until the end of the period so they don't miss an exciting play. Then they all go to the bathroom between periods. The figure also cites the source the graph was retrieved from in the caption using an in-text citation, which is linked to a full reference below. Therefore, if you want to assess the credibility of the source or need more information about this data, you can find it. The original image has not been distorted in any way and all elements are clearly readable. Thus, **Figure 3.3.2** follows the five conventions listed above.

In addition to those five conventions, there are specific guidelines for implementing them.

Guidelines for Integrating Graphics

Terminology

Visual elements are referred to as either **Tables** or **Figures**. **Tables** are made up of rows and columns and the cells usually have numbers in them (but may also have words or images). **Figures** refer to any visual elements—graphs, charts, diagrams, photos, *etc.*—that are not Tables. They may be included in the main sections of the report, or if they contain supplemental material they may be contained in an appendix. Try to ensure that figures and tables are not broken over two pages. If a table require a full page, consider whether it might be better placed in an appendix.

Labelling Tables and Figures

Tables and figures must all be labelled with numbered captions that clearly identify and describe them. Table captions **must** be placed *above* the tables. This is because we conventionally read tables from the top down, and therefore want to see the caption at the top. Figure captions are generally placed below the figures, as these are not always read top down; however, you have some choice here. When you open a page and see a figure, the first thing you want to know is "what is that?" The caption below it should immediately identify what the figure represents for the reader. If you choose to place figure captions above the figures, do so consistently throughout your document. If you use Word's "insert caption" function, it will automatically place table captions above and figure captions below.

Use the following conventions to assist the reader in understanding your graphics:

- **Numbering**: Table and Figures are numbered sequentially, but separately

  e.g. Table 1, Table 2, Figure 1, Figure 2, Table 3, *etc.*

- **Captioning**: After the Figure or Table number, add a **descriptive caption** that clearly indicate what the figure or table illustrates without having to read anything else on the page.

There are two systems for numbering figures and tables within your document:

- ***Simple Consecutive Numbering***: All figures and tables are numbered consecutively (Figure 1, Figure 2, Figure 3, Table 1, Table 2, Table, 3 *etc.*) throughout the document regardless of which section they are in.
- ***Section-based Numbering***: Within each section, figures and tables may be numbered sequentially through each section (e.g. Table 1.1 refers to the first table in section 1, Table 2.4 refers to the fourth table in section 2). This textbook uses the section-based system.

If a large number of illustrations are presented, and your document has numbered sections, then the latter option is the better choice. This can become confusing, however, when using sub-sections.

If you did not create table or figure that you present in your report, but copied it from other sources, you must include a reference for the original source in your caption: *e.g.*: ***Figure 1.*** *Sample Network Design [3].* You must ensure that all figures and tables represent data accurately and ethically, and that they do not distort data to create bias.

Using the **Insert → Caption** function will allow Word to keep track of the Figure and Table numbering for you, and allow you to auto-create a **List of Figures and Tables** at the beginning of your document.

If you don't use the **Insert Caption** function, then you should manually change the font of your captions to distinguish them from body text. Caption font is usually slightly smaller than body font and is often italicized or in a slightly different colour. The numbered portion is often bolded in both the caption and in the in-paragraph reference to the figure or table for ease of cross-referencing.

Referring to Tables and Figures in your Text

Any figures or tables you use in your document must be discussed in your text. Use the following guidelines when discussing and referring to tables and figures:

- Place the table/figure close to where it is first referred to in the text (preferably immediately below the paragraph in which it is mentioned or discussed).
- Refer to tables and figures in your text by their numbers, not their placement in the text. *E.g*, "See Figure 9 for a detailed schematic" (**not** "see the figure below"); "the test results are summarized in Table 1."
- When referring to a figure or table in your body text, it is helpful to place the reference in bold font.

Selecting the Right Visual

Table 3.3.1 lists common kinds of visual elements used in technical writing, along with their general purpose or description (for a more detailed discussion of how and when to use these kinds of visuals, see Graves and Graves.[2] Notice the "box head" on the top and "stubs" on the left are bolded and centred to enhance readability, and the box head is shaded. Tables that have text in the cells instead of numbers can also be referred to as figures as you can think of them as a type of chart. Thus, **Table 3.1.1** could have been captioned as **Figure 3.3.3** instead.

TABLE 3.3.1 Common types of illustrative graphics

[Skip Table]		
Type of Visual		**Description and Purpose**
Tables		Place detailed data/information in categories formatted into rows and columns for comparison; use when exact figures are important. Label column headings (box heads) and/or rows (stubs).
Graphs	**Bar Graph**	Compare and contrast two or more subjects at the same point in time, or compare change over time.
	Column Graph	Reveal change in a subject at regular intervals of time.
	Line Graph	Show the degree and direction of change relative to two variables; compare items over time, show frequency or distribution, or show correlations.
Charts	**Pie Chart**	Display the number and relative size of the divisions of a subject; shows relation of parts to a whole (parts must sum to 100% to make sense).
	Org. Chart	Map the divisions and levels of responsibility or hierarchy within an organization.
	Flow Chart	Show the sequence of steps in a process or procedure.
	Gantt Chart	Indicates timelines for multi-stepped projects, especially used in proposals and progress reports.
Illustrations	**Diagram**	Identify the parts of a subject and their spatial or functional relationship; emphasize detail or show dimensions.
	Photo	Show what a subject looks like in realistic detail or show it being used.
	Animation	Simulate a process, operation, or incident.
	Film clip	Depict a process, operation, or incident in realistic detail.

When constructing tables, consider that you may need to adjust the default column widths to balanced the information in the table aesthetically, and depending on the style you choose, you may need to define the headers. **Table 3.3.2** has a poor balance of text and passive space (and thus seems unbalanced, even though the columns are the same width). The text in the top row does not clearly signal that this is header text.

TABLE 3.3.2 An example of a table that needs reformatting

CONVENTION	Description
CAPTION	Give each visual a numbered caption that includes a clear descriptive title (For example, if the image above had a caption, it would be something like this: ***Figure 1***. *Yin Yang image as demonstration of a gratuitous visual*)
DISCUSS	Refer to the caption number within the body text and discuss its content (don't leave a figure or table to "speak for itself"). For example, ***Figure 1*** *is meant to be an example of a gratuitous graphic that serves no purpose.*
LABEL	Clearly label all units (x and y axes, legends, column box heads, parts of diagrams, etc)
CITE	Provide the source of the data and/or visual image if you did not create it yourself. You can include the citation in the body text where you refer to the image or at the end of the caption.
ACCURACY	Avoid misrepresenting or distorting the data or image. Represent data accurately and use high quality images.

Note how the adjustments made in **Table 3.3.3** enhance readability.

TABLE 3.3.3 Reformatted Table 3.3.2, adjusted to enhance readability

CONVENTION	DESCRIPTION
CAPTION	Give each visual a numbered caption that includes a clear descriptive title (For example, if the image above had a caption, it would be something like this: ***Figure 1***. *Yin Yang image as demonstration of a gratuitous visual*)
DISCUSS	Refer to the caption number within the body text and discuss its content (don't leave a figure or table to "speak for itself"). For example, ***Figure 1*** *is meant to be an example of a gratuitous graphic that serves no purpose.*
LABEL	Clearly label all units (x and y axes, legends, column box heads, parts of diagrams, etc)
CITE	Provide the source of the data and/or visual image if you did not create it yourself. You can include the citation in the body text where you refer to the image or at the end of the caption.
ACCURACY	Avoid misrepresenting or distorting the data or image. Represent data accurately and use high quality images.

Adjust the columns as needed to make efficient use of space and enhance aesthetic appeal, but avoid making columns so narrow that words break in awkward places. If necessary, text size in tables can be made slightly smaller (e.g. 9-10 pt font) to avoid this problem.

Visualizing Data to Suit your Need

Figure 3.3.3 shows 4 different ways to visualize the same data comparing the annual revenues of 3 different stores over time (2023-2025). What are the strengths and weaknesses of each method of visualization? Are some better at highlighting specific ideas that might help the viewer make decisions about where to allocate resources?

Figure 3.3.3 *Four data visualizations (made using MS Excel) comparing the revenue of 3 stores over 3 years.*

The 3D visualization may seem fancy, but it actually make it difficult to pick out specific data, forcing the viewer work too hard to figure out what is going on. The simple bar graph on the top right makes it much easier to compare how each store's revenue performed in each of the 3 years. The line graph in the bottom left shows clear trends for each store, but does not focus on specific data. The bar graph on the bottom right uses shades of grey instead of colours to distinguish data sets, making this more accessible for people who don't see colour. It also reverses the year and store data orientation to highlight the *comparison* of how each store has performed over the 3 year time period. Your choice of data visualization style will depend on what data you want to emphasize for your audience.

EXERCISE 3.8 *Design a figure to match the data*

Using what you have learned about figures and tables, create two different visual representations of the data described in the following paragraph, and caption appropriately with a number and a *descriptive title*. Explain why you chose those forms you did, and list the pros and cons of each:

> We surveyed the students in 3 sections of ENGR 240 (total of 100 students) to gauge which aspect of the writing process they found most challenging: Pre-writing, Drafting, or Revising. The results among the 3 sections were consistent. Overall, 50% of students said that they found the Pre-writing stage to be the most challenging, while 28% found the Drafting stage most difficult and 22% said the Revision stage was most challenging (see **Figure 1)**. These results suggest that we should place more emphasis on teaching and practicing pre-writing strategies during the course.

Create a **Figure 1** and a descriptive caption that describes the purpose of the data visualization. Input the data into an Excel spreadsheet and have it create a visualization for you (highlight the data and use the "Insert" option to have Excel recommend a visualization style). Try a few different methods to see which will best serve your purpose.

Additional Resources

For excellent examples of professional data visualizations, check out the following videos:

David McCandless: *The Beauty of Data Visualization* (TED, YouTube)

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://pressbooks.bccampus.ca/technicalwriting2ed/?p=68#oembed-1

Hans Rosling, *The Joy of Stats* (YouTube)

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://pressbooks.bccampus.ca/technicalwriting2ed/?p=68#oembed-2

The Perceptual Edge site offers examples of poorly designed data visualizations, with an explanation for why they are poorly designed, and a suggestion for improving them.

Image descriptions

Figure 3.4.1 image description:

A graph with no figure number or caption and no x or y axis labels, so it is difficult to determine what point it is trying to make. It shows something rising and falling during a hockey game. This thing spikes at the end of each period and drops dramatically when Canada wins.

[Return to Figure 3.4.1]

Figure 3.4.2 image description:

A graph charting water consumption in Edmonton during the 2010 Gold Medal Hockey Game. The graphs shows spikes in water consumption at the end of each period, followed by very low usage periods, especially near the end of the 3rd period, and between the end of the game and the medal ceremony. It also has a line depicting water usage the previous day, which was fairly steady throughout the day.

[Return to Figure 3.4.2]

Notes

1. EPCOR, Edmonton's Water Utility. "Water Consumption in Edmonton during 2010 Gold Medal hockey game," Cited on Flowing Data[Online] Available:https://flowingdata.com/2010/03/09/canada-the-country-that-pees-together-stays-together/
2. H. Graves and R. Graves, "Communicating through visuals," in *A Strategic Guide to Technical Communications*, 2nd ed. Peterborough, ONT: Broadview Press, 2011, pp. 137-148.

3.4 Visual Rhetoric

Visual rhetoric is the use of visual design element to help you achieve a communication goal. Infographics, advertisements, websites, memes, menus, even graffiti are all obvious examples of media that use visual rhetoric to influence or persuade the viewer. Within technical writing, the use of images, colour schemes, typography, spacing, layout and composition help you to design compelling and persuasive messages in a variety of media, including documents, posters, web interfaces, and presentations.

We've discussed rhetoric in general in Ch. 2.2 Writing to persuade, and in Ch. 3 we've focused on designing information to ensure "readability" using headings, lists, figures and tables. Visual rhetoric builds on these ideas by focusing on how the visual elements of your message can contribute to its persuasiveness. Where effective visual design can make strong arguments even more compelling, poor visual design can confuse or irritate your reader, and potentially make ideas less persuasive or accessible.

Consider the three rhetorical appeals in terms of the visual impact your document might have on the reader:

Rhetorical Appeal	Visual Rhetoric
Ethos	How can your document's visual design help support your credibility as an author? Does it convey professionalism? Expertise? Authority? Attention to detail? Will it encourage your reader to trust you?
Pathos	How do you want your audience to feel when they see your visual design? Impressed? Shocked? Interested? Curious? Strategic use of images, colour, and fonts can impact your reader's emotional response to what you've written
Logos	How can you strategically use visual tools like images, typography, colour, layout and composition to clearly convey your purpose, convey a hierarchy of ideas, and signal key ideas you want your reader to prioritize?

CRAP Design Principles

C.R.A.P. is an acronym for a widely recognized set of design principles focusing on *contrast*,

repetition, *alignment*, and *proximity*. These principles are applied in many visual design contexts from fine art to graphical user interfaces and document design.

CONTRAST: use contrast to create visual interest and focus attention. Strategic use of contrasting font sizes and styles can help organize information logically, allow readers to scan effectively, and make certain ideas stand out. For example, headings are larger and bolder than body text to help create orientation markers for the reader. Caption text is often smaller to distinguish it easily from body text. The labeled portion of a labeled list is bolded, italicized and/or capitalized to make the key words/ideas stand out (for example, this one uses **BOLDED ALL CAPS** for the labels). Overuse can make the document feel chaotic and out of balance.

REPETITION: repetition and consistency help to create visual coherence and flow in the document and can help establish your visual brand. Once you have established a design principle (heading and font styles, margins, spacing, layout, colour, etc), you should stick with it. Otherwise your document can appear amateurish and might confuse your reader.

ALIGNMENT: Every element in your design is visually connected. Alignment ensures that these connections help to establish structural order and coherence in your document. Alignment principles can work as conventions. For example, in academic writing, text is left aligned, except for the first line of each paragraph, which is indented slightly to indicate a new paragraph. Technical writing, on the other hand, uses an additional space between paragraphs to signal a new paragraph, and keeps full left alignment of all text. Both typically use the more reader-friendly "ragged right" margin. Lists and long quotations are typically indented to clearly signal where they start and end. Inconsistent or inappropriate alignment causes your document to appear "messy" and poorly thought out.

PROXIMITY: this principle is based on the tendency for readers to perceive things that are close together as related to each other. For example, when adding space around headings, you should have more space above the heading than below it. The text below the heading, to which it belongs, should be closer to the heading than the text above it (which is associated with the previous heading). This is also why we avoid creating "widows and orphans" where the heading ends up at the bottom of the page, but the text that follows it appears on the next page. When readers see a figure or table, they expect to see the discussion of that visual on the same page, usually in the paragraph directly preceding or following the visual. Readers will get annoyed if they have to flip ahead or back to find the visual that is being discussed on a different page.

For a deeper dive into these and related visual design principles, check out Gestalt Principles of Perceptual Organization by Lois Frankel.

Visual Rhetoric in Action

Watch the short animated videos below, created by LearnFree, for some thoughtful and visually engaging information on visual rhetoric (*Typography*, *Layout and Composition*, *Colour*, *Images*, and *Fundamentals* of line, shape, form, texture and balance) that will help you make effective and strategic information design choices.

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://pressbooks.bccampus.ca/technicalwriting2ed/?p=317#oembed-1

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://pressbooks.bccampus.ca/technicalwriting2ed/?p=317#oembed-2

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://pressbooks.bccampus.ca/technicalwriting2ed/?p=317#oembed-3

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://pressbooks.bccampus.ca/technicalwriting2ed/?p=317#oembed-4

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://pressbooks.bccampus.ca/technicalwriting2ed/?p=317#oembed-5

Designing Accessible Information

When designing your document, infographic, or website, keep in mind that not all readers will have the same visual abilities. Some readers with low or no vision will rely on screen readers to read the information aloud. People who are colour blind may not be able to understand ideas that rely on colour coding alone. As the information designer, you must consider how these different ways of perceiving can be addressed in your design.

Create accessible information by adopting the best practices described below for each element of your design

FONTS: accessible fonts prioritize legibility to allow people with low vision or reading disabilities to read quickly and easily. Serif fonts (like Times New Roman) have decorative features (serifs) that can impede readability. Select common *sans serif* fonts such as Aptos, Calibri, or Arial to enhance legibility. Avoid excessive use of ALL CAPS, *italics*, underlining, or fonts smaller than 11 points. In small doses, these can help with emphasizing key ideas, but overuse can have the opposite effect.

HEADINGS: Use Styles in MS Word to create consistent headings that can be scanned and understood by assistive technology such as screen readers. These will allow the screen reader to alert the listener to the presence of a headings. If you format your headings manually, the screen reader will interpret them as body text, and this could create confusion for the listener.

TABLE OF CONTENTS: Provide a table of contents for long documents (or a navigation menu in a website) to help readers easily select the content they want to read. Using Styles to create headings allows you to automatically generate a table of contents based on the headings and sub-headings in your document.

IMAGES: Add Alt Text to describe images (Smart Art, illustrations, photos, shapes, etc,) in your document and indicate their purpose. Screen readers will read the alt text to the listener who cannot see the image. Try to make the alt text as concise as possible, but still convey the information necessary to understand the nature and purpose of the visual. You can append Image Descriptions for visuals that require more detailed descriptions than are typically used in alt text.

DATA VISUALIZATIONS: Use descriptive captions for all figures and tables, and include descriptive labels for X and Y axes, as well as important diagram features. Using the "insert caption" function means that you can automatically generate a List of Figures and List of Tables in your Table of Contents. Please note that tables can be problematic for screen readers to present accurately, especially if there are merged cells. Tools for making tables accessible are limited, but using row and column headers (box heads and stubs) can be helpful.

LISTS: Use the bullet and numbered list options in the Paragraphs toolbar to make lists. Manually making lists using the tab button does not provide the document structure for screen readers to identify the text as a list. Use a bullet lists for items that do not need to be in a specific order; use a numbered lists for items that need to be presented chronologically (a list of steps to follow in order).

COLOUR: Avoid using colour alone to convey meaning. If you use green for correct and red for incorrect, include a check mark within the green image, and an X within the red. If you have a graph with different

coloured bars comparing different data sets, include texture or shade to help distinguish one bar from another and include these in your legend. Make sure that font colours contrast effectively with the background colour.

HYPERLINKS: Create descriptive hyperlink text. Hyperlinks embedded in your text should provide clear and accurate information about where the link will take the reader. Avoid using vague terms like "click here" or "source." Instead, you might use the name of the webpage you are linking to, the name of the author, title of the document, or the key word that the destination site defines. Don't use the same hyperlinked text (eg "source") to link to different sites.

The Check Accessibility tool in MS Word (found in the **Review** toolbar) can offer some general guidance on how accessible your document it, but it is not designed to adhere to any specific accessibility regulations or policies. Depending on your context, you may need to abide by more stringent accessibility guidelines.

Universal Design (UD) is a proactive framework for designing products and experiences that can be accessed, understood, and used by the greatest number of people possible, regardless of abilities. The Centre for Excellence in Universal Design outlines 7 Principles that can be used to guide your design process and help you consider ways to make your designs accessible to a wide range of users. While these principles were developed to apply to designing built environments and products, many of them also apply to document and website design.

EXCERCISE 3.9 *Analyze the Visual Rhetoric of an Online Influencer*

While there is no consensus definition, one common way of thinking of an "Influencer" is someone who is able to build a relationship with followers, usually on social media, and use their position, knowledge and authority to influence purchasing decisions, attitudes, or behaviours. Using this definition, choose someone you think of as an effective online influencer who uses a visual medium. Review 2 or 3 examples of their content. Can you see a specific pattern of rhetorical strategies that they use to influence their audience? Consider the following questions:

- Who is their target audience? how do you know?
- How and why do they create appeals to emotion, logic, and credibility (to win hearts, minds and trust)?
- Can you see design principles at work in their visuals? For example, what kinds of images do they include and why? What colour schemes? Use of contrast, repetition, alignment and proximity? Do they include any written information? If so, what sort of typography? layout?
- How do the design principles become rhetorical strategies used to create the overall persuasive effect?

3.5 Revision Strategies

Anything that you write is designed to be read. That is its first and foremost purpose. Thus, increasing readability means increasing the functionality of your information in terms of both content and design—making it "user friendly." If your information is difficult to read because vocabulary, sentence structure, paragraphing, organization, or formatting is unclear, your reader will likely become annoyed and may even stop reading.

The **Revision Checklist** below offers a step-by-step process for revising your document to achieve a readable style. It incorporates key information fromChapter 2: Professional Style and Chapter 3: Information Design. Implementing this checklist means doing several "passes" over your document, focusing on different aspects each time.

REVISION CHECKLIST – *a five-pass process*

1st Pass: Document-level Review

- **Task Analysis**: Review task specifications to ensure that you have included all required content and have followed required formatting and style conventions.
- **Reader-Centred**: Try to read from the perspective of your intended audience to consider if you have met their needs and expectations. Ensure that the relationship between your purpose in writing and your reader's purpose in reading is well aligned, and that information is presented efficiently.
- **Look over your Table of Contents** to make sure you have updated it, and see if the flow of information seems logical and well organized. Make sure headings, subheading, and table/figure labels are clear and descriptive. Headings should clearly and efficiently indicate the content of that section; Figure and Table captions should clearly describe the content of the visual. Be on the lookout for overuse of headings and lists, or alternatively, places where adding these could improve readability.
- **Scan your document layout** to ensure that all visual elements have appropriate passive space around them, and spacing is consistent throughout your document. Make sure all visual elements are captioned consecutively (you don't have two Figure 1s).
- **Review Organization**: Make sure ideas flow in a logical order and explanations come in a timely manner. Make sure visuals illustrate your textual information.
- **Review Style**: Make sure you are using an appropriate tone (neutral, objective, constructive, formal) and level of formality for your purpose and audience.

2nd Pass: Integrated Research Review

- Make sure all quotations, paraphrases and summaries of sources are cited appropriately, and cross reference clearly to a properly formatted entry in your references section. Remember: citations and references in IEEE must go in chronological order; APA and MLA references go in alphabetical order by authors last names.

- Make sure in-text citations clearly indicate what idea is being cited (avoid "random acts of citation"). Citations should indicate how you have used a source to support an idea or where a clearly paraphrased, summarized or quoted idea comes from.
- Make sure you have cited any visuals that you did not create yourself (citation can go at the end of the caption)
- Review REFERENCES section to make sure it follows the conventions of the style you are using. Review output of citation generators for potential errors or omissions.
- Make sure every reference has a working URL or DOI that links to the original online source (don't make your reader search online for your references).

3rd Pass: Paragraph-level Review

- **Topic Sentences**: Make sure each paragraph has a clear topic sentence that previews and/or summarizes the paragraph's purpose and content. Topic sentences are often — but not always — most effective at the beginning of the paragraph.
- **Transitions**: Add coherent transitions to link one sentence logically to the next.
- **Relevance**: Cut unnecessary or irrelevant information; add clarification where needed to fill in gaps
- **Length**: Avoid overly long or short paragraphs (5-10 lines long is a reasonable guideline for technical information. Academic writing may have longer paragraphs.

4th Pass: Sentence-level Review

- **Subjects**: make sure the subject of each sentence is clear (avoid overuse of "it" and "this" as subjects), and place subjects at or near the beginning of the sentence. Ensure each sentence has a clear subject-verb relationship that explains Who/What does the action. Generally keep subject and verb close together.
- **Verbs**: Use strong, active verbs – avoid vague, passive, verbs and "is/are/was/were/being" whenever feasible. Verbs like "make" "do" 'have" and "get" have many possible meanings; try to find more precise ones. Make sure you are using a consistent and logical verb tense suitable for your purpose. Watch for shifts from present to past tense that might confuse the reader.
- **Combining Ideas**: Make sure you have clearly and correctly used conjunctions to subordinate and coordinate ideas in sentences with 2 or more clauses.
- **Sentence length**: Review long sentences to ensure they can be easily understood; consider whether sentences longer than 25 words need revision to be clear. Vary the length and structure of sentences.
- **Sentence Structures**: Review for sentences that may confuse the reader. Watch for issues such as comma splices, fragments, run-ons, dangling modifiers, and faulty parallels.

5th Pass: Word-level Review

- **Clear**: Ensure you have used clear, plain language (appropriate for your audience) rather than pompous diction: write to express, not impress! Check for consistent use of vocabulary throughout the document; ensure you have used a vocabulary level appropriate for your audience. Check for word use errors (effect vs affect; preform vs perform; sweet vs suite; their vs there; *etc*)
- **Concrete**: Check for vague, abstract or overly general words/phrasing, and see if you can replace it with specific, precise words and phrasing.
- **Concise**: Watch for unnecessary padding and "sound bite" phrases that have no real meaning and get rid of them. Use a single word instead of a phrase whenever possible. Avoid clichés, colloquial expressions, and slang. Avoid starting sentences with "There is/are…" or "It is"
- **Courteous**: make sure you are using Bias Free Language: especially in the context of accessibility and disability, ensure you are using respectful language, and avoid negative or condescending terms.

- **Match your vocabulary to your audience**: experts can tolerate complex information with a lot of terminology; general readers require simpler, less detailed descriptions and explanations.
- **Watch for "ad speak"** — don't sound like you are "selling" something; use objective, measurable descriptors.
- **Limit use of 1st person**: Use "I" and "we" sparingly; focus on your DESIGN, not on yourself. Describe what your design does (not what you did). You might refer to yourself or team when introducing your proposed designs and when concluding/recommending.
- **Avoid use 2nd person** (you) pronouns (or use sparingly in appropriate contexts).

The last step is proofreading! Read over your document one last time looking for spelling errors, typos, missing words, or other issues. Spall cheque cant ketch everything!

NOTE: if you are downloading your document from an online platform to a desktop version or saving it as a pdf, sometimes formatting can get "lost in translation." You will need to review the document again after downloading for formatting glitches and revise as needed.

Pro Tips: Reviewing each line of your document from right to left can help catch especially sneaky typos. Reading it aloud or having someone read it aloud to you can help you hear where things might sound awkward and need revision.

4. TEAMWORK AND COMMUNICATION

Teamwork is a key expectation in most workplaces, especially where tasks are complex and require differing areas of expertise. Working in teams allows us to address the increasing complexity of large projects, and integrate a diversity of skills, experiences, and expertise to complete them more quickly and skillfully than a single individual could. Imagine how many people must work together to designs a sophisticated product like *Skyrim* (check out this information on the *Skyrim* development team if you want to know the answer).

Team Synergy describes the phenomenon that occurs when the achievement of a team working together is greater than the sum of what each team member could achieve working individually. It is widely accepted that team synergy and team intelligence generally lead to greater efficiency and better results. Why, then, are some people reluctant to engage in teamwork? Perhaps they have had ineffective or dysfunctional teamwork experiences in the past. While sometimes the culprit in these situations is a "poor team player" more often, these issues are caused by one of three things: misaligned goals, confusion over roles, or unclear team processes.

You have likely engaged in "group work" in many of your classes; this may have been productive and fun, or may have seemed pointless, depending on a variety of factors. But keep in mind that a **group** is not the same as a **team**. Teams work *inter*dependently, are accountable to each other, and have mutually agreed upon shared goals. Where a group may be comprised of several individuals each working on separate but connected tasks that may lead to a common goal, a ***team*** actively collaborates and relies on the diverse skills, and clearly defined processes to navigate crises and conflicts, support each other, and achieve their goals synergistically.

For teamwork to be effective, the team must

- understand and share the goals of the project, and ideally be involved in developing and shaping these goals
- have clearly defined processes that guide how the team will interact and how work will be done
- fully understand their roles, what is expected of them, and how they will be held accountable to each other
- trust the other team members, and feel able to safely discuss ideas and concerns

An effective team leader must make sure that goals, roles, and team processes are fully understood by all team members, and will strive to create a safe environment where all voices are heard and respected.

A well-functioning team is the very model of synergy: more than "the sum of its parts," a high-performance team can achieve far greater results these same than individuals working on their own. However, the inverse is also true: a poorly-functioning team is unlikely to produce quality work, and dysfunction can derail a project entirely. One of the most essential elements needed to ensure that a team functions effectively is clear communication.

This is why teamwork is a key learning objective and is taught explicitly in this text. Very few people intuitively know how to structure communications that allow them to collaborate effectively and equitably. This is something we learn to do. This chapter provides information to help you achieve key learning objectives that will help you contribute to and be a part of a high performing team.

Learning Objectives

Chapter 4 contains the following sections designed to help you achieve the following learning objectives:

4.1 Understanding Team Dynamics: Understand various models of team dynamics, and reflect on how you might apply them to help you and your teammates agree on proactive strategies, resolve conflicts and work productively.

4.2 Managing Team Conflict: Develop strategies to engage in constructive and solution-focused ways to manage conflict with teams.

4.3 Team Project Management Tools and Strategies: Understand how to use strategies and documents, such as Team Charters, Agendas, Minutes, Gantt Charts, and Work Logs to facilitate effective teamwork.

4.4 Collaborative Writing Strategies: Understand and apply various processes and strategies for writing collaboratively, and reflect on what works for your team.

4.5 Peer Review Strategies: Understand and engage in constructive peer review to ensure quality control.

4.1 Understanding Team Dynamics

Teams are formed for a variety of reasons, and thus there are many kinds of teams. They can be categorized by function or by performance. For example, a "cross-functional team" combines people with diverse areas of expertise (such as mechanical, electrical, and software engineering) to all work on connected parts of the same project, while a "within-function team" is comprised of people with the same area of expertise.

Teams can also be categorized by how well they perform. Katzenbach and Smith in*The Wisdom of Teams*[1] describe 4 categories of teams based on how well they perform.

Pseudo Team: a group of people not achieving what you would expect, based on their individual potential. They tend to work as isolated individuals rather than as a cohesive team, lacking strong communication with each other and commitment to the team's goals. They either lack clear team processes, or do not follow them; team meetings are not productive; team members don't feel accountable to each other; and there is little or no attempt to improve.

Potential Team: each team member performs at the level of the average team member, or maybe slightly above, developing some synergy and effective communication, but not reaching their potential as a team.

Real Team: A small number of people with complementary skills and compatible commitment levels maintain accountability to each other, their team processes, and overall goals to achieve a successful outcome through a high level of synergy.

High Performing Team: Few teams reach this level. A "high performing team" exceeds the abilities of individual team members and can accomplish far better results together than they could individually. Team members bring out the best in each other and see the interpersonal aspects of the team as just important as the tasks. Team synergy is established through strong communication, clear team processes, and commitment to the project and to each other's continual development. Building this kind of team synergy usually happens over time (and multiple projects) and takes consistent effort and commitment.

For a team to reach this level of performance, all members need to be focused not only on the

success of the project, but also on effective team dynamics as well as personal growth. To set your team up for success, consider the following:

SIZE: You need to be able to meet and communicate regularly. Typically, smaller teams are more effective than larger ones, but that will depend on the kind of project or task you are working on.

SKILLS: team members should have adequate levels of complementary skills, and/or be willing to develop skills required to complete the project.

PURPOSE & GOALS: all team members need to feel that the project is meaningful and important, and should have some agency in defining the purpose and goals. All team members must be able to clearly articulate the goals.

PROCESSES: the team needs to have clearly stated processes and approaches to completing work that are understood by all, and that allocate work equitably and fairly to each team member.

ACCOUNTABILITY: All team members need to feel accountable to each other and to the project, and the team needs to have mechanisms in place to ensure ensure accountability and address lapses fairly.

EXERCISE 4.1 *Reflect on Previous Teamwork*

Think of a time when you had to work with others to produce or achieve something – a design, poster, presentation, document, *etc*. You might have been working on a school assignment, been part of a sports team, work team, a club, or a musical band. Briefly describe what the task was and then consider the following questions:

1. What was the team's overall goal? Did you have a clear goal you all committed to?
2. What was your job within the team? Were roles clearly defined?
3. How were the jobs distributed? Was the workload fair?
4. How well did your team function? How would you categorize this team based on the types described above? (Group, Pseudo-team, Potential team, Real Team, or High Performing team)
5. Did anyone on the team hijack (take over) the project? Hitchhike (not contribute)? Isolate (work on their own and fail to communicate with the team?) What effect did this have?
6. Was the outcome successful?
7. Did your teammates teach you useful things and help you develop skills?
8. Would you happily work with those teammates again on another project? Why or why not?

They say "teamwork makes the dream work!" Becoming a member of a real or high performing team requires significant commitment and an understanding of team dynamics. The following sections provide some perspectives on team dynamics that are often used in professional contexts to promote strong team performance and manage crises effectively; these include the **GRIP** model, the **Tuckman** model, the **Lencioni** model, the **DISC** model, and the **Thomas Kilman Conflict Management** model.

GRIP Model

Richard Beckhard's GRPI model,[2] originally developed in 1972, has been widely adapted in sports contexts as the **GRIP** model (see **Figure 4.1.1**), outlining four interrelated components of highly effective teamwork:

Goals: everyone must fully understand and be committed to the goals of the team, and of the organization. Everyone's goals must be aligned in order to establish trust, make progress, and achieve desired outcome.

Roles: all team members must know what part they play, what is expected, and how they will be held accountable and responsible.

Interpersonal: quality communication and collaboration require and foster trust among team members; sensitivity and flexibility needed to deal with conflict and make progress.

Processes: well-defined system for how decisions are made, how the team solves problems and addresses conflict; well-defined work flow and procedures to be followed in completing the project.

Figure 4.1.1 *GRIP Model for establishing successful teamwork dynamics.*

Apply the GRIP Model to your team

Set a strong foundation for your team's success by using the these GRIP model principles:

DISCUSS GOALS: All team members should explicitly discuss and agree on the team's goals as well as their individual commitment levels, to ensure they are aligned. Define some "big picture" goals for your project, but also consider goals that each team member would like to achieve. For example, if one team member's goal is

put in the extra effort needed to exceed expectations and achieve above average results, while another team member wants to simply produce work that is 'good enough', their goals and commitment are not aligned and this will lead to problems down the road if not addresses proactively.

CHOOSE ROLES: Team members should discuss their strengths and weaknesses related to the team task (clearly, you will need to do some task analysis first to ensure you understand what the task entails), and decide on who will take on which roles. Team members might "work to their strengths" – for example, someone who is very detail oriented might take on the role of editor; someone who has strong word processing skills might take on the role of document designer. However, you might also take a "growth mindset" approach, and choose roles that will allow you to strengthen weak areas, and build skills that you want to improve on. You might decide to alternate roles, so everyone has a chance to develop various skills. Consider how taking on roles integrates with the goals you have identified.

INTERPERSONAL: We all have different ways of communicating, and sometimes miscommunication can happen without us realizing it. One person might find it helpful to engage in some off-task "small talk" at the beginning of a team meeting as a kind of ice breaker or warm up, while another might find this annoying and inefficient. Discuss with each other what kinds of communication help to motivate you, and what kinds can "shut you down." Determine how you can be sensitive to each other's communication styles and preferred workflows.

DEFINE PROCESSES: Start defining some processes for how your team will communicate, make decisions, and ensure an effective workflow. For example, consider what communication channels your team will use for brief check ins and questions, for more sustained collaboration and discussion, for sharing documents, *etc*. Will you create agendas to guide your meetings? Will you take minutes to record the decisions and progress made at meetings? How will you share them?

Using this GRIP process at the beginning of your project – in the "forming" stage – will help to set your team up for successful collaboration. You can refine the work you've done here and use it to create a Team Charter, as discussed in section 4.3 Project Management Tools and Teamwork Strategies.

The Tuckman Team Model

"Tuckman's Stages of Group Development," proposed by psychologist Bruce Tuckman in 1965,[3] is one of the most famous theories of team development. It describes four stages that teams may progress through: **forming, storming, norming**, and **performing** (a 5th stage was added later: **adjourning**). The stages move from organizing your team (defining goals, choosing roles, and developing processes) to collaborating on the results you are trying to achieve.

Although the stages appear linear, in fact teams may move back and forth through these stages, depending on events that may influence the team and the communications strategies that they use. For example, a new member may be added to an already established team, which will require the team to revisit the forming stage. Some teams can also stall in a stage and never fully realize

their potential. **Figure 4.1.2** outlines these stages that are described in more detail below. While reading about each stage, you will note how crucial clear communication is at each stage!

.

Figure 4.1.2 *The Stages of the Tuckman model of team development*

FORMING: During the team forming stage, everyone is getting to know each other and are trying to make a good impression. A fun team-forming activity can be a good way to help get to know each other, build trust, and get to know the various strengths and weaknesses of the team members and how these might apply to the team project. This is a good time to create a set of shared expectations, guidelines, or a **Team Charter**, that defines how the team agrees to operate for the duration of the project. Team members usually exchange contact and scheduling information, and set up a communication channel. This is an orientation stage, on both an

interpersonal and professional level, where preliminary boundaries and expectations are established.

STORMING: The **storming** stage is the one most often characterized by group conflict. It is the stage where the preliminary boundaries and expectations are tested as individuals learn more about each other's motivations, commitment levels, strengths, weaknesses, ideas and strategies. This coincides with the "brainstorming" stage of the design process, in which each member contributes ideas to help define the focus and trajectory of the project. It is important to recognize that conflict at this stage can be very productive, if managed effectively (using the strategies outlined in your Team Charter). Remaining overly polite and accommodating might seem like a tempting way to avoid conflict, but this rarely results in innovative ideas and approaches. Sometimes the best ideas are forged in the fires of disagreement and animated discussion where all team members feel safe to voice their ideas. However, some teams get stuck at this stage and revert back to working individually and become a "pseudo team."

To help get through this stage successfully, you might agree on brainstorming rules ("no bad ideas!"), use pros and cons list, designate someone as the "devil's advocate" whose official role is to poke holes and argue against. Commit to valuing the diversity of opinions and approaches in your team (see 4.2 Managing Team Conflict for additional tips). At this stage, team members may refine their goals and roles in the project. Learning to harness the constructive potential of conflict and compromise in this stage is important to setting your team up for a successful "norming" stage where you start to really make progress.

NORMING: During the **norming** stage, conflicts have been largely resolved, team members have proven flexible and supportive, each team member knows their role and works on their part of the project, follows the designated team processes and guidelines, and all is going well. Sometimes, people work independently in this stage, but frequently check in with teammates to make sure workflow is efficient and effective. For example, you will want to make sure you aren't accidentally duplicating work or developing work that is inconsistent with what other team members are doing. A teammate may become ill and unable to meet a deadline, so others agree on how to proceed. Group cohesion ensures that everyone is responsible for their task and accountable to the team; team members acknowledge and appreciate each other's contributions. Gantt Charts or Work Plans can be very helpful in keeping everyone on track during this stage. Problems might arise at this stage if a team member has been absent and has not caught up, or if team members do not fully understand their role, team expectations, or the overall goal. If this happens, revisiting the forming or storming stage may be required.

PERFORMING: Reaching the **performing** stage is the goal of high-performing teams. This usually only happens when teams have worked together well on several projects, have established a synergy, and have developed systems that that make projects go smoothly and efficiently. The first time a team works together, they might not reach this stage; "performing" teams have established

trust in each other, have well-defined roles and goals, and follow the strategies and processes they have chosen to achieve them. They can move quickly and efficiently, work interdependently, and understand how to best support each other when needed.

ADJOURNING: At the end of the project, team members celebrate their achievements, express their appreciate for each other's contributions, reflect on what they have learned, and go their separate ways. If the team has successfully established trust and synergy, this parting can be somewhat emotional (leading to what some have called a "mourning" stage).

Figure 4.1.3 [4] depicts the trajectory of each team member during each stage.

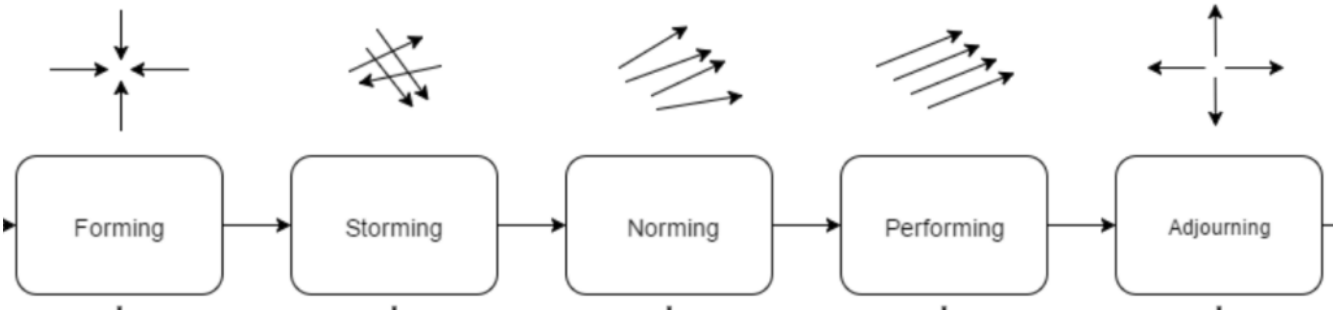


***Figure* 4.1.3** *Trajectory of team mates during each stage of the Tuckman team formation model.*

For an entertaining overview, watch this video on the Tuckman phases of team development, as depicted in *The Fellowship of the Rings*:

One or more interactive elements has been excluded from this version of the text. You can view them online here:
https://pressbooks.bccampus.ca/technicalwriting2ed/?p=83#oembed-1

Lencioni Model

In his 2005 book, *The Five Dysfunctions of a Team*, *Patrick Lencioni*, [5] *outlines* five common problems teams experience that impact their effectiveness:

Lack of trust: if team members do not trust each other, they are unlikely to feel safe enough to speak honestly, take risks, or ask for help. A lack of trust means a low level of comfort that makes it difficult to communicate, commit, and perform effectively as a team

Fear of conflict: avoiding conflict can lead to an artificial "peace" at the expense of progress and innovation, or it can lead to unaddressed dysfunction that undermines the team. Shifting mindset to see conflict as a normal part of teamwork can be very productive if managed effectively.

Lack of commitment: having insufficient control or ownership of team processes and decisions can lead to a lack of commitment, where team members do not complete their assigned work, do not follow through on decisions or tasks, do not meet deadlines, and let their teammates down, ultimately affecting the success of the whole project.

Avoidance of accountability: if team members do not feel accountable to all other members of their team (rather than just the "boss"), they are less likely to care about not letting each other down.

Inattention to team results: when team members focus on their own personal goals instead of project goals, they lose sight of the expected results that actually measure the success of the project. Not focusing on the results during the process means that no one is planning how to improve those results.

Lencioni designed a "pyramid" showing how each "dysfunction" is connected and builds upon previous ones. **Figure 4.1.4** illustrates how to proactively address each of these issues, first and most importantly by establishing trust among all team members. Establishing trust is a crucial foundational step to being able to manage conflict effectively, achieve commitment, create accountability and focus on team results.

Figure 4.1.4
Proactive steps for preventing the dysfunctions described by Lencioni

DISC Model

DISC theory, developed in 1928 by Dr. William Moulton Marston (who also, as it happens, created the *Wonder Woman* comic series!), has evolved into a useful model for conflict management as it predicts behaviours based on four key personality traits he originally described as Dominance, Inducement, Submission, and Compliance.[6] The names of these four traits have been variously revised over the decades, so you might find different terms used in different contexts. The four general traits are now often described as (1) Dominance, (2) Influence/Inspiring (3) Steadiness/Supportive, and (4) Compliance/Conscientiousness (see **Figure 4.1.5**).

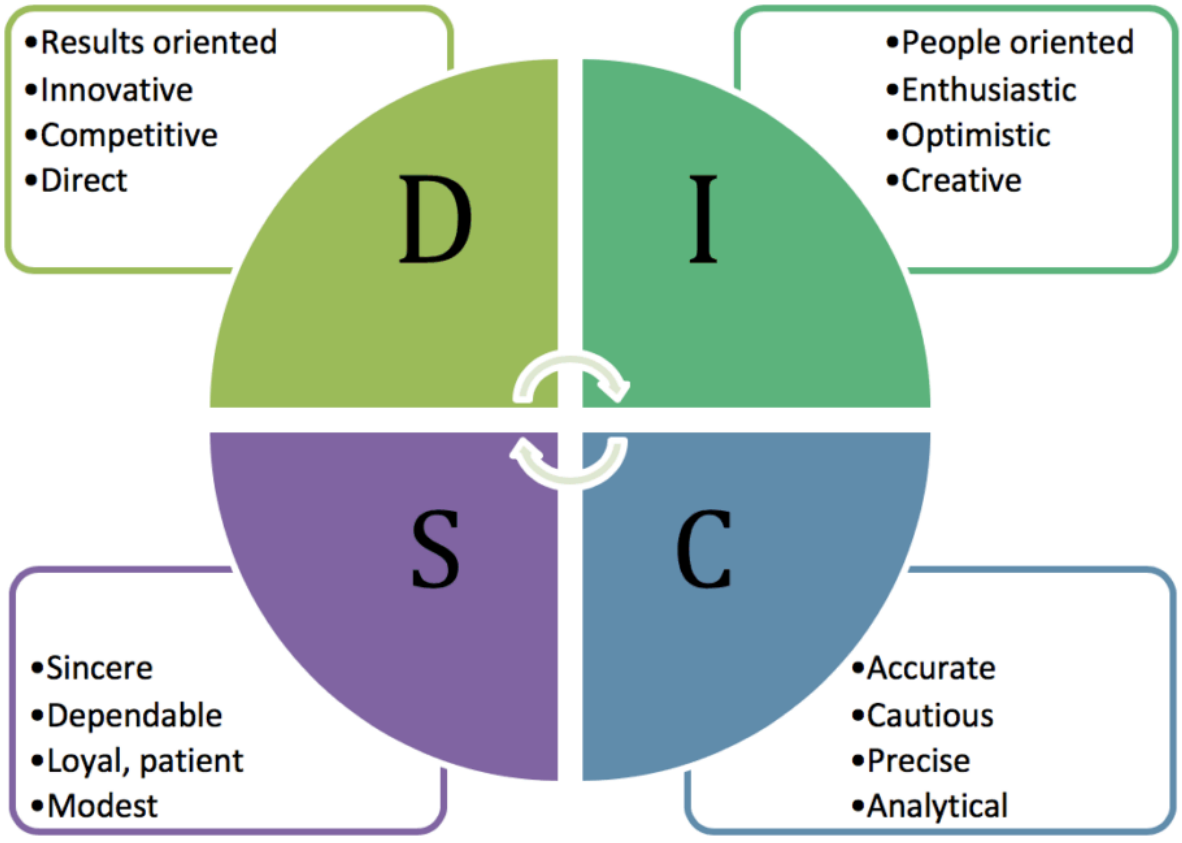


Figure 4.1.5 *DISC Profile outlining the key characteristics of Dominance, Influencing, Supporting, and Conscientious personality types.*

Industries often use DISC assessments in professional contexts. Having some insight into your

teammates' personality traits can help when trying to resolve conflicts. General characteristics of each trait are as follows:

Dominance

Characteristics: direct, decisive, ego-driven, problem-solver, and risk-taker; likes new challenges and freedom from routine; driven to overcome obstacles

Strengths: great organizer and time manager; challenges the status quo; innovative

Weaknesses: can be argumentative, disrespectful of authority, and overly ambitious (taking on too much); can be blunt, stubborn, and aggressive

Inspiring/Influential

Characteristics: enthusiastic, persuasive, optimistic, trusting, impulsive, charismatic, and emotional

Strengths: creative problem solver; great cheer-leader, negotiator, and peace-maker; a real "people person"

Weaknesses: more concerned with popularity than tangible results; lacks attention to detail

Steady/Supportive

Characteristics: reliable, predictable, friendly, good listener, team player, empathetic, easy-going, and altruistic.

Strengths: dependable, loyal; respects authority; has patience and empathy; good at conflict resolution; willing to compromise.

Weaknesses: resistant to change; sensitive to criticism; difficulty prioritizing

Cautious/Conscientious/Compliant

Characteristics: has high standards; values precision and accuracy; analytical and systematic; even-tempered, realistic, and logical; methodical; respect for authority

Strengths: great information gatherer/researcher; able to define situations precisely and accurately; offers realistic perspective

Weaknesses: can get bogged down in details; needs clear boundaries, procedures, and methods; difficulty accepting criticism; may avoid conflict or just "give in." May be overly timid.

You might recognize yourself in one of these descriptions, or you might have characteristics of 2 or more "types." Having the team consider where they might fall in this typology can help you determine roles and give you insights into how to resolve issues.

Thomas-Kilmann Conflict Mode Model

The Thomas-Kilmann Conflict Management model[7] is used by Myers Briggs among others for understanding and managing conflict. This model, shown in **Figure 4.1.6**, outlines 5 main conflict styles or "modes" (*competing*, *collaborating*, *compromising*, *avoiding*, and *collaborating*), and places them in a matrix with two dimensions: ***Assertiveness*** (the degree to which one tries to meet their own needs) and ***Cooperativeness*** (the degree to which one tries to meet the needs of the other team members).

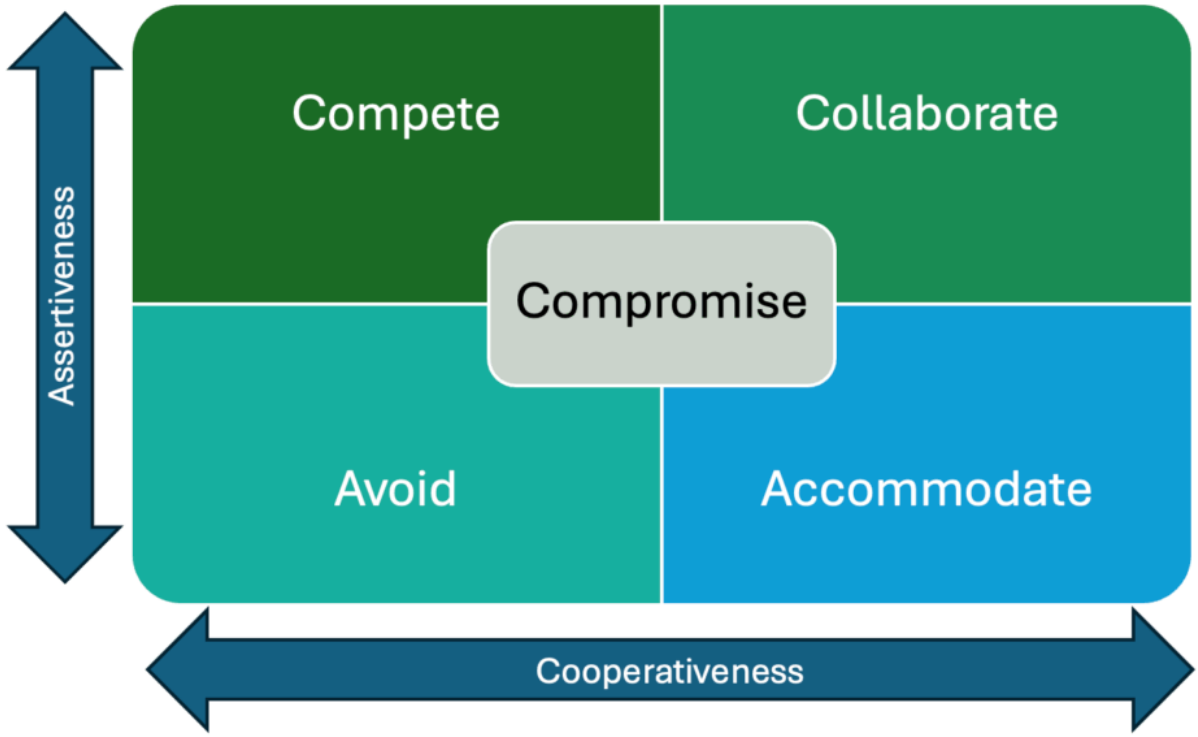


Figure 4.1.6. *Thomas-Kilmann Conflict Management model*

Each approach can have both positive and negative impacts:

Collaborating requires high level of both cooperativeness and assertiveness, but often leads

to the best results. However, this may require persistence and effort for team members to successfully persuade each other and achieve consensus.

Compromising can seem a bit easier to achieve, but by definition, it "compromises" the quality of the final product. Everyone "gets a little" and everyone "gives a little;" everyone may be somewhat happy, but also a bit unhappy with the final result.

Competition can drive excellence, but within a team, keep in mind that competition usually results in "winners" and "losers" – and this does not make for a constructive team.

Accommodating can also be a useful approach if someone feels very strongly about their position and there is no harm in giving them the win. However, this should not come at the expense of something you also feel strongly about that could have really helped the team.

Avoiding conflict can sometimes be a wise choice, if the issue is a small one and the outcome does not have a significant impact. The old adages "don't sweat the small stuff" and "pick your battles" apply here. However, in many cases, avoiding a problem will not make it go away, and indeed, it may well get worse, leading to unwanted consequences. Consider the "cost-benefit" analysis of avoiding vs engaging with the conflict to solve the problem.

Applying the Models

Clearly collaborating with others can have its challenges! But consider the pros and cons of individual vs teamwork when working on a writing-intensive project:

	Individual Work	**Collaboration**
Choosing a Topic and Approach	You are in control of the topic and approach; you have to make all the decisions, and you have to be able to complete all the tasks yourself.	You must negotiate the focus of your work and the approaches you will use, but you share the work of making these decisions, relying on more than just your own knowledge and skills.
Task Analysis	You have to make sure you understand all the assignment instructions, project requirements, and evaluation criteria, as well as remember due dates, etc.	Teammates may interpret assignment criteria and project requirements differently, resulting in discussion and questions, and ultimately stronger task understanding. Teammates remind each other about due dates and requirements.
Research	You are solely responsible for devising research questions, choosing research methods, finding and integrating all the research needed to support your project, and citing sources properly.	You have a team to brainstorm research questions, compare approaches, divide up the work of reading and synthesizing sources to support your project; you have other eyes to spot citation errors and research gaps that need filling.
Writing	Writing on your own makes it easier to maintain a consistent "voice" in terms of purpose, style, and tone,	Collaborating requires the team to be aware of each other's different styles, and aim for a consistent overall "voice"
Critical Thinking	You are solely responsible for coming up with and refining ideas, evaluating source material for credibility, constructing persuasive arguments that will appeal to your intended audience, etc.	Teammates can bounce ideas around, give each other feedback about choices and help refine ideas. They might have more nuanced ideas about what might appeal to (or offend) your intended audience.
Document Design	You make all the design choices, and it's relatively easy to be consistent. But you are limited by your own word processing skill level and awareness of design choices.	When collaborating, you have to ensure that everyone is using consistent design features so that the document doesn't end up in chaos, but you have more skills to draw up to enhance the look and readability of your document.
Reviewing	When reviewing and editing your own work, it can be easy to miss errors. Also, you know what you mean, and it can be hard to see where expression might be ambiguous or confusing to other readers.	Teammates understand your purpose in writing, and can spot your mistakes more easily. They can indicate when something you've written could be more clearly articulated. You can learn techniques by seeing how others revise and edit their own work.
Accountability	You are only accountable to yourself, so you can work at your own speed and determine what quality you are aiming for. If you procrastinate, no one else is affected.	Being accountable to others makes you more likely to complete work on time, or even early to ensure time for peer review. However, one team member' work habits and commitment level can negatively affect the outcome of the project.

Ideally, students can learn a great deal from their teammates – the more diverse the team, the more opportunities to learn! For example, your teammates can help you

- develop a greater awareness of many different perspectives and approaches
- combine your different knowledge and skill levels to fill in gaps and solve problems in

innovative ways
- understand the assignment expectations more fully and know if you are on track
- learn different ways of communicating ideas, needs, and concerns
- develop ways of sharing the workload equitably and efficiently
- understand how to establish trust and accountability, how to support each other without overstepping, how to give constructive feedback, and when to compromise.

Seeing first-hand how others approach the project you are working on – how they do task analysis, research, brainstorm, and plan; how they write (draft, revise, give and receive feedback, etc) – can teach you more than any lecture!

EXERCISE 4.2 *Apply these models to your experience*

Apply one or more of these models to your past or current experience of teamwork:

1. Have you consciously or unknowingly engaged in the Tuckman team formation steps?
2. Can you determine which of the DISC characteristics most closely matches your personality traits?
3. Have you experienced a team project where misaligned goals or unclear roles had a negative impact?
4. Do you think learning about the conflict modes or typical dysfunctions can help make your future team experiences more productive?
5. Could you propose an alternative model for effective teamwork?

Notes

1. J. R. Katzenbach and D.K. Smith,The Wisdom of Teams: Creating the High-performance Organisation, Harvard Business School, Boston, 1993.
2. R. Beckhard, (1972). "Optimizing team building efforts," *Journal of Contemporary Business*, 1972, pp. 23–27.
3. B. Tuckman, "Developmental sequence in small groups," *Psychological Bulletin*, vol. 63, no. 6, pp. 384-399. Available: http://dx.doi.org/10.1037/h0022100 :
4. Dlogo Nicoleti. "Modelo de Tuckman.png", *Wikimedia Commons*, https://commons.wikimedia.org/wiki/File:Modelo_de_Tuckman.png . CC BY-SA 4.0 .
5. P. Lencioni, *Five Dysfunctions of a Team*, New York, NY: John Wiley and Sons Inc., 2002.
6. W. M. *Marsten, Emotions of Normal People. Keegan Paul Trench Trubner and Co. Ltd.*, 1928; *republished London: Routledge*, 2002
7. K. W. *Thomas & R. H. Kilmann, "Thomas–Kilmann Conflict Mode Instrument," Tuxedo* NY: *Xicom*, 1974.

4.2 Managing Team Conflict

It's important to recognize that whenever people work together in teams, there are bound to be challenges, and conflicts are likely to arise — and this is okay. People have different opinions, perspectives, and ways to doing things. Some conflict, if managed effectively, can be productive and lead to stronger ideas and unexpected innovations. Poorly managed conflict, however, can be detrimental, and can even derail a team and the project entirely.

Often, conflict arises from confusion over team members' roles and team goals. For example, if one team member's goal is to exceed expectations (get an A+) on the project, and anther's is to simply make it "good enough" (B-), their goals are misaligned, and this will show in work ethic and commitment to the project. If team members do not share the same goals, or if members are unsure of what their role is in the team, this can lead to anxiety, confusion, or even anger. This in turn can cause the following unproductive behaviours:

> ***Isolating**: breaking away from the team and just doing work on your own without collaborating with others or with minimal interaction. This can lead to inefficiency in the team, as they don't communicate sufficiently with the team, are not involved in decision-making, and other team members don't know what they are doing.*
>
> ***Hijacking**: taking over the project and doing work without consulting with the team. This may arise out of anxiety about grades, or lack of trust in team members; hijackers may revise or redo work already done by others without consultation or permission.*
>
> ***Hitchhiking**: just coming along for the ride, but not contributing equitably. Hitchikers may simply not show up, or they may make excuses for not attending team meetings (I'm too busy, I have a midterm, a rugby game, a trip planned, etc). Not meeting expectations around commitment makes extra work for other team members, which leads to resentments.*
>
> ***Enabling**: being overly helpful (a "people pleaser"), taking on too much of the work to try to make up for other team members. "Hitchhikers" can start relying on "enablers" to pick up their slack. This can lead to frustration and potentially burn out when they are not able to complete all the additional tasks they have volunteered to do.*

How to deal with team conflict? The first strategy is to develop clear processes that help to prevent conflict where possible (see the GRIP model in Ch. 4.1). You can do this in the forming stage by creating clear team guidelines and expectations. Creating a ***Team Charter*** *can help you define team goals, expectations for equitable contribution, and procedures for communicating and producing work. You can also define problem-solving approaches that your team will use when conflicts arise, and determine what kinds of behaviour will trigger a consultation with the instructor.*

Think about conflicts or problems you have had in the past when working in teams. Can you think of ways you could have planned ahead to prevent them? Being proactive can prevent a lot of issues. For example, defining the criteria and protocols for removing a team member from the team will often prevent issues from going that far. However, despite these preventative measures, conflict is bound to come up from time to time. You need to have effective strategies for managing it effectively when it does arise.

Here is a list of some effective conflict management approaches, derived from the information on ***Team Dynamics,*** *to keep in your tool box:*

- *Acknowledge, understand, and value the diversity within your team; recognize team members' various strengths and weaknesses, and play to your strengths, while acknowledging and trying to improve on your weaknesses.*
- *Avoid making assumptions about someone's motivations or rushing to judgment; instead, approach differences of opinions with honest curiosity and explore why you see things differently. Listen actively to understand other positions and perspectives.*
- *Don't "silo" (break up into smaller teams of "us" vs "them"); deal with issues as a team*
- *Don't ignore problems or conflicts; deal with them head on; communicate issues quickly and directly with the whole team; maybe review the Team Charter to remind you of the expectations and protocols you agreed to follow as a team. (Have a regular "festivus" meeting where everyone can air their concerns.)*
- *"Don't sweat the small stuff;" don't get side-tracked by minor differences of opinion or approach that don't have a significant effect on the project; be willing to make some compromises.*
- *But keep in mind that compromise does not always lead to the best solution; be a strong, but diplomatic advocate for what you think is the best approach. Persuade, but don't bully. Use your rhetorical skills to convince your team to see your perspective. Your teammates will thank you for it in the long run.*
- *Separate the "people" from the "problem" (avoid "blame game"); don't dwell on past actions and consequences; focus on coming up with solutions that benefit the whole team and allow you to move forward constructively.*
- *Focus on "interests" not "positions." That is, focus on what is in the best interests of the team rather than on "being right" or "winning." Try having one team member play "devil's advocate" or use a debate format to argue for/against ideas in an objective and neutral way.*

Reviewing the models for *Understanding Team Dynamics* (Ch. 4.1) *may give you insights into some of the causes of team issues and ideas for solutions.*

If your conflict management strategies are not working as well as you'd like, consult with your facilitator, instructor, or TA for additional support – ***before*** *it's too late to solve the problem. Especially if you feel like the problems is impacting the quality of your team's work (your grade), you*

should alert the instructor as soon as possible. Your instructor will have additional "administrative" tools to help deal with the problem that are not necessarily available to you as students.

Working with other people can be satisfying and exciting, but will also inevitably lead to challenges throughout your academic and professional life. Learning and applying these strategies for how to address these challenges will provide you with valuable skills needed for professional success.

4.3 Project Management Tools and Teamwork Strategies

As we have seen, effective teamwork requires strong communication, but also systematic strategies and processes that help the team stay organized and function productively. Excellent teams have synergy that makes them more than simply the sum of their parts. The term "team intelligence" refers to the fact that collectively, teams have more knowledge and skill than the single individuals working separately. Working together allows for greater efficiency and innovation. However, challenges can also arise when working in a team. Many of these challenges can be addressed by using effective management strategies, including team documents.

Below, you will find a list of ***strategies*** *and descriptions of various kinds of* ***team documents*** *that are designed to help teams handle some of the challenges of collaboration and ensure that teams function effectively.*

Strategies for Promoting Efficient, Effective and Equitable Teamwork

Select a team leader: the team leader will act as the hub for communication and tasks. This person helps provide direction and guidance for the team. This should be someone who has earned the team's respect and who can be persuasive and tactful. This role can be rotated among team members. Smaller teams may prefer to operate in a more egalitarian or democratic manner; in such cases, you need to be careful that "big picture" tasks related to managing the team are not left undone.

Ensure the team's main goal is clear: a team is governed by the goal that everyone shares and works to achieve. It is important that everyone clearly understands and agrees upon the goal. Misaligned or misunderstood goals is one of the most frequent causes of team dysfunction. Articulating your goals in a **Team Charter** or other guiding document can help the team remain focused.

Establish team rules: as a team, determine the rules and behavioural guidelines by which the team will operate. These should include expectations around time commitments, scheduled meetings, consistent attendance, respectful communication, equitable contribution, and decision-making protocols. You should also create clear protocols for how the team will react if someone does not follow these rules, and what the consequences will be. For example, describing a clear, step-by-step system for what will lead to a team member being fired from the team, and what warning steps will be followed before such a drastic action is taken, can help to prevent this from happening. Collaboratively creating a **Team Charter** that contains accountability strategies is an excellent way make sure everyone's goals are aligned and everyone understands what is expected of them.

Establish Milestones: create a list of actionable steps that are reasonably easy to accomplish and will help the team make progress towards the final goal. These milestones – or you can think of them as a series of "sprints"

instead of one long marathon – will help the overall task seem less daunting by breaking it down into smaller, more manageable tasks. This also allows you to celebrate achievements and request feedback along the way.

Assign roles and responsibilities: each team member should take on responsibility for completing certain tasks, or for ensuring that they are completed by the team. For example, for a collaborative writing project, all team members will write and research, but you might select people to take primary responsibility for one or more of the following roles:

- **Scheduling Coordinator**: ensures team has a feasible schedule and sends reminders to all team members regarding meetings and upcoming due dates; liaises with TA/Instructor (or ensures someone does) if extensions are needed.
- **Task Coordinator**: ensures that the team understands what is required for each deliverable (coordinates the team's Task Analysis) and that all required tasks are distributed equitably. Also makes sure the team has a realistic sense of how long tasks will take to complete, and builds in time for integrating each team member's contribution into the shared document. **Pro Tip**: This typically takes longer than you think, so it's advisable to build in an extra 25% cushion.
- **Research Coordinator:** ensures that all research done by individual team members is complete, effectively incorporated into the team document, and properly cited (abides by Academic Integrity Policy).
- **Writing Coordinator**: creates the initial shared document and coordinates the contributions of all team members into the team document
- **Document Design Coordinator**: ensures that all contributions follow the team Style Guide consistently in terms of layout, typography, use of headings, colour schemes, citation style, figure and table formatting, etc.

Set Agendas for meetings and keep Minutes: to ensure that team meeting time is used efficiently and achieves its purpose, plan an agenda for each meeting to help keep everyone on task. In addition, have someone take minutes to record decisions that are made. This record helps prevent repetition and ensures work actually gets done.

Reflect regularly: Build in time for regular check ins to reflect on what strategies are working well, what needs more attention, and what could use refinement. After each milestone or "sprint" is a great time to reflect on how things went and what you might want to do differently going forward.

Team Documents

There are many types of documents specifically designed to help teams run smoothly and productively. There are also software applications, like Monday and Slack, that have many of these genres built into them, but you can also create simple versions of these in a word document. Some examples, described in more detail below, include using the following documents:

> ***Team Charter**: outlines the guiding principles, rules, processes, and expectations agreed upon by the team*

Meeting Agenda: *outlines the main points for discussion at a meeting*

Meeting Minutes: *records the decisions and relevant points discussed at a meeting*

Gantt Charts and Work Plans: *helps teams plan out each step of the project, visualize the timeline, and keep track of who is responsible for what and when.*

Status/Progress Reports: *records the completed tasks and work left to complete*

Work Logs: *records the tasks and time spent for each team member*

Team Charters

A Team Charter is a document created by all team members, ideally before starting the project, that identifies the team's agreed upon goals, values, strategies, and plans for how everyone will work together. Team charters can take many forms and can serve a variety of functions depending on the context. In the business world, they often define the purpose, duration, scope and goals of team projects in term of the desired output. They also list team members, resources, deliverables, reporting systems, and so on. In the working world, a team charter may have an audience that extends beyond the immediate team members. For example, if teams need external support in dealing with a problem, an outside facilitator may review the Team Charter to see what guidelines need to be followed in solving the problem.

For our purposes, in an educational setting, we will use a Team Charter as a way for each team to define their own goals, values, expectations, guidelines, strategies, and procedures – and make sure everyone is "on the same page." Doing this at the beginning of the project helps set the team up for success and prevent typical problems related to misaligned goals, unclear roles, and miscommunication around expectations and processes. Keep in mind that someone outside of the team (facilitator, instructor, etc) may use your Team Charter to help you resolve internal issues, so all information will need to make sense to an external audience.

Here are some questions to consider as a team when negotiating and creating your team charter:

> **Who *are the team members***? *along with names, you might include contact information. You might consider identify team members' individual goals, strengths, and weaknesses as a way to help determine the roles each person will take on in the team. Identifying relevant* ***strengths*** *and* ***weaknesses*** *can help you anticipate potential* ***opportunities*** *and* ***challenges*** *you might encounter during the team project (***SWOC*** analysis). For example, if some team members acknowledge that they are prone to procrastination, your team might set artificial internal*

deadlines for getting work done well before the official due date. Someone who likes to be super organized might take on the role of team scheduling coordinator.

What is the team's purpose and goals? *The team should be able to collectively articulate the purpose of the project and the goals you want to achieve. It is important to discuss the relationship between goals and commitment level: if your goal is to exceed expectations (e.g. achieve an A+ grade), this requires a stronger commitment to putting in the additional time and effort required. If your goal is to meet expectations (achieve a B grade), discuss what means in terms of time commitment.*

Communication Channels: *How will you communicate during the project both in and outside of class? Will you use a messaging app for short questions and reminders? Zoom for online team meetings? A word processing app (like Google docs) for shared documents that you all collaborate on? Or will you use Microsoft Teams for all team communications?*

Expectations and Guidelines: *Discuss your values around respect, courtesy, commitment and accountability. When devising rules, expectations and potential consequences, strive to make them reasonable and compassionate, remembering that we are all human and sometimes make mistakes or let people down.*

- *What does respectful and constructive interactions look like to you? How can you ensure that all team members feel safe to communicate their ideas and concerns in a constructive manner? What is the expected reply time for messages?*
- *When, how, and how often will you meet as a team to work collaboratively? What are your expectations around punctuality and staying on task during meetings? How will you maintain focus to avoid getting distracted or off-task?*
- *What are your expectations for the quality of work the team aims to submit? How will you ensure quality control? What kind of time commitment are you will to make to ensure combined work meets the team's expectations?*
- *What are your strategies for maintaining equitable workloads, dividing tasks fairly, and getting work done on time? How will you ensure that the workload feels fair and reasonable to all team members?*
- *How will you make decisions as a team? Will you strive to reach consensus? Vote? How about when a decision must be made quickly in a crisis? Will you give one or more team members "executive decision-making" authority?*
- *How will you deal with emergent issues (such as a team member becoming ill or unavailable)?*

Project Management Tools and Strategies: *how will you keep track of tasks, documents, resources, etc? Will you create a Work Plan? Gantt Chart? Linear Responsibility Chart? Use*

Agendas and Minutes to keep team meetings organized and document decisions/progress? Who will be responsible for these? Will you use an online app like Slack, Monday, or MS Teams? How will you evaluate the performance of your team?

Design Aesthetic: *depending on what type of project you are working on, you may want to define your Style Guide or design aesthetic by providing clear guidelines on what your team documents will look like. Consider choosing your font styles (for various levels of headings, body text, and caption text), colour palette, table design, margins, paragraph alignment, etc., so that all team members are creating work that has a consistent look.*

Team Policies: *Your team should create a clear policy on "Use of Generative AI" that is consistent with your course Academic Integrity Policy and that all team members agree to abide by. You should also outline some conflict management strategies consistent with the previous information.*

> *How will you ensure that all team members remain accountable and abide by the guidelines outlined in your team charter? If someone does not meet the expectations laid out in the Team Charter, what are the consequences?*
>
> *If your team experiences conflict that they cannot resolve, how will you proceed? Devise policies that clearly indicate what steps you will take internally, and when interventions should be requested.*
>
> **NOTE**: *If a team member's actions or inactions are negatively impacting the team's progress or quality of work, you should alert your supervisor/instructor/TA.*
>
> ***Irreconcilable Differences***: *At what point should someone leave the team? What are the protocols for quitting a team or firing a team member if problems cannot be resolved? This should be a multi-step process that includes problem-solving strategies, consultation with instructor/TA, and clear documentation.*

At the end of your Team Charter, it's a good idea to have a place for all team members to officially sign off on the agreement – it's like signing a contract you all agree to abide by.

Meeting Documents: Agendas and Minutes

For team meetings to be productive and efficient, you should plan the meeting and keep track of the progress made for future reference. ***Agendas*** *and* ***Minutes*** *are documents that do this. A meeting also should have a chair (the person who keeps an eye on the agenda to make sure the meeting stays*

on track) and a recorder (who records important information discussed at the meeting, and what decisions were made).

The Agenda is the plan for what you want to discuss and accomplish at the meeting. It is usually made up of a list of items, sometimes with a time frame for each item.

SAMPLE AGENDA

Team 8 Meeting Agenda

Date:

Place and time:

Members:

———————————————-

- Updates from each team member (progress) (5 min each)
- Develop work plan for upcoming week (15 min)
- Determine next meeting time (5 min)
- Work on Task X together (45 min)
- Matters arising

Minutes *follow up on the agenda by recording what decisions were made and what important topics were discussed. One person is responsible for recording the events of the meeting, and distributing the minutes to each member. That way, no one should forget what tasks they agreed to complete and when.*

Sample Minutes

Team 8 Meeting Minutes

Thursday Feb, 15, 2026

In Class, 3:30-4:50

Present: Jaime, Kris, Tai

Regrets: Jo (has the flu)

———————————————-

- STATUS UPDATE: All team members have completed last week's work plan (Jo emailed a report, as she is sick). Jaime completed the draft Introduction and Problem Definition; Kris has created a detailed template for the report, including pre-matter sections, headings, and placeholders for visuals. Tai has drafted a "design description section" and compiled all of our combined sources to date into an IEEE References section.
- In the coming week, we plan to complete the following:

Task	Who will do it?
1. Interview Facilities Management contact	Jaime
2. Research bike share programs	(Jo?)
3. Create visuals for design descriptions	Kris
4. organize a site visit	Tai

- Next meeting: Feb 21, after class (in library). Goal is to integrate work completed into the team document and create a weighted objectives chart
- Excellent progress during meeting; Jo will follow up on researching bike share programs.
- Meeting adjourned 4:50

NOTE: *In the professional world, Agendas and Minutes are generally much more complicated, reflecting the fact that meetings are often run using Roberts Rules of Order. The simplified examples here should work fine for your team projects in a course.*

Gantt Charts and Work Plans

When planning a complex team project over a significant time span, a team will often create a ***Work Plan*** *to provides a detailed map of what tasks need to get done, when, and by whom. This can be created using a spreadsheet, word document, or an app like MS Projects, Slack, or Monday. A* ***Gantt Chart*** *can also be used to provide a quick visual summary of the work schedule in a clear and detailed way. Gantt charts are typically used in proposals, to show the target audience that the proposers have a well-thought out and feasible plan for completing the project. They can also be used in progress reports to update the reader on what tasks are complete, which are in progress, and which are yet to be completed.*

Gantt charts can take different forms, but generally provide a simplified visual chart of what tasks will be done when, in relation to other tasks. You can download complicated software to make detailed Gantt Charts, but you can also use a simple table. See the sample Gantt chart below, showing the kinds of tasks you might include in a Research Project Proposal. The sample lists fairly generic tasks; ideally, your chart will include more specific information, such as what kind of existing designs you might research, what specific kind of user experience, and a Literature review of what, specifically?

TASKS	***Responsible***	**Week 1**	**Week 2**	**Week 3**	**Week 4**	**Week 5**
Task analysis: ensure we all understand requirements	*Tai/team*					
Research existing designs	*Jo*					
Conduct User Research	*Jaime & Kris*					
Draft Lit Review	*Team*					
Plan Report Template	*Kris*					
Draft Intro and Problem Def	*Jaime*					
Draft Solution Descriptions	*Tai/Team*					
Additional Research as needed	*Team*					
Draft Analysis, Conclusion, Recommendations	*Jo & Kris*					
Draft Exec. Summary	*Tai & Jaime*					
Draft Pre-Matter and Appendices	*Jo & Kris*					
Complete integrated draft and feedback requests for peer review	*Team*					
***Revise draft**: review peer feedback, document design, organization, research integration, consistency and flow, formal style/grammar.*	*Team*					

Where a Gantt Chart offers a simple visual that can be taken in at a glance, a Work Plan is a more detailed "master plan" that allows the team to track what has been completed, what is in progress, and what is yet to be done – and indicates who has primary responsibility for which tasks, what tasks depend on the completion of other tasks, who will review the work, and so on. Creating a Work Plan shortly after beginning the project is an excellent way to engage in thorough ***task analysis*** *so that the team can get a full picture of exactly what work needs to be done to complete the project, how the various tasks integrate and line up time-wise, and who needs to do what and when. It requires you to review the task requirements, assessment rubrics, formative deliverables that might be due along the way, and devise a detailed plan for how to accomplish all of the work that needs to be done. You will update your Work Plan frequently to indicate where you are in the plan.*

As Benjamin Franklin famously noted, "**if you fail to plan, you are planning to fail.**" Time management experts assert that putting time into the planning during the early stages saves you tons of time down the

road. but the real key to planning successfully is ensuring that you clearly understand *how* you will *implement* your plan.

Remember to build in considerable time for integrating work that team members have completed separately, to ensure that it is consistent in terms of content, style, and document design. This generally takes far more time than you might think, especially if moving from one platform (Google docs) to another (MS Word). Moving from a cloud-based to a desktop platform can seriously alter your formatting, which takes time to fix. It's a lot like debugging code!

Status Reports

Status reports are similar to Progress Reports (and are sometimes used interchangeably), in that they provide information on the status of your project. These are very common documents, as project partners and interested parties want to be kept apprised of how projects are going. A status report can update your instructor, supervisor, or client on the current state of the project and how things are going. A more detailed Progress Report covers more ground in that it reviews what has been done, what is in progress, and what is still yet to be done, and what problems you may have encountered. A key goal of these reports is to reassure your audience that everything is going according to plan and budget – or if it's not on track, to explain why, present an updated plan, and perhaps ask for assistance or additional resources

Work Logs

Work logs are common documents used in the work place (and in your Co-op Work Terms) to keep track of what work is done, by whom, and how long it took. These can be very helpful for keeping a team on track and ensuring equitable workloads. In the workplace, they can also be super helpful when you need to refer to previous work in a report, or want to look back on work done several weeks earlier and reflect on what strategies worked well and what might need rethinking. If you compare each team member's work log, you will quickly see if some team members are doing more work than others. To ensure accountability, have each team member sign off on the work log.

Sample Work Log

Date	Task Description	Assigned to	Status / Date Completed	Total Time Spent

Team signatures:

Name: _____

Name: _____

Name: _____

Name: _____

Post Project Review

In professional contexts, conducting a Post Project Review (PPR) and documenting the "lessons learned" during the project is generally considered to be an essential end-of-project activity and a tool for "continuous improvement." If done well, reflecting on the lessons learned not only provides valuable insights into what made the project successful, but also identifies potential areas for improvement; reflection helps you to successfully build on your team's successes and refine teamwork and project management strategies for future projects. The saying goes, "we learn from experience" and learn from our mistakes; but this is only true if we ***reflect*** *on our experiences and mistakes and actively consider what we can learn from them. Indeed, sometimes we can learn more from failure than from success!*

A PPR report typically contains the following elements:

Project purpose and goals*: summarize the project's overall purpose and key goals*

Project performance*: reflect on how well the project achieved the intended goals. What were the key highlights/successes? Failures? What challenges did you encounter? Acknowledge team member contributions and how they impacted the outcome of the project.*

Team processes and performance*: describe the team processes you put in place and evaluate*

their effectiveness at keeping the team on track and working productively and equitably. The team leader or manager might evaluate individual team members' performance here as well.

***Lessons learned**: what key take-aways can you extract from the above information and the experience of working on this project? Identify specific strategies that worked very well that you would use again. Identify areas that need improvement, and what specific steps you would take in future projects to produce better results.*

***Goals/Recommendations**: going forward, what concrete recommendations can you offer, based on the experience of working on this project, to improve future planning, communication, and project/risk management?*

Reflecting on the successes and failures ensures that we learn from both – indeed, if we fail to learn from mistakes, we tend to just keep repeating them. Reflecting is a crucial part of the continuous improvement process and helps us to set goals for future growth.

4.5 Collaborative Writing Strategies

SUZAN LAST AND CANDICE NEVEU

You have likely had at least one opportunity to work and write collaboratively, as this is an increasingly common way to work, both in school and in the workplace. The engineering design process, at least in part, entails working collaboratively to gather, organize, manage and disseminate information. This information is often carefully analyzed and used to make important decisions, so it is critical that team members collaborate effectively in managing these communications tasks.

Engineers and business professionals report spending a considerable amount of their time writing, and they frequently engage in collaborative writing (CW). A recent survey asked various professionals what portion of their work week was devoted to writing, collaborative writing, and international communications.[1] *The results shown in* ***Table 4.5.1*** *indicate that collaborative writing makes up a significant portion of overall writing tasks.*

TABLE 4.5.1 *Percentage of total work week that business professionals, engineers, and programmers report spending on communications tasks*

	Finance, Management & Marketing	***Engineers***	***Programmers***
Time spent writing	34	35	25
Time spent planning and writing documents collaboratively	20-25	19	12
Time spent communicating internationally (across national borders)	*not available*	14	18

Research has also shown that "writing in general and CW in particular have been recognized to be fundamental to most professional and academic practices in engineering."[2] ***Figure 4.5.1*** *shows that engineers rate writing skills as extremely important to career advancement.*[3]

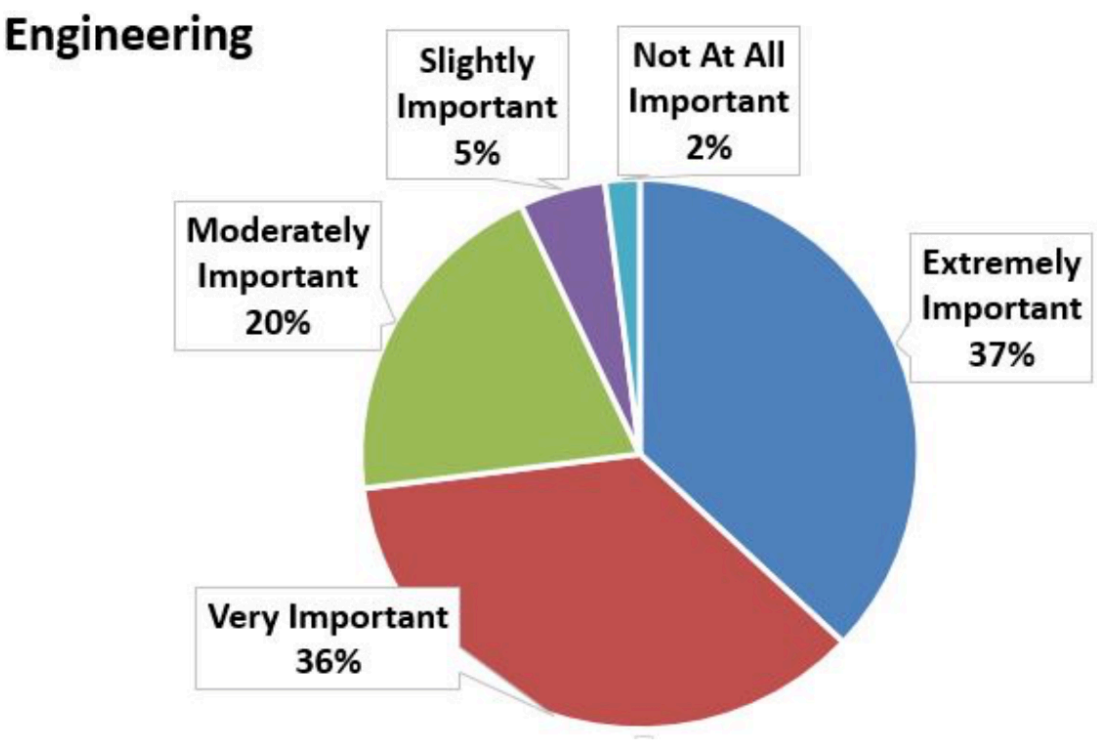


***Figure* 4.5.1** *The importance of writing for career advancement for surveyed engineers.* [4]

Like any kind of teamwork, collaborative writing requires the entire team to be focused on a common objective; according to Lowry et al., an effective team "negotiates, coordinates, and communicates during the creation of a common document."[5] *The collaborative writing process, like the Tuckman team formation model, is iterative and social, meaning the team works together and moves back and forth throughout the process.*

Successful collaborative writing is made easier when you understand the different strategies you can apply, how best to control the document, and the different roles people can assume. ***Figure* 4.5.2** *outlines the various activities involved at various stages of the collaborating writing process.*

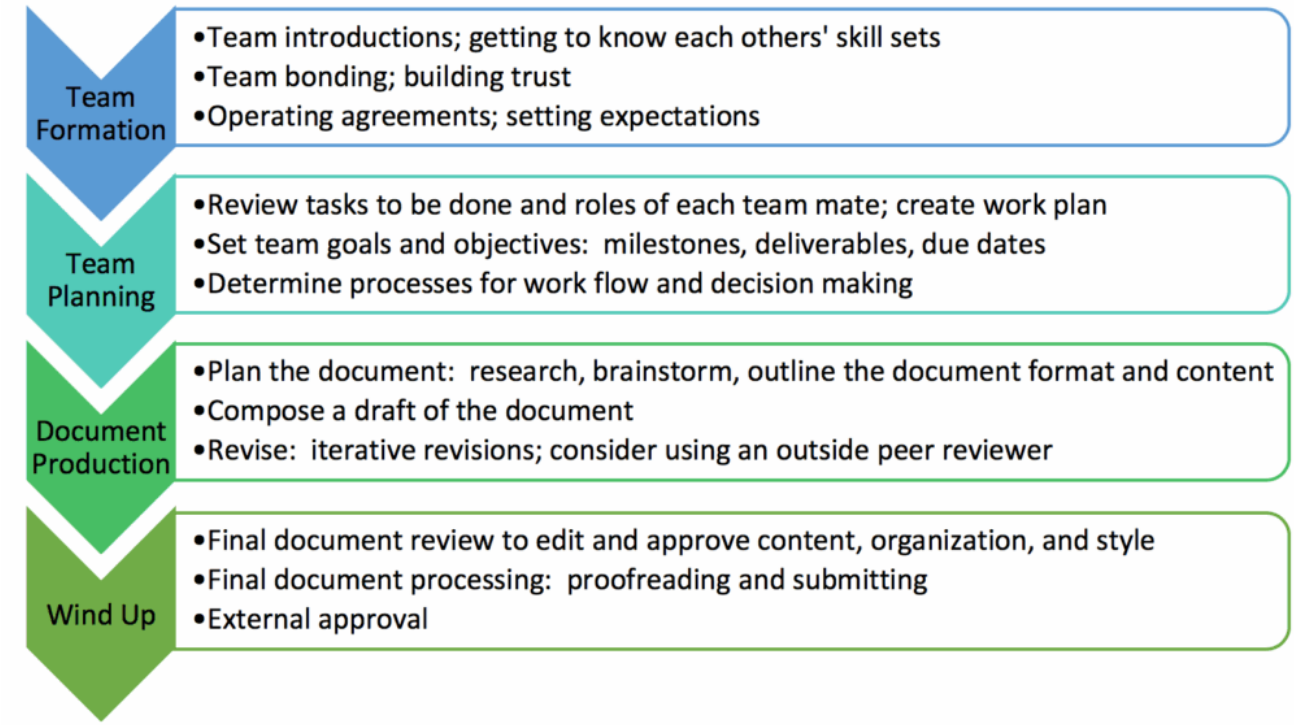


***Figure* 4.5.2** *Collaborative writing stages [Image description]*

Collaborative writing strategies are methods a team uses to coordinate the writing of a collaborative document. There are five main strategies (see ***Table* 4.5.2***), each with their advantages and disadvantages. Can you think of any other benefits or limitations?*

TABLE 4.5.2 *Collaborative writing strategies*[6]

[Skip Table]			
Writing Strategy	**When to Use**	**Pros**	**Cons**
Single-author *One member writes for the entire group*	*For simple tasks; when little buy-in is needed; for small groups*	*Efficient; consistent style*	*May not clearly represent group's intentions; less consensus produced*
Sequential *Each member is in charge of writing a specific part and write in sequence*	*For asynchronous work with poor coordination; when it's hard to meet often; for straightforward writing tasks; small groups*	*Easy to organize; simplifies planning*	*Can lose sense of group; subsequent writers may invalidate previous work; lack of consensus; version control issues*
Parallel Writing: Horizontal Division *Members are in charge of writing a specific part but write in parallel. Segments are distributed randomly.*	*When high volume of rapid output is needed; when software can support this strategy; for easily segmented, mildly complex writing tasks; for groups with good structure and coordination; small to large groups*	*Efficient; high volume of output*	*Redundant work can be produced; writers can be blind to each other's work; stylistic differences; doesn't recognize individual talents well*
Parallel Writing: Stratified Division *Members are in charge of writing a specific part but write in parallel. Segments are distributed based on talents or skills.*	*For high volume rapid output; with supporting software; for complicated, difficult to segment tasks; when people have different talents/skills; for groups with good structure and coordination; small to large groups*	*Efficient; high volume of quality output; better use of individual talent*	*Redundant work can be produced; writers can be blind to each other's work; stylistic differences; potential information overload*
Reactive Writing *Members create a document in real time, while others review, react, and adjust to each other's changes and addition without much pre-planning or explicit coordination*	*Small groups; high levels of creativity; high levels of consensus on process and content; looming deadline means work must be done in a hurry*	*Can build creativity and consensus*	*Very hard to coordinate; version control issues*

Document management *reflects the approaches used to maintain version control of the document and describe who is responsible for it. Four main control modes are listed in* **Table 4.5.3**, *along with their pros and cons. Can you think of any more, based on your experience?*

TABLE 4.5.3 *Document control modes*

Mode	*Description*	*Pros*	*Cons*
Centralized	*When one person controls the document throughout the process.*	*Can be useful for maintaining group focus and when working toward a strict deadline*	*Non-controlling members may feel a lack of ownership or control of what goes into the document*
Relay	*When one person at a time is in charge but the control changes in the group*	*Democratic*	*Less efficient*
Independent	*When person maintains control of his/her assigned portion*	*Useful for remote teams working on distinct parts*	*Often requires an editor to pull it together; can reflect a group that lacks agreement.*
Shared	*When everyone has simultaneous and equal privileges*	*Can be highly effective; non-threatening; good for groups working F2F, who meet frequently, who have high levels of trust*	*Can lead to conflict, especially in remote or less functional groups*

Roles *refer to the different hats participants might wear, depending on the activity.* ***Table* 4.5.4** *describes several roles within a collaborative writing team. Which role(s) have you had in a group project? Are there ones you always seem to do? Ones that you prefer, dislike, or would like to try?*

TABLE 4.5.4 *Collaborative writing roles*

Role	Description
Content Creator	*A person who is responsible for drafting a portion of the content*
Graphic Designer	*A person who is responsible for creating or coordinating visual elements to accompany and illustrate written content*
Reviewer	*Responsible for reviewing and suggesting revisions to content drafted by others (can be internal or external to the team)*
Editor	*A person with permission to edit the content created by others*
Writing Coordinator	*Creates the initial shared document and coordinates the contributions of all team members into the team document to ensure all content requirements are met*
Research Coordinator	*Ensures that all research done by individual team members is complete, credible effectively incorporated into the team document, and properly cited (meets integrity and documentation requirements).*
Document Design Coordinator	*Ensures that all contributions to the document follow the required Style Guide consistently in terms of layout, typography, use of headings, colour schemes, citation style, figure and table formatting, etc.*
Task Coordinator	*Ensures that the team understands the requirements (coordinates the team's Task Analysis) and that all required tasks are distributed equitably. Also makes sure the team has a realistic sense of how long tasks will take to complete, and builds in time for integrating each team member's contribution into the shared document.*
Team Leader	*A person who is part of the team and participates in authoring and reviewing the content, but who also leads the team through the processes, planning, rewarding, and motivating.*
Facilitator	*A person external to the team who leads the team through collaborative writing processes and may offer feedback on content or process.*

Clearly, some of these roles may overlap, especially in a small team of 3-4 people. For a course assignment, every team member should be writing, researching and engaging in document design in order to achieve the course learning objectives, but you might find it useful to assign individual team members to coordinate these task to ensure consistency and quality control.

EXERCISE 4.3 *Follow up and reflect*

Consider a collaborative writing project you have worked on in the past or are currently working on. Using the tables above, analyze your example to determine the collaborative writing strategy (Table 4.3.2) and document control mode (Table 4.3.3) that best describes your experience, and what collaborative writing role(s) (Table 4.3.4) you took on.

How effective was the strategy that you used? Would another strategy have been more effective?

Image description

Figure 4.5.2 image description:

Four stages of collaborative writing

1. *Team Formation*
    - *Team introductions, getting to know each others' skill sets*
    - *Team bonding, building trust*
    - *Operating agreements, setting expectations*
2. *Team Planning*
    - *Review tasks to be done and roles of each team mate, create a work plan*
    - *Set team goals and objectives: milestones, deliverables, due dates*
    - *Determine processes for workflow and decision making*
3. *Document Production*
    - *Plan the document: research, brainstorm, outline the document format and content*
    - *Compose a draft of the document*
    - *Revise: iterative revisions, consider using an outside peer reviewer*
4. *Wind Up*
    - *Final document review to edit and approve content, organization, and style*
    - *Final document processing (proofreading and submitting)*
    - *External approval*

[Return to Figure 4.5.2]

Notes

1. J. Swartz, S. Pigg, J. Larsen, J. Helo Gonzalez, R. De Haas, and E. Wagner, "*Communication in the workplace: What can NC State students expect?*" *Report from the Professional Writing Program, North Carolina State University*, 2018.
2. J. Gimenez and J. Thondhlana, "Collaborative writing in Engineering: Perspectives from research and

implications for undergraduate education," *European Journal of Engineering Education*, *vol.* 37, *no.* 5, 2012, 471–487. DOI: http://dx.doi.org/10.1080/03043797.2012.714356

3. *J. Swartz, et al.*
4. *J. Swartz, et al.* CC-BY 4.0.
5. *P.B. Lowry, A. Curtis, and M.R. Lowry, "Building a taxonomy and nomenclature of collaborative writing to improve interdisciplinary research and practice," Journal of Business Communication, vol. 41, 2004, pp. 66-97. DOI: https://doi.org/10.1177/0021943603259363*
6. *(adapted from Lowry et al. [4])*

4.6 Peer Review Strategies

SUZAN LAST AND LOREN GAUDET

Peer review is a standard form of quality control and way to get feedback on your work in both professional and academic contexts. When you submit a paper in a course, or deliver a document to a client, you're not usually sitting in front of the person while they read it. Even though your writing may make sense to you, there's no guarantee that your reader will engage with your writing in the way that you intended. In fact, different readers will have different lived experiences, knowledges, and backgrounds, and all of these can affect their reading experience. This is one of the reasons that it's so important to keep your audience(s) in mind while you're writing. Having a colleague review your final draft before presenting it to the intended audience is common practice in both academic and professional contexts.

If you are writing collaboratively, you have built-in peer reviewers who understand the purpose, goals, and intended audience of your document. Even still, it can be useful to have an external reader give you their feedback. People who have been drafting and revising the same content for a while are sometimes "too close" to see something that might be unclear or ambiguous to an outsider.

Peer review entails having a peer — a fellow student who is familiar with your assignment, or a colleague who understands your purpose — review and offer feedback on the effectiveness of your content and how it might be improved. While peer review ultimately benefits the intended reader/user as a form of "quality control," it also has clear benefits for the reviewer. In the process of peer review, creators can get helpful feedback on how they can improve their content/organization/format, and reviewers can learn from the content they are reviewing, reinforce the assignment and grading criteria, and come back to their own draft with a fresh perspective. For both it is a helpful way to review content, structure, style and formatting before submitting your final document. Building in time for peer review also helps with time management, as you have a completed final draft well before the due date.

In order to attain the maximum benefits of Peer Review, both authors and reviewers should keep the following strategies in mind:

Author Strategies

- **Be prepared**: provide your reviewer with the most polished and complete draft possible in order to fully

benefit from peer review. A partial or very rough draft can benefit from some preliminary review about content gaps, structural issues, or general tone, but a completed draft can elicit more helpful and detailed feedback.

- **Give reviewer some guidance**: describe the concerns you have about your draft at this point. Alert your reviewer to areas where you would particularly appreciate feedback (or where you do not want feedback because you know what revisions are needed). Providing questions helps your reviewer give you targeted feedback that will be useful to you. If the reviewer is not familiar with your purpose and audience, fill them in.
- **Be open to new ideas**: avoid becoming defensive about the feedback; remember, your reviewer is trying help you improve your draft. Consider alternative viewpoints you may not have thought of before; listen before deciding what you will do with the feedback.
- **Consider advice carefully**: think critically about whether the reviewer's suggestions will help you to improve your draft and if they are appropriate for your purpose and audience. What and how you revise is ultimately up to you; consider your reviewer's advice carefully, and seek additional advice if you are unsure about following their suggestions for revision.

Reviewer Strategies

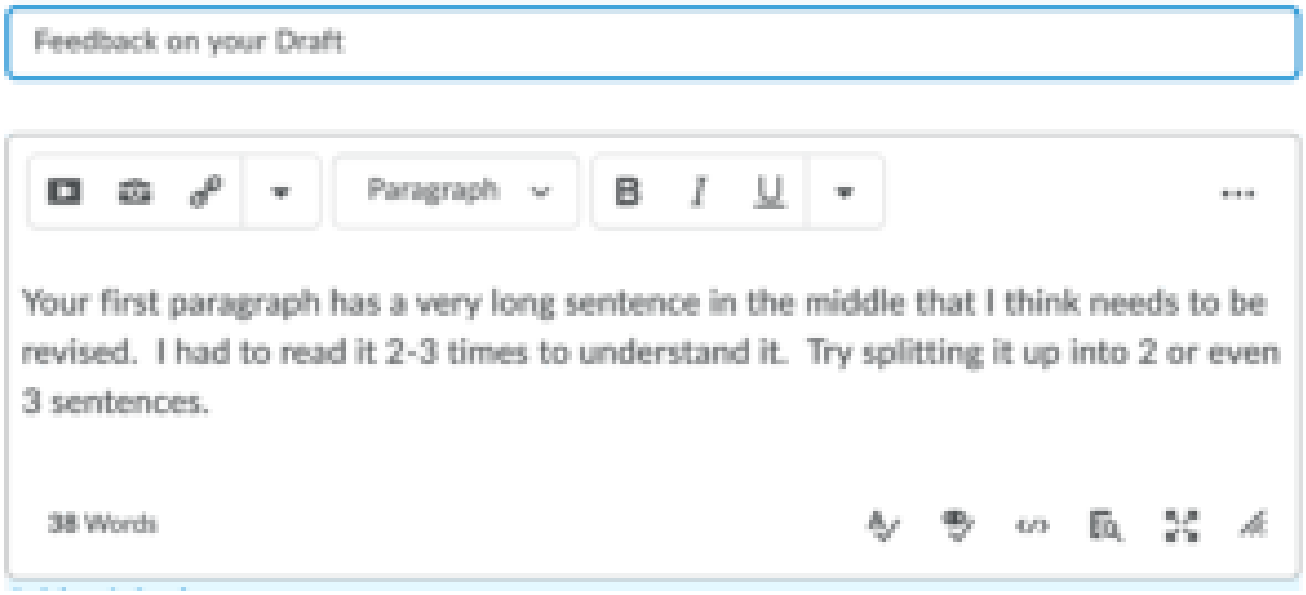
- **Know the document's purpose and audience**: review the assignment description and/or grading rubric before reviewing the draft; know what the document is trying to achieve before you assess what revision it might need to achieve it.
- **Provide balanced feedback**: be honest and critical, but also point out strong areas where things are working well. Use positive, constructive tone to discuss areas that could use improvement. Don't gush ("your paper is so awesome!") and don't trash ("This totally sucks! Rewrite the whole thing!"). Remember your purpose is to help the author find ways to improve the draft; recognize what is already good, and suggest what could use further work.
- **Be specific**: explain why a sentence, paragraph, or image needs improvement; explain why you as the reader are confused or bothered by a specific phrase or passage, or why the logic does not flow for you (be "reader centred").
- **Be courteous**: be aware of your language use and tone when addressing peers. Avoid patronizing, belittling, or "talking down" to your peers when giving advice. Asking questions can be an effective way to provide feedback on what might be missing or confusing in the draft.
- **Don't edit**: Your job is reviewer, not editor. Don't fix errors or phrasing issues; just point out areas that need improvement. You might offer ONE sample correction to demonstrate what you mean, but do not engage in wholesale editing. A key purpose of peer review is for each person to learn how to edit their own work based on reviewer feedback.
- **Be efficient**: don't overwhelm your author with too much detailed feedback. A page that has more feedback notes than content will be very difficult to process. Focus on a handful of the most important revisions that are needed to help improve the draft. For example, if there are numerous spelling errors, don't point them all out; highlight one or two and then recommend that the author spellcheck carefully before submitting.

NOTE on Using AI: Some people use Generative AI to provide peer review, but please note that as a reviewer, you **must obtain the author's permission** to submit their work to an AI tool. It is a violation of copyright to upload another person's work to an LLM without their explicit consent. Some authors do not want their work being used as training material for LLMs. Also, keep in mind that Gen AI tools are designed to "flatter" the user and tell them what they want to hear, not necessarily provide effective feedback on ways for them to improve.

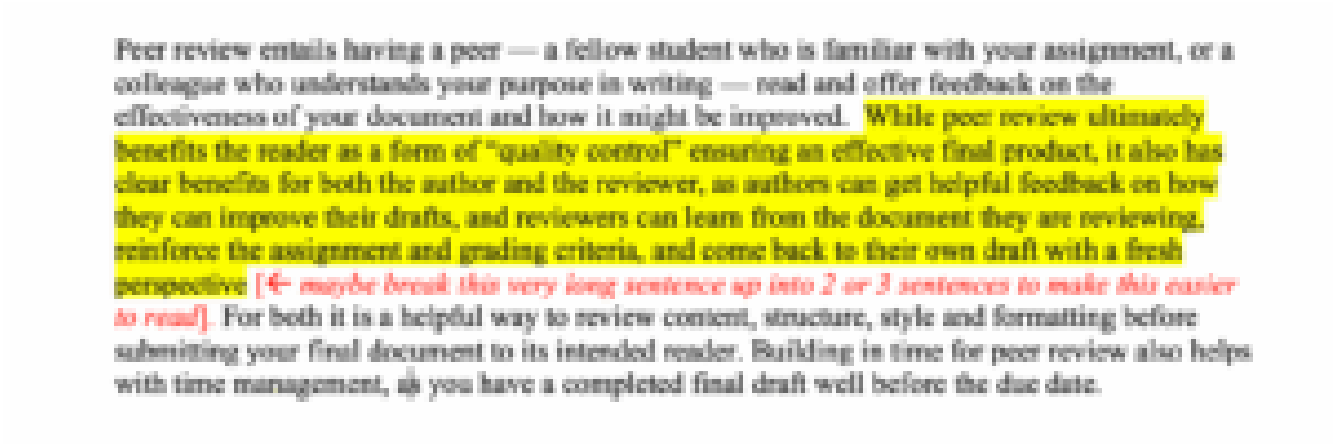
Methods of Giving Feedback

There are many ways to provide feedback on someone's work; how you do this will depend on what form of work you are reviewing, the context, and the situation. For example, if you are doing a peer review in a classroom with your peer groups face-to-face, you might give feedback verbally, or you might put hand-written feedback directly onto their papers. In some cases, your instructor might give you a checklist or heuristic to use, which you must fill out as you are reading your peer's draft.

If working remotely, you might read your peer's work in an online forum, and post a reply in which you write out all your feedback within the reply window, like the one below.

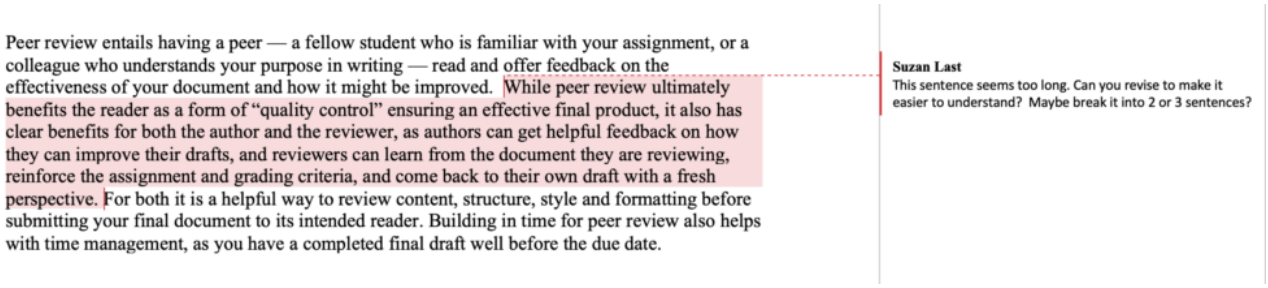


To offer more detailed feedback, you might download the author's document and write inline comments on the draft – ideally using a different colour to make your comments standout more easily, as seen below.



Then upload your revised document as a reply to the author.

Writing inline comments can affect the formatting of the document, so you may instead want to use the "insert comment" function.



This will allow the document formatting to remain stable, and your comments can be easily deleted after reading.

Read Aloud Peer Review

***Read Aloud** is an excellent method of peer-review that focuses on giving the content creator access to the reader's direct experience of the draft. Rather than having a peer offer written feedback about the draft, the Read Aloud method invites the reviewer to express their experience as a reader. When a peer reads your work out loud, you can see how they are responding to your draft in real time. Sometimes a change from reading to hearing your work can help you catch writing issues that need attention. When you're reading a peer's work out loud, you get practice expressing your experience*

as a reader and thinking critically about why and how different aspects of writing can shape your reading experience. These reflections are really helpful if you can apply them to your own work!

There are many ways of doing read aloud peer review, but here are some guidelines to follow.

- *Find a suitable place where you can hear each other reading aloud, and you won't disturb others. Consider working in pairs, taking turns reading each other's drafts out loud.*
- *Try to make yourself comment on your experience after each paragraph, or even sentence!*
- *If you stumble, pause, or have to reread something, this is usually a good opportunity to reflect on why this happened and explain this to your partner. (did you simply lose focus, or was the sentence difficult for you to understand the first time through?)*
- *Remember to be kind, supportive, and compassionate.*

If your draft is being read out loud, here are some guidelines for listening:

- *Make sure that you have a copy of the draft for your partner and a copy for yourself on which you're able to write comments as you listen. This could mean having 2 printed copies of your draft, using an online tool such as google docs, or simply having a laptop or tablet that you feel comfortable handing to your partner.*
- *While your partner is reading your work out loud, listen carefully. Sometimes, changing the medium of your words can help you to catch writing issues that need attention. (like maybe you've used the word "plethora" too many times!)*
- *Take notes on your reader's reactions. Are there places where what you're trying to say and what they're communicating don't match up? If so, highlight these places and return to them for revision.*
- *If your partner says, "I like this," consider asking them to be more explicit about their reading experience. What do they like about it?*
- *If you have specific concerns about your writing, consider highlighting these for your partner. For example, you might ask your peer to focus on your argument and its supporting evidence; or you may be more concerned about the sentence structure.*

Having your work read out loud can be uncomfortable, nerve-wracking, or even scary! Having said that, hearing the feedback put in terms of your reader's experience can help. Practice and repetition can also help to make this less intimidating.

In order to make sure that you and your partner are commenting on the experience of reading — and NOT making corrections to the paper — the table below offers some guidelines for thoughtful ways to respond.

Instead of saying….	***Try saying…***
This paper has no thesis	*I'm through the first paragraph, and I'm still not quite sure what the main claim of the paper is.*
This word is wrong	*I find this word choice to be confusing. It means something different to me.*
This is a run-on sentence	*I've lost track of what's happening in this sentence.*
This is unclear	*I'm having trouble understanding this part.*
This point doesn't belong here	*I'm struggling to see how this point relates to your argument.*
This is really good	*I found this idea interesting/this sentence easy to read because…*

Whichever method you use to provide feedback, keep in mind these essential guidelines:

- ***Be specific:*** *give the author specific examples and details; avoid vague or overly general statements*
- ***Be constructive:*** *try to help the author improve the quality of their work in substantial ways; point out what is working well and where further attention is needed*
- ***Be courteous:*** *remember the golden rule, and give feedback in a way that you would like to receive it yourself.*

5. CONDUCTING RESEARCH

Most projects you work on—whether you are developing innovative new products, implementing a design, or recommending a solution to a problem—will require research. Research can save you time by determining what other similar designs/solutions have already been proposed, what has been tried and tested in the past and what the results were, what patents are already in place, what intended users need or expect, and so on. It also helps you to understand the background of your project and how it fits into a larger context. Finally, research is necessary to help you to develop and validate your ideas. Researching is one of the key elements in any design process.

Chapter 5 Learning Objectives

The chapter contains the following sections that will help you develop your research skills and meet the following learning objectives:

5.1 Defining Your Scope: understand how to use various methods to define and refine the scope of your project and create focused research questions to guide your research process

5.2 Research Terminology and Methodologies: understand conventional terminology related to conducting and disseminating various kinds of research.

5.3 Finding and Evaluating Sources: review various kinds of sources and how to determine their reliability, authority, and relevance as research sources in professional and academic contexts.

5.4 Synthesizing and Integrating Sources: Understand and apply conventional rhetorical moves when using sources; incorporate source material ethically and effectively using quotation, paraphrase and summary.

5.5 Citing Sources: Understand how to use correct and effective citational practice to give credit to your sources both in the body of your text and in the References section at the end.

5.5 Engagement and Consultation: Understand how to determine who the relevant parties are (individuals, organizations, and environments that might impact or be impacted by your project), and determine effective and meaningful ways of engaging and consulting with them.

5.7 Human Research Ethics: Understand the protocols involved when doing research (such as surveys, interviews, focus groups, etc.) that collects data from human participants. Understand why it is important to abide by human research ethics guidelines.

5.1 Defining Your Scope

Often, when you are first assigned a project, the problem may be fairly general and open-ended. This allows you to approach the problem in a variety of ways, but also requires you to engage in critical thinking to decide which particular approach you will take and what limits you will place on what you hope to achieve. That is, most projects will require careful definition of ***scope****.*

Defining your scope is a foundational step in your project, where you outline specific goals you want to achieve, but also set limits and determine what your project will ***not*** *do. If you are tackling a large problem, you will likely not be able to solve it entirely; you might choose one slice of the problem pie to work on. Sometimes when students propose a research topic or project, they might not be aware of some of the issues involved and end up proposing a topic that might take an entire book to deal with! In such cases, you want to narrow your focus to a single chapter of that book. So while defining your scope will help you determine what kind of research you will need to do, you may also need to do some research to help you define your scope — because sometimes we don't even know what we don't know until we start doing research.*

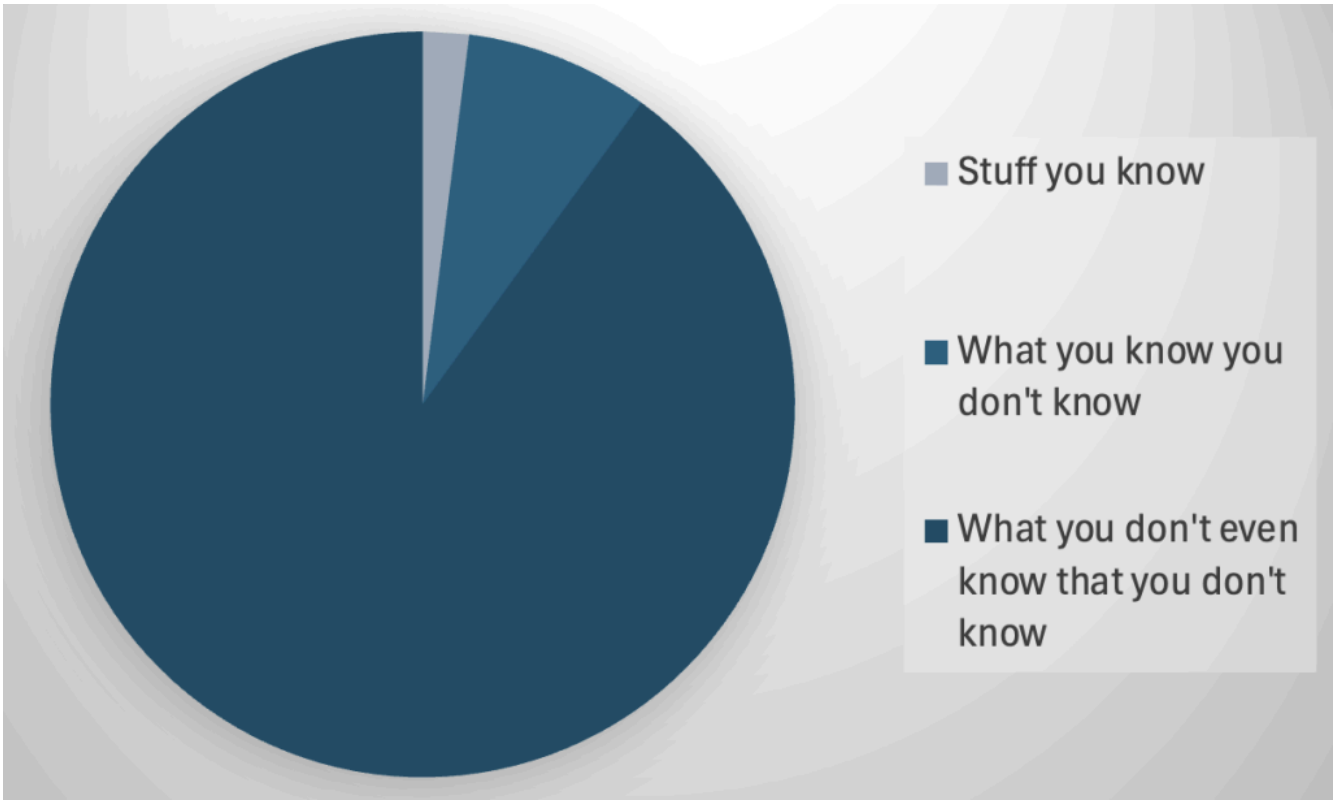


Figure 5.1.1 *Circle of knowledge; we don't know what we don't know*

It is unlikely that a project will be relevant to or encompass all people in all places at all times. Limiting your scope means considering which people (or other entities), in which places, at which times. You may need to consider some or all of the following, depending on the type of project you are embarking on:

- ***Background research**: to more fully understand the context in which you are working and clearly define the problem you are tackling. How do you know there is a problem? What measurable impacts result from the current "unsatisfactory situation"? What data will you need to prove that this is a significant problem that has negative impacts and needs to be addressed?*
- ***Purpose**: What is your goal? What do you want your project to achieve? What are the limitations placed on what can be expected or achieved? Are there expected goals or targets that any proposed solution is expected to meet? How will these be measured? What are the constraints (time frames, resources available, budget, regulations, etc) you have to work within? What solutions have already been tried unsuccessfully?*
- ***Intended Audience**: Who is your immediate intended audience? What do you know about them? What more do you need to know in order to effectively convince them of your idea? Where might you find this information? What is the best way to present this information to this audience? Who else might read this?*
- ***Other Relevant Parties**: Who else might read your document or be interested in your project? Will you need to engage or consult with people or groups who might influence or be impacted by this project?*

- *Are there limitations (or a potential to apply limits) in terms of geography, demographics, or available technology? Could you consider a Pilot Project or Beta-Test?*
- *Are there legal considerations, patents, regulations, policies, and guidelines that must be taken into account?*

The process of coming up with a focused idea for your research can take many forms. Some strategies for narrowing and focusing include the following:

- ***Free-writing**: write for 10 minutes straight without stopping or self-editing. Then review what you have and circle any promising ideas. Use these and the basis of the next free-write.*
- ***Mind-mapping or Concept-mapping**: create a graphic organizer listing ideas and indicating how they are connected*
- ***Questioning**: who, what, where, when, why, how? What do I already know? What do I need to find out?*
- ***Brainstorming**: list all ideas without censoring or rejecting any, no matter how ridiculous or irrelevant they might seem at first.*

In engineering fields, projects most often take a Problem-Solution approach. This entails clearly

defining the problem in as open-ended a way as is feasible, possibly considering its causes and effects, and potentially coming up with or evaluating solution ideas.

In presenting your solution, you will have to find research to provide support for the basic premise of your research question (is this idea feasible?) and prove your hypothesis (show that it will be effective/beneficial). You might do this by showing that similar ideas have been implemented and/or researched in other areas, or that the ideas you are presenting are based on sound evidence. Collecting your own primary data (such as conducting a survey, interview, or site visit) may also help show how your ideas are feasible in the local community context.

Using appropriate methods and finding the right sort of research allows you to convince people that your ideas have validity and merit, and that the knowledge you have acquired or created is evidence-based.

The first step in most projects is figuring out what you don't know and what you need to know. Without this basic context work, it's difficult to work your way to finding relevant sources that can help you apply and analyze information and data from sources, and synthesize them into your own argument or recommendation.

A problem-solving approach offers many ways to narrow your focus. Try creating a concept map like in ***Figure 5.1.2*** *to get a sense of the many ways you might approach your topic, and then narrow down your focus to* ***one*** *of those approaches. This will help you think of key words to use in your search for sources. The more you brainstorm, the more potential key words and synonyms you can come up with. The "mind map" below shows various ways to consider the larger context of your problem and find a specific area to focus on.*

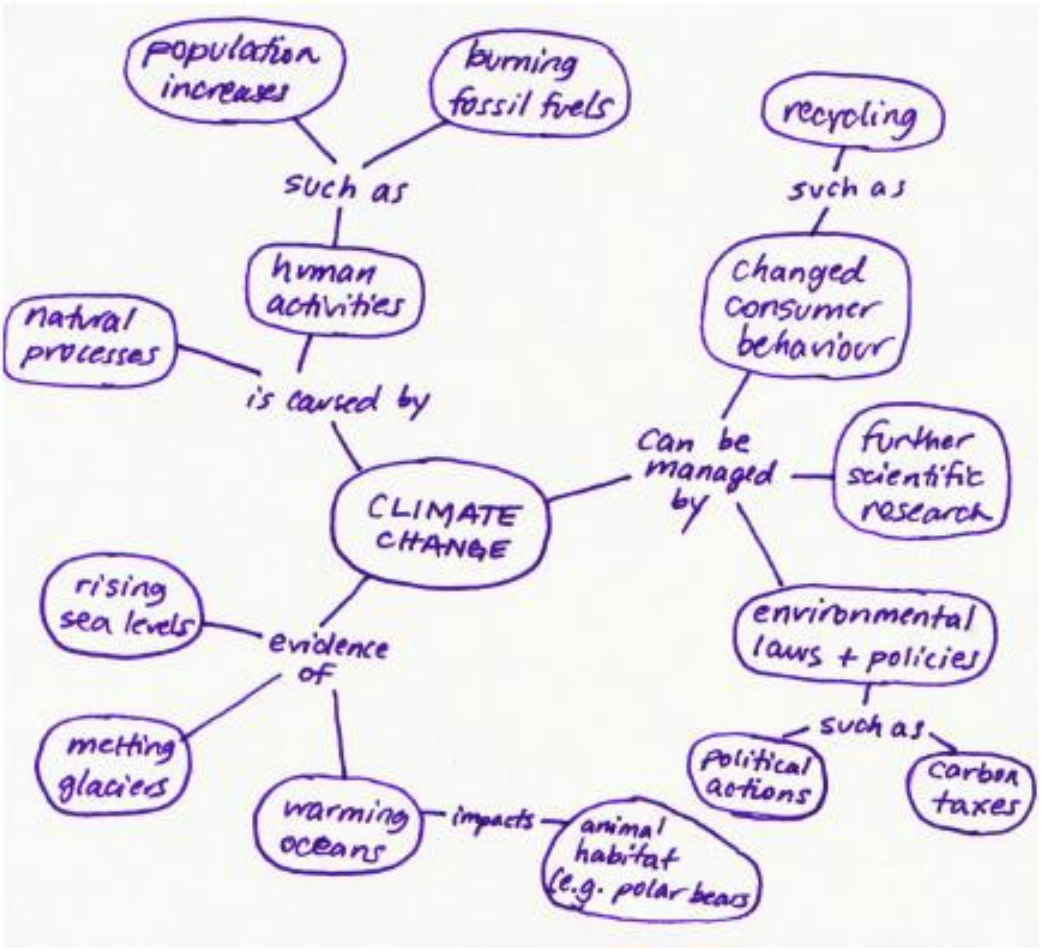


Figure 5.1.2 *Concept map for refining a topic on climate change.*[1] *[Image description]*

This kind of "graphic brainstorming" can help you consider many different ways your topic can be approached. You can ask questions such as how? why? who? to further extend this exploration. Your goal here is to narrow down your focus to one "bubble" (that is perhaps 3 or 4 nodes away from your central topic node) that can afford a promising topic while limiting the scope to something you can accomplish in the given time frame and assignment specifications (word count, research requirement, goal, etc).

Clearly you can't solve the problem of climate change in one paper or project. And no reasonable instructor or employer would expect you to. However, you might be asked to explore effective ways to reduce carbon emissions in a specific industry in a given period of time and/or geographical region. Or you might investigate whether a particular form of alternative energy would be effective in a particular situation. Even then, you would have to consider approaches. Would you recommend changing a policy or law to try to address the causes of the problem? Providing incentives to industry or consumers? Innovating a current technology or process? Creating a new technology or process? Evaluating a currently proposed solution?

Researching what other people working in this field have studied and written about can help you

refine your focus and choose how you want to participate in this scholarly conversation. The ultimate aim is to narrow your topic enough to provide a specific question to guide your research and identify key words and terminology related to your topic.

A good research question should be somewhat open ended; that is, the answer should not be a simple "yes" or "no." The focus of your research question should allow you to provide a comprehensive answer that takes context into careful consideration.

***Figure* 5.1.3** *shows a more specifically problem-based approach to concept mapping the general idea and finding areas of potential focus. A good focus for a paper or project will likely be 3-4 nodes away from the central problem box.*

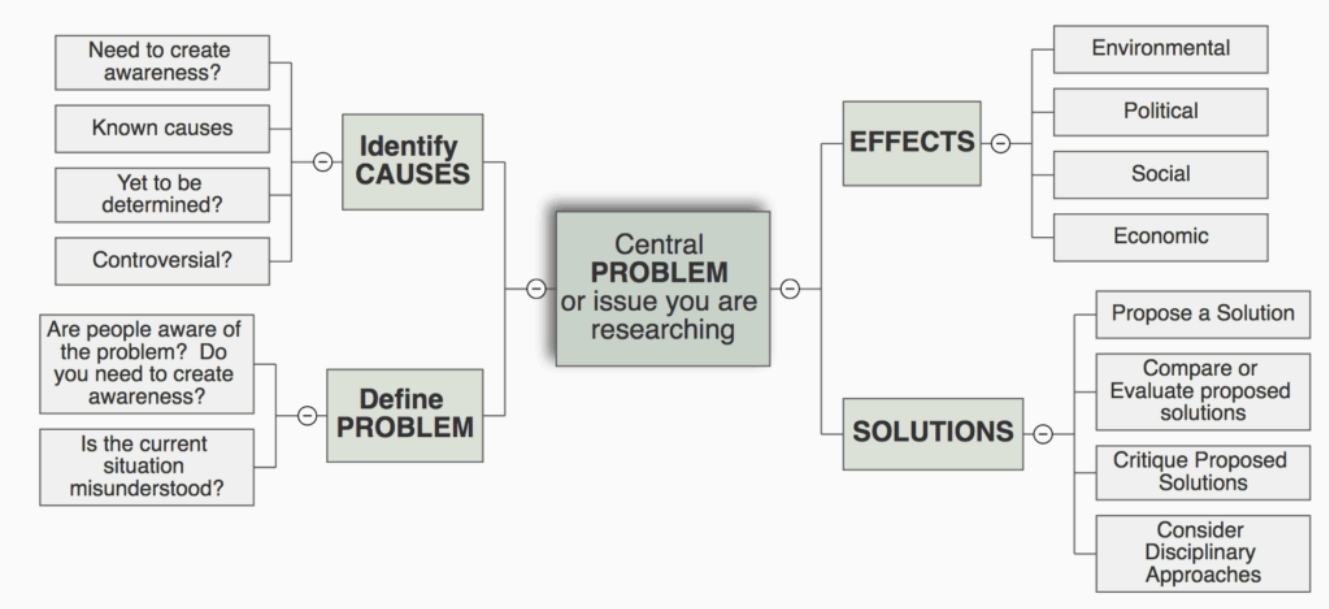


***Figure* 5.1.3** *Refining your project scope using a problem-based approach to concept mapping.* [*Image description*]

You generally cannot cover ***all*** *of these issues in one paper or project. Try to narrow your focus so that you can research a specific aspect of the topic in-depth. Choose* ***one*** *specific focus (proposing a solution), and consider what other aspects must be included (defining the problem; choosing a specific demographic or geographical area to focus on).*

As an example, consider the issue of ***Climate Change*** *and how it might fit into each of these "narrowing your focus" categories.*

EXAMPLE: *Ways of Narrowing the Focus on Climate Change Topics*

Define the Problem

Several years ago, research focused on trying to define the "wicked" problem, and convincing the general public, industries, and governments that a problem exists and is serious enough that we must start working on solutions immediately. Now, the vast majority of scientists and researchers accept that a problem exists: the climate is indeed warming and this is causing measurable impacts. Ongoing research might determine ways to convince people who are not yet convinced and ways to motivate people to take the problem seriously enough to consider changing their behaviour or policies.

Identify Causes

In the last few decades, there has been controversy over what the CAUSES of this problem are. Is climate change a naturally occurring, cyclical phenomenon or "anthropogenic" (human-caused)? Research has convinced most people that climate change is anthropogenic: that human consumption of fossil fuels is the main cause of climate change.

Research is ongoing about what kinds of activities (fracking, building dams, data centres, driving vehicles that run on fossil fuels, *etc.*) might contribute more or less to climate change. Research might also consider effective ways to modify human behaviour in order to slow down those causes.

Identify Effects

Much research currently explores the effects of climate change, and even how we can determine what specific effects can be the direct effect of climate change. This can be done from many different disciplinary approaches. For example:

- Social justice research explores how certain groups of people (based on geography or socio-economic status) are impacted more severely than others.
- Political theorists may explore how different government types create different kinds of policies in response to the problem.
- In economics, researchers might try to predict how climate change may affect certain aspects of the global or local markets.
- In psychology, researchers might explore how people respond to the idea of climate change (*e.g.*: stress, depression, motivation, *etc.*)
- Environmental researchers have numerous possible topics! For example, how is climate change affecting a particular species in a particular region? What impact might this have on the local ecology or human society? How should building standards in coastal areas be adapted for climate change?

Explore Solutions

Research questions— such as "How must we adapt current designs for X in place Y to be more resistant to specific types of climate impacts? "Are Carbon Taxes and Caps an Effective Way to Reduce GHS Emissions?" and "Will Developed Nations Taxes Help Developing Countries Develop Low Carbon Technologies?"—analyze the effectiveness of proposed or currently implemented solutions. Some research compares the effectiveness of two possible solutions. Some propose new solutions (Tidal Power or AI controlled systems to enhance efficiency). Some might propose implementation of previous solutions in new contexts.

Why Project Proposals Might be Rejected

A proposal or recommendation needs research to convince the reader that the idea is worth pursuing or implementing. A project proposal could be rejected for any of the of following reasons related to insufficient research or poor scoping:

- ***Unclear Problem Definition:*** *research problem is not clearly defined so research plan has no clear focus (the idea is too vague , lacks a specific scope or goal, or not well though out)*
- ***Unnecessary Project****: this issue is already well-known or the problem has already been addressed (or is in the process of being addressed). For example, proposing that the institution's Food Services unit should replace plastic cutlery with compostable cutlery, when it has already done so, would result in a rejected proposal.*
- ***Impractical Scope****: access to information, resources, and equipment needed to complete your proposed study may not be available; adequate conclusions cannot be reached in designated time frame and resources available. For example, if you propose to do a study that will take 2 years, but your project is due in 2 months, the proposal will be rejected.*

As you can see, research will be needed in all stages and sections of your project.

EXERCISE 5.1 *Background Research*

Think of a problem you have recently encountered on campus – something that caused inconvenience, unnecessary cost, or some other "unsatisfactory situation" for you. What kind of research would you have to do to prove

1. that this is a significant problem that should be addressed?
2. that it affects a large number of people, not just you?
3. that this situation has tangible, measurable, negative consequences?

How would you convince a "decision maker" or someone in a position of authority that they should apply time and resources to remedy this situation? Where will you search for the information you need to make an evidence-based argument that will convince them?

Image descriptions

Figure 5.1.2 *image description:*

A concept map to brainstorm topics related to climate change.

Climate change

- *is caused by*
  - *natural processes*
  - *human activities, such as*
    - *population increases*
    - *burning fossil fuels*
- *evidence*
  - *rising sea levels*
  - *melting glaciers*
  - *warming oceans*
    - *which impact animal habitat (e.g., polar bears)*
- *can be managed by*
  - *changed consumer behaviour, such as*
    - *recycling*
  - *further scientific research*
  - *environmental laws and policies, such as*
    - *political action*
    - *carbon taxes*

[Return to Figure 5.1.2]

Figure 5.1.3 *image description:*

A problem based approach to concept mapping.

What is the central problem or issue you are researching?

1. *Define the problem.*
   1. *Are people aware of the problem? Do you need to create awareness?*
   2. *Is the current situation misunderstood?*
2. *Identify causes.*

    1. *Need to create awareness?*
    2. *Known causes*
    3. *Yet to be determined?*
    4. *Controversial?*
3. *Identify effects.*
    1. *Environmental*
    2. *Political*
    3. *Social*
    4. *Economic*
4. *Look at solutions.*
    1. *Propose a solution*
    2. *Compare or evaluate proposed solutions*
    3. *Critique proposed solutions*
    4. *Consider disciplinary approaches*

[Return to Figure 5.1.3]

Notes

1. *[Concept Map]. [Online]. Available:* http://libguides.uvic.ca/c.php?g=256802&p=3906769

5.2 Research Terminology and Methodologies

You will undoubtedly be required to conduct research for a course assignment or include research conducted by others to support your ideas. While this may seem a bit intimidating, remember that engaging in research is basically just using a systematic process to find out more information about your topic. Nicholas Walliman, in his handbook Research Methods: The Basics, defines research methods as "the tools and techniques for doing research."[1] *These techniques include collecting, sorting, and analyzing the information and data you find. The better the tools and more comprehensive the techniques you employ, the more effective your research will be. By extension, the more effective your research is, the more credible and persuasive your argument will be.*

Here are some basic terms and definitions you should be familiar with:

> ***Research***: *the systematic process of finding out more about something than you already know, ideally so that you can prove a hypothesis, support evidence-based decision making, and even produce new knowledge and understanding.*
>
> ***Research Methods:*** *techniques of collecting, sorting, and analyzing information and data.*
>
> ***Data***: *bits of information (observations, statistics, etc)*

The typical kinds of research sources you will use can be grouped into three broad categories:

> ***Primary Sources:*** *research you might conduct yourself in lab experiments and product testing, through surveys, observations, measurements, interviews, site visits, prototype testing, beta testing, etc. These can also include published raw statistical data, historical records, legal documents, firsthand historical accounts, and original creative works.*
>
> ***Secondary Sources***: *written sources that discuss, analyze, and interpret primary data, such as published research and studies, reviews of these studies, meta-analyses, and formal critiques.*
>
> ***Tertiary Sources***: *reference sources such as dictionaries, encyclopedias, and handbooks that provide a consolidation of primary and secondary information. They are useful to gain a general understanding of your topic and major concepts, lines of inquiry, or schools of thought in the field.*

Data *can be categorized in several ways:*

Primary data	***Secondary Data***
Data that have been directly observed, experienced and recorded close to the event. This is data that you might create yourself by • **Measurement**: *collecting numbers indicating amounts (temperature, size, etc.)* • **Observation**: *with your own senses or with instruments (camera, microscope)* • **Interrogation**: *conducting interviews, focus groups, surveys, polls, or questionnaires* • **Participation**: *experience of doing or seeing something (visit the site, tour the facility, manipulate models or simulations, Beta test, etc.)* **Note**: *primary research done in an academic setting that includes gathering information from human subjects requires strict protocols and will likely require ethics approval. Ask your instructor for guidance on conducting this kind of research.*	*Comes from sources that record, analyze, and interpret primary data. It is critical to evaluate the credibility of these sources. You might find such data in* • **Academic research**: *refereed academic studies published in academic journals* • **Print sources**: *books, trade magazines, newspapers, popular media, etc.* • **Online research**: *popular media sources, industry websites, government websites, non-profit organizations* • **Non-written Material**: *TV, radio, film, such as documentaries, news, podcasts, etc.* • **Professional Documents**: *annual reports, production records, committee reports, survey results, etc.*
Quantitative Data	***Qualitative Data***
Uses numbers to describe information that can be measured quantitatively. These data are used to measure, make comparisons, examine relationships, test hypotheses, explain, predict, or even control.	*Uses words to record and describe the data collected; often describes people's feelings, judgments, emotions, customs, and beliefs that can only be expressed in descriptive words, not in numbers. This includes "anecdotal data" or personal experiences.*

Research methods are often categorized as quantitative, qualitative or "mixed method." Some projects, like a science lab report, require the use of the scientific method of inquiry, observation, quantitative data collection, analysis and conclusions to test a hypothesis. Other kinds of projects gather both quantitative and qualitative evidence to support a thesis, position, or recommendation. The research methods you choose will be determined by the goals and scope of your project, and by your intended audience's expectations. More specific methodologies, such as ways to structure the analysis of your data, include the following:

- **Cost/benefit Analysis**: *determines how much something will cost vs what measurable benefits it will create, and may lead to a calculation of "return on investment" (ROI).*
- **Life-cycle Analysis**: *determines overall sustainability of a product or process, from resource extraction and manufacturing, through lifetime use, to disposal (you can also perform comparative life-cycle analyses, or specific life cycle stage analysis)*
- **Comparative Analysis**: *compares two or more options to determine which is the preferable solution (given specific problem criteria such as goals, objectives, and constraints)*
- **Process Analysis**: *studies each aspect of a process to determine if all parts and steps work efficiently together to create the desired outcome.*

- **Sustainability Analysis**: *uses concepts such as the "triple bottom line" or "three pillars of sustainability" to analyze whether a product or process is environmentally, economically, and socially sustainable.*

In all cases, the way you collect, analyze, and use data must be ethical and consistent with professional standards of honesty and integrity. Lapses in integrity can not only lead to poor quality reports in an academic context (poor grades and academic integrity violations), but in the workplace, these lapses can also lead to lawsuits, loss of job, and even criminal charges. Some examples of these lapses include

- *Fabricating data (making up data to suit your purpose)*
- *Ignoring data that disproves or contradicts your ideas*
- *Misrepresenting someone else's data or ideas*
- *Using data or ideas from another source without acknowledging or citing the source.*

Failing to cite quoted, paraphrased, or summarized sources properly is one of the most common lapses in academic integrity, which is why the following chapters provides detailed information on how to find credible sources and how to synthesize and integrate your source material ethically and effectively.

Notes

1. *N. Walliman, Research Methods: The Basics. New York: Routledge, 2011*

5.3 Finding and Evaluating Sources

In this "information age" when so much information is available at our fingertips on the Internet, it is crucial to be able to critically search through the reams of information in order to select credible sources that can provide reliable and useful data to support your ideas and convince your audience. In the era of "fake news," deliberate misinformation, AI generated "deep fakes" and hallucinations, developing the skill to evaluate the credibility of sources is critical.

In your studies so far, you have likely been expected to read academic articles and understand how they differ from popular sources: they have different audiences who read for different purposes and expect different kinds of content and use of conventions. Academic journals contain peer-reviewed articles written by scholars, often presenting their original research, reviewing the original research of others, or performing a "meta-analysis" (an analysis of multiple studies on a given topic).

***Figure* 5.3.1** *Examples of Popular vs Scholarly Sources.*[1]

Scholarly articles published in academic journals are usually required sources in academic research essays; they are also an integral part of engineering and business projects, as well as technical reports. Many projects require a ***literature review****, which collects, summarizes and sometimes evaluates the work of researchers in this field whose work has been recognized as a valuable contribution to the "state of the art." However, they are not the only kind of research you will find useful. Since you are researching in a professional field and preparing for the workplace, there are many credible kinds of sources you will draw on in a professional context.* ***Table* 5.3.1** *lists several types of sources you may find useful in researching your projects.*

TABLE 5.3.1 Typical research sources for technical projects

[Skip Table]	
Source Type	**Description**
Academic Journals, Conference Papers, Dissertations, etc.	*Scholarly (peer-reviewed) academic sources publish primary research done by professional researchers and scholars in specialized fields, as well as reviews of that research by other specialists in the same field.* *For example, the Journal of Computer and System Sciences publishes original research papers in computer science and related subjects in system science; International Journal of Robotics and Animation is one of the most highly ranked journals in the field.*
Reference Works	*Specialized encyclopaedias, handbooks and dictionaries can provide useful terminology and background information.* *For example, the Kirk-Othmer Encyclopedia of Chemical Technology is a widely recognized authoritative source.* **Do not** *cite Wikipedia or dictionary.com in a technical report.*
Books **Chapters in Books**	*Books written by specialists in a given field and contain a References section can be very helpful in providing in-depth context for your ideas.*
Trade Magazines and Popular Science Magazines	*Reputable trade magazines contain articles relating to current issues and innovations, and therefore they can be very useful in determining the "state of the art" or what is "cutting edge" at the moment, or finding out what current issues or controversies are affecting the industry.* *Examples include Computerworld, Wired, and Popular Mechanics.*
Newspapers (Journalism)	*Newspaper articles and media releases can offer a sense of what journalists and people in industry think the general public should know about a given topic. Journalists report on current events and recent innovations; more in-depth "investigative journalism" explores a current issue in greater detail. Newspapers also contain editorial sections that provide personal opinions on these events and issues.*
Industry Websites (.com)	*Commercial websites are generally intended to "sell," so you have to select information carefully, but these can provide a wealth of privately produced research that can offers insights into a company's "mission statement," organization, financials, investments, policies, strategic plan, current or planned projects, archived information, White Papers, technical reports, product details, costs estimates, etc.*
Organization Websites (.org)	*A vast array of .org sites can be very helpful in supplying data and information, such as NGOs, advocacy groups, think tanks, research and policy institutes, etc. These are often* **public service** *and* **non-profit** *sites and are designed to share information with the public.*

Government Publications and Public Sector Web Sites (.gov/.edu/.ca)	*Government departments often publish reports and other documents that can be very helpful in determining public policy, regulations, and guidelines that should be followed; demographics, statistics, trade data, labour market information, and economic conditions.* *Statistics Canada,[2] for example, publishes a wide range of data.* *University web sites also offer a wide array of non-academic information, such as strategic plans, facilities information, services, etc.*
Patents	*You may have to distinguish your innovative idea from previously patented ideas; you can look these up and get detailed information on patented or patent-pending ideas.*
Laws and Regulations	*You may need to understand how local, national or international laws and regulations will impact or constrain your ideas.*
Public Presentations	*Public Consultation meetings and representatives from industry and government speak to various audiences about current issues and proposed projects. These can be live presentations or video presentations available on* ***YouTube*** *or* ***TED talks****.*
Other	*Can you think of some more? (Radio programs, podcasts, forums, social network platforms, wikis, blogs, video sharing sites (YouTube), etc.)*

Where to Look?

Researchers often use a variety of tools, depending on the type of research they want to do. Broad interdisciplinary search engines such as Google and Google scholar can be helpful in many cases, but in some instances, you may need to use more targeted tools like subject-specific databases.

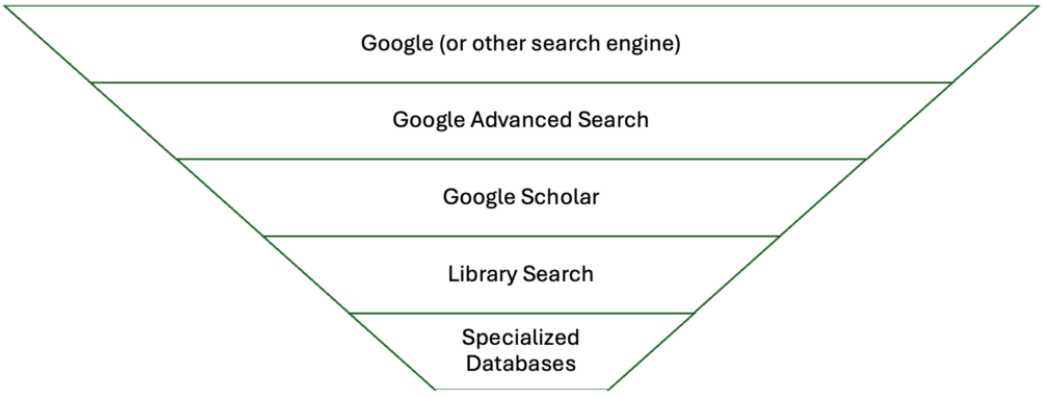


Figure 5.3.2 *Search tools ranging from the broadest to the most focused and subject-specific.*

The more specialized your search, the more likely you are to find credible research done by reliable

expert researchers and professionals. Consulting a librarian is an effective step in your research process. Librarians are experts in many of the fields you might be studying and can help you develop useful search terms and direct you to relevant data bases likely to hold the information your are searching for.

Evaluating Sources for Credibility

The importance of critically evaluating your sources for authority, relevance, timeliness, and credibility cannot be overstated. Anyone can put anything on the internet; and people with strong web and document design skills can make this information look very professional and credible—even if it isn't. And as noted in Ch. 1.4, Gen AI is known for confidently producing inaccurate information and fabricating sources. Since much research is currently done online, and many sources are available electronically, developing your critical evaluation skills is crucial to finding valid, credible evidence to support and develop your ideas. Hana Lee Goldin's "How to Spot AI Hallucinations like a Reference Librarian" should be considered required reading!

H.G. Wells has been (mis)quoted as stating, "statistical thinking will one day be as necessary for efficient citizenship as the ability to read and write."[3] On the other hand, Mark Twain (supposedly quoting British Prime Minister Benjamin Disraeli) famously said, "There are three kinds of lies: lies, damned lies, and statistics." The fact that the actual sources of both of these "quotations" are unverifiable makes their sentiments no less true. The effective use of statistics can play a critical role in influencing public opinion as well as persuading in the workplace. However, as the fame of the second quotation indicates, statistics can be used to mislead rather than accurately inform—whether intentionally or unintentionally.

When evaluating research sources and presenting your own research, be careful to critically evaluate its ***authority***, ***purpose content***, *and* ***currency.***

Evaluating the Authority, Purpose, Content and Currency of Sources

AUTHORITY

Who are the researchers/authors/creators? What are their credentials? What else have they published?

Where is this information published? What kind of publication is it? What do you know about the publisher?

PURPOSE

Who is the intended audience? Why would they read this source?

What is the intended purpose of the publication? to persuade? report facts or information? Does the purpose of the publication align with your purpose?

Is the research funded? by whom? Is there a potential conflict of interest?

CONTENT

How comprehensively does this source cover your topic?

What methodology was used in the study? Is it sound? What are the stated limitations? Does the scope align with your purpose?

Does it contains sufficient data to support the claims it makes? What kind of data is used (quantitative, qualitative, mixed) and does this align with your needs?

Do visual representations of data and information make sense? avoid distortion?

CURRENCY

When was the work published or updated? Might the information be out of date?

Do you need recent research for your topic? Is research done several years or decades ago still relevant to what you are working on?

Also evaluate your own process in selecting and using research sources:

- *Why am I using this source? will it bolster the credibility of my argument?*
- *Am I "cherry picking" by using inadequate or unrepresentative data that only supports my position (and ignores substantial amount of data that contradicts it)?*
- *Could "cognitive bias" be at work here? Have I only consulted the kinds of sources I know will support my idea? Have I failed to consider alternative kinds of sources?*
- *Am I representing the data I have collected accurately?*
- *Are the data statistically relevant or significant to my argument?*

Given the pie chart in ***Figure 5.3.3****, if you only consulted articles that rejected global warming in a project related to the issue of climate change, you could be guilty of cherry picking and cognitive bias.*

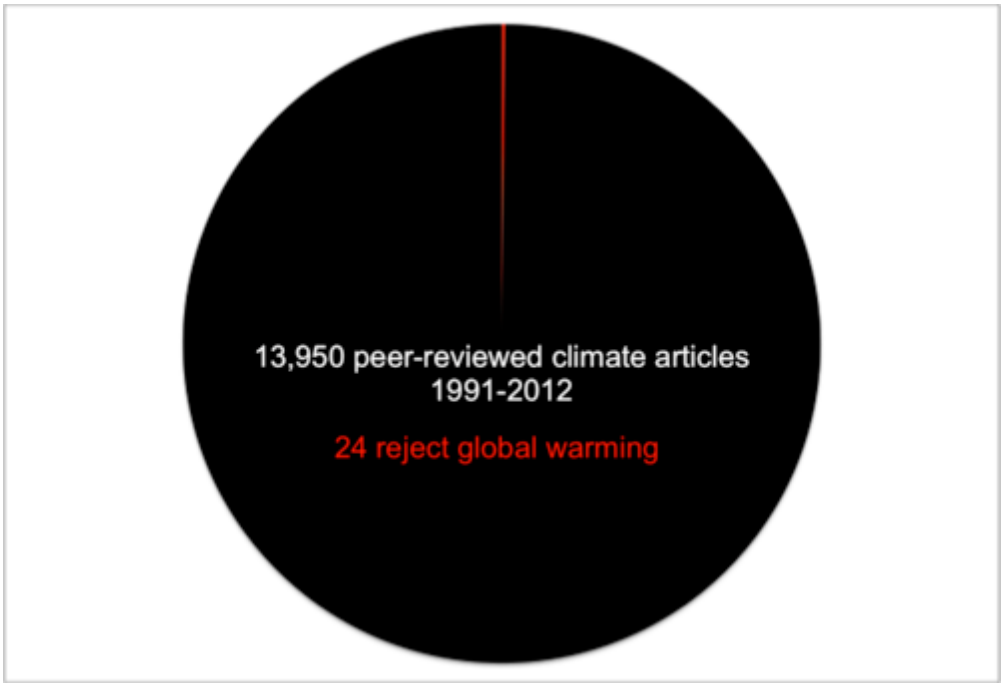


***Figure* 5.2.2** *The number of articles that reject global warming out of all peer-reviewed climate articles within a 21 year time period.* [4]

Beware of Logical Fallacies

There are many logical fallacies that both writers and readers can fall prey to (see ***Table* 5.3.1***). It is important to use data ethically and accurately, and to apply logic correctly and validly to support your ideas.*

TABLE 5.3.2 *Common logical fallacies*

[Skip Table]	
Bandwagon Fallacy	*Argument from popularity – "everyone else is doing it, so we should too!"*
Hasty Generalization	*Using insufficient data to come to a general conclusion.* *An Australian stole my wallet; therefore, all Australians are thieves!*
Unrepresentative Sample	*Using data from a particular subset and generalizing to a larger set that may not share similar characteristics.* *e.g.: giving a survey to only female students under 20 and generalizing results to all students.*
False Dilemma	*"Either/or fallacy" – presenting only two options when there are usually more possibilities to consider* *e.g.: You're either with us or against us.*
Slippery Slope	*Claiming that a single cause will lead, eventually, to exaggerated catastrophic results.*
Slanted Language	*Using language loaded with emotional appeal and either positive or negative connotation to manipulate the reader*
False Analogy	*Comparing your idea to another that is familiar to the audience but which may not have sufficient similarity to make an accurate comparison* *e.g.: Governing a country is like running a business.*
Post hoc, ergo prompter hoc	*"After this; therefore, because of this"* *e.g.: A happened, then B happened; therefore, A caused B.* *Just because one thing happened first, does not necessarily mean that the first thing caused the second thing.*
Begging the Question	*Circular argument – assuming the truth of the conclusion by its premises.* *e.g.: I never lie; therefore, I must be telling the truth.*
Ad hominem	*An attack on the person making an argument does not really invalidate that person's argument. It might make them seem a bit less credible, but it does not dismantle the actual argument or invalidate the data.*
Straw Man Argument	*Making a "straw man" argument means restating the opposing idea in an inaccurately absurd or simplistic manner to more easily refute or undermine it.*

Others?	*There are many more… can you think of some?* *For a bit of fun, check out Spurious Correlations.*

We all have biases when we write or argue; however, when evaluating sources, you want to be on the look out for bias that is unfair, one-sided, or discriminatory. Consider whether the author has acknowledged and addressed opposing ideas, potential gaps in the research, or limitations of the data. Look at the kind of language the author uses: is it slanted, strongly connotative, or emotionally manipulative? Is the supporting evidence presented logically, credibly, and ethically? Or has the author cherry-picked or misrepresented sources or ideas? Does the author rely heavily on emotional appeal?

Critical thinking lies at the heart of evaluating sources. You want to be rigorous in your selection of evidence, because once you use it in your paper, it will either bolster your own credibility or undermine it.

Notes

1. *Cover images from journals are used to illustrate difference between popular and scholarly journals, and are for noncommercial, educational use only.*
2. *Government of Canada, Statistics Canada [online]. Available: http://www.statcan.gc.ca/eng/start*
3. *"What is the source of the H.G. Wells quote, 'Statistical thinking will one day be as necessary for efficient citizenship as the ability to read and write/"? Quora n.d.[Online]. Available: https://www.quora.com/What-is-the-source-of-the-H-G-Wells-quote-Statistical-thinking-will-one-day-be-as-necessary-for-efficient-citizenship-as-the-ability-to-read-and-write*
4. *"Why climate deniers have no credibility — in one pie chart," DeSmog Blog [Online]. Available: https://www.desmogblog.com/2012/11/15/why-climate-deniers-have-no-credibility-science-one-pie-chart*

5.4 Synthesizing and Integrating Sources

SUZAN LAST AND CANDICE NEVEU

5.4 Learning Objectives

This section focuses on the **what**, **why**, and **how** of synthesizing sources, and will help you

1. Understand the various purposes for source synthesis
2. Apply the "rhetorical moves" involved in synthesizing source materials
3. Integrate quoted, paraphrased, and summarized material from sources clearly and effectively to achieve your purpose

Synthesizing Sources

Synthesizing sources is arguably the most important writing move you will use in both academic and professional context. Where summarizing involves accurately conveying the main points from a source in condensed form, synthesis entails combining ideas and research from a variety of perspectives, voices and perhaps even fields of study, in order to both summarize these ideas and use them to support and develop your ideas. This can help establish your understanding of the complexity of the issue, determine your own perspective on this issue, and join the "scholarly conversation." If you've read a literature review or a meta-analysis, then you have seen synthesis in action. If you have checked several online restaurant reviews so that you can recommend the best chicken vindaloo in town to your visiting friend, you have engaged in a kind of source synthesis.

As a student, you will engage in synthesis when writing something that draws on information from multiple sources, such as a research essay or report. As a professional, you might combine information from various sources to understand a problem and recommend a solution to a workplace problem. Synthesis, as a rhetorical move, allows you to "borrow" credibility and logical support from reliable research sources, to help you convince your reader to accept your position as valid. However,

that does not necessarily mean that all of the sources you use will "agree" with or directly support your perspective.

You might consult sources that offer a range of approaches to a topic to establish a consensus among experts, or they might indicate what controversies and diverging approaches exist in the literature. You should avoid "cherry picking", that is, only using sources that directly support your claims; look for a representative sample of sources that allow you to examine and include diverging viewpoints and potentially conflicting research. This approach will provide you with a sophisticated understanding of the complexity of the issue you are writing about. It also might allow you to see where "gaps" exist in the current knowledge and research, providing a potential "springboard" for your own research or approach.

Synthesis "Moves"

Synthesizing source material entails a number of specific rhetorical "moves" that you might use, depending on your purpose. Scheidt and Middleton[1] *identify 5 rhetorical moves that authors use when incorporating ideas from other authors (inform, explain, react, develop, and connect) and they explain why you might use them:*

> **INFORM**: *you might refer to specific information, facts, definitions, etc., from respected sources to simply provide reliable information and background context that your reader will find credible.*
>
> **EXPLAIN**: *you might summarize, paraphrase, or integrate quotations from a source in a way that moves beyond merely presenting facts. You might note that the sources have something significant to say, or you might be providing an in-depth explanation with help from the source, using the source to help you establish a framework and do argumentative or rhetorical work.*
>
> **REACT**: *you might take a position in relation to the source and react to the source's ideas. You might use a source that you don't quite agree with to exemplify a common misunderstanding or set up your alternative perspective; or you might express your reaction by noting that the source ideas are "surprising" or "shocking."*
>
> **DEVELOP**: *you might build upon or analyze ideas from the sources. You might apply them to a new situation, take them in a slightly new direction, or explore them in more depth.*
>
> **CONNECT**: *you might make connections between two (or more) texts or two (or more) authors*

to show how ideas relate to each other in a broader context, show a variety of perspectives, or engage in compare and contrast.

EXERCISE 5.2 *Read the two excerpts below and identify where the authors are using the synthesis moves of informing, explaining, reacting, developing, and connecting.*

"A recent study showed that, in some contexts, [rhetorical framing] might have an even stronger effect on our reasoning than our own political views. In the study, participants were presented with brief passages about crime in a hypothetical city named Addison. For half of the participants, a few words were altered so that the passage said that crime was a "beast preying" on the city of Addison. For the other half, crime was described as a "virus infecting" the city. Simply changing the metaphor in this passage by altering a few words influenced people's beliefs about crime more than pre-existing differences in opinion between Republicans and Democrats. Those exposed to the "beast" metaphor were more likely to believe that crime should be dealt with by using punitive measures, whereas those exposed to the "virus" metaphor were more likely to support reformative measures. One of the most remarkable things about the metaphor's influence in this study was that it was covert. When participants were asked about what influenced their decision, no one mentioned the metaphor. They instead pointed to other aspects of the passage that were the same for all participants, such as statistics."

(Steve Rathje, "The power of framing: It's not what you say, it's how you say it." *The Guardian*, July 2017)

"Previous work has demonstrated that using different metaphors can lead people to reason differently about notions like time, emotion, or electricity [6–11]. For example, people's reasoning about electricity flow differed systematically depending on the metaphoric frame used to describe electricity (flowing water vs. teeming crowds) [6]. Such findings on metaphorical framing are grounded in a larger body of work that has established the importance of linguistic framing in reasoning [12], and the importance of narrative structure in instantiating meaning [13]. However, questions about the pervasiveness of the role of metaphor in thinking remain. Critics argue that very little work has empirically demonstrated that metaphors in language influence how people think about and solve real-world problems [14].

In this paper we investigate the role of metaphor in reasoning about a domain of societal importance: social policy on crime."

(P.H. Thibodeau and L. Boroditsy, "Metaphors we think with: The role of metaphor in reasoning," PLOS One, 23 Feb. 2011)

Examining these excerpts, you might note that Rathje informs the reader about the study, explains the study's methodology and findings, reacts to the results ("one of the most remarkable things…"), and connects it to his overall thesis. (Note that this passage does not include in-text citations, because it is published in an online newspaper, not in an academic journal.) The authors of the second passage

(*from an academic article*) *use synthesis to explain, develop and connect ideas from several other sources in order to set up their own contribution to the scholarly conversation by noting where the gaps are.*

Applying Synthesis Moves

When what you are writing requires research — say a research essay for school or business proposal for work — you might synthesize information from sources, applying the inform, explain, react, develop, and connect strategies, in the following ways:

> ***In the Introduction****: use sources to establish the background information and context necessary to understand your purpose and the "controversy" or "problem" you are addressing. You will need to include data that helps establish why this issue needs to be addressed, what current impacts are occurring, and who is directly or indirectly impacted.*
>
> ***Defining your Scope:*** *use sources to justify the approach or framework you are using and the limitations you are applying to your project. For example, you might explain how other researchers have approached the problem, what frameworks or heuristics they have used, how similar solutions have been implemented, demographic data about users or other relevant parties, and how you have determined objectives and constraints for the problem you are addressing.*
>
> ***Validating and Supporting:*** *use sources to help you support your claims and validate your solution idea. Sources might help you justify specific design features and principles, and convince your reader that your proposed idea will provide measurable benefits. You might include research on similar designs to prove your design is feasible; user experience research to show that your design is "user-friendly" and accessible; sustainability research to show that your design will not have negative environmental impacts; and so on.*
>
> ***Addressing Opposition****: depending on context, you may need to look at sources that might disagree with your approach or oppose your solution idea. The more you understand why someone might oppose your idea, the stronger you can make your case by addressing their concerns. In some cases, you might need to concede that they have some good arguments that need to be further considered or researched. This also bolsters your credibility as a person who is open to seeing other perspectives and not blindly following only one idea.*

You might use a chart like the one below to brainstorm specific ways that you might use your secondary sources to support, develop, explain, diverge from or connect ideas in your research essay.

Author and Title info	***Main Thesis or Argument***	***Types of Evidence Used***	***Important ideas or quotations***	***Possible uses (inform, react explain, etc)***

Integrating Sources Using Quotation, Paraphrase and Summary

Integrating the words and ideas of others coherently and fluently into your own writing can be challenging from a grammatical and structural perspective. Structurally, there are three main ways of integrating source material: ***quoting*** *directly,* ***paraphrasing****, and* ***summarizing****. Each of these methods had a set of conventions you should follow.*

Quoting Sources

Direct quotations are useful when you want to call attention to the specific words or style of language being used by the author as the focus of your analysis, or when the author has stated something in such a way that you really cannot improve on or condense effectively. Quotations should generally be used sparingly because too many quotations can interfere with the flow of ideas and make it seem like you don't have enough ideas of your own. Quotations must be carefully contextualized both argumentatively and grammatically.

CONTEXT: *A quotation, statistic or bit of data generally does not speak for itself; you must provide context and an explanation for quotations you use. Essentially, you should create a "quotation sandwich" where you*

- *Introduce the the context (the idea that the quotation will support)*
- *Quote (and cite)*
- *Explain how the quoted information supports your idea.*

GRAMMAR: *quoted words and phrases must integrated grammatically with your own so that information flows logically and coherently. There are three main methods to integrate quotations grammatically:*

- ***Seamless Integration Method**: embed the quoted words as if they were an organic part of your sentence (if you read the sentence aloud, your listeners would not know there was a quotation).*
- ***Signal Phrase Method:** use a signal phrase (Author + Verb) to introduce the quotation, clearly indicating that the quotation comes from a specific source*
- ***Colon Method**: introduce the quotation with a complete clause ending in a colon, and use the quoted material to explain or exemplify the idea in your introductory clause.*

Three Methods of Integrating Quotations

Consider the following opening sentence (and famous comma splice) from A *Tale of Two Cities* by Charles Dickens:

"*It was the best of times, it was the worst of times*" *[1].*

Seamless Integration Method: embed the quotation, or excerpts from the quotation, as a seamless part of your sentence:

> Charles Dickens begins his novel with the paradoxical observation that the eighteenth century was both "the best of times" and "the worst of times" [1].

Signal Phrase Method: introduce the author and then the quote using a signal verb (scroll down to the Using Signal Phrases section below see a list of common verbs that signal you are about to quote someone)

> Describing the eighteenth century, Charles Dickens observes, "It was the best of times, it was the worst of times" [1].

Colon Method: If your own introductory words form a complete sentence, you can use a colon to introduce the quotation to give it added emphasis:

> Dickens defines the eighteenth century as a time of paradox: "It was the best of times, it was the worst of times" [1].
>
> The eighteenth century was a time of paradox: "It was the best of times, it was the worst of times" [1].

Editing Quotations

Placing quotation marks around material indicates that these are the ***exact*** *words of the original author. However, sometimes the text you want to quote will not fit grammatically or clearly into your sentence without making some changes. Perhaps you need to replace a pronoun in the quote with the actual noun to make the context clear, or perhaps the verb tense does not fit. There are two main ways that you can edit a quotation to make it fit grammatically with your own sentence:*

> ***Use square brackets****: to reflect changes or additions to a quote, place square brackets [like this] around any words that you have changed or added.*
>
> ***Use ellipses (3 dots):*** *to show that some text has been removed, use the ellipses. Three dots indicate that some words have been removed from the sentence; 4 dots indicate that a substantial amount of text has been deleted, including the period at the end of a sentence.*

Here is a sample excerpt from Henry Petroski's "The Obligation of an Engineer," followed by examples of how you might edit quoted material to suit your needs.

> "Engineers are always striving for success, but failure is seldom far from their minds. In the case of Canadian engineers, this focus on potentially catastrophic flaws in a design is rooted in a failure that occurred over a century ago. In 1907 a bridge of enormous proportions collapsed while still under construction in Quebec. Planners expected that when completed, the 1,800-foot main span of the cantilever bridge would set a world record for long-span bridges of all types, many of which had come to be realized at a great price. According to one superstition, a bridge would claim one life for every million dollars spent on it. In fact, by the time the Quebec Bridge would finally be completed, in 1917, almost ninety construction workers would have been killed in the course of building the $25 million structure" [3].
>
> [3] H. Petroski, "The obligation of an engineer," in *To Forgive Design*, Boston: Belknap Press, 2014, p. 175.

You are allowed to change the original words or cut some material, but only if you signal those changes appropriately with square brackets or ellipses:

> ***Example 1:*** *Petroski asserts that while "[e]ngineers are always striving for success… failure is seldom far from their minds" [3; p. 175].*
>
> ***Example 2****: Petroski recounts the story of a large bridge that was constructed at the beginning of the twentieth century in Quebec, asserting that "by the time [it was done], in 1917, almost ninety construction workers [were] killed in the course of building the $25 million structure" [3; p. 175].*

> ***Example 3***: *"Planners expected that when completed the … bridge would set a world record for long-span bridges of all types" [3; p. 175].*

If you find that you have to incorporate a lot of square brackets and ellipses to make the quotation work, you might be better of simply paraphrasing instead of trying to quote.

Paraphrasing and Summarizing

Instead of using direct quotations, which can become cumbersome, you can paraphrase and summarize evidence to integrate it into your argument more concisely. Both paraphrase and summary requires you to read the source carefully, understand it, and then rewrite the idea in your own words to avoid "patchwriting." Using these forms of integration demonstrates your understanding of the source, because rephrasing requires a good grasp of the core ideas. Paraphrasing and summarizing also makes integrating someone else's ideas into your own sentences and paragraphs a little easier, as you do not have to merge their grammar and writing style with your own.

Paraphrase and summary differ in that paraphrases focuses on a smaller, specific section of text that when paraphrased may be close to the length of the original. For example, you might paraphrase a concluding portion of the Petroski excerpt above like this:

> At the end of its construction, the large cantilever bridge cost $25 million, but the cost in lives lost far exceeded the prediction of one death for each million spent. While planers hoped that the bridge would set a global record, in fact, its claim to fame was much more grim [3].

Summaries, on the other hand, are condensations of large chunks of text, so they are much shorter than the original and capture only the main ideas. A summary of the above excerpt might look like this:

> According to Petroski, a large bridge built in Quebec during the early part of the twentieth century claimed the lives of dozens of workers during its construction. The collapse of the bridge early in its construction represented a pivotal design failure for Canadian engineers that shaped the profession [3].

What is Patchwriting?

"When a writer takes sentences from the original document and substitutes synonyms for some words, changes the order of others, and maybe reworks a few phrases, this person isn't creating a successful summary. **Instead, this way of replicating features of the original text too closely is called patch-writing.** Even when the source is cited, patch-writing is usually considered plagiarism because the writer is implying they reworked the original text more than they did." (Humphreys and Kelly, Why Write)

Compare the original quote from the Petroski excerpt with the example of patchwriting beside it:

Original quote	Patch-writing
“Planners expected that when completed, the 1,800-foot main span of the cantilever bridge would set a world record for long-span bridges of all types, many of which had come to be realized at a great price. According to one superstition, a bridge would claim one life for every million dollars spent on it. In fact, by the time the Quebec Bridge would finally be completed, in 1917, almost ninety construction workers would have been killed in the course of building the $25 million structure” [3].	Designers predicted that when it was done, the main span of the cantilever bridge would set a world record for all types of long-span bridges, many of which had been very costly. One superstition predicted that a bridge would take one life for every million dollars it cost. By the time the Quebec Bridge was completed, in 1917, almost ninety construction workers had been killed in process of constructing the $25 dollar bridge [3].

Using Signal Phrases

Verbs like says, writes, talks about, or discusses tend to be over-used to signal a quotation and are vague in that they do not provide much information about the rhetorical purpose of the author. Consider using more rhetorically descriptive verbs when signalling that you are integrating the words or ideas of a source. For example, is the author explaining something? Arguing a point? Providing examples? Estimating? Recommending? Warning or urging the reader? Choose a verb that accurately represents the author's intent.

The list of signal verbs below offers suggestions for introducing quoted, paraphrased, and summarized material that convey more information about the rhetorical "move" the author is making than verbs like "says" or "writes" or "discusses."

The author makes a claim	***The author recommends***	***The author disagrees or questions***	***The author agrees***	***The author shows***
argues *asserts* *believes* *claims* *emphasizes* *insists* *suggests* *hypothesizes* *maintains*	*advocates for* *proposes* *calls for* *demands* *encourages* *implores* *pleads* *recommends* *urges* *warns*	*challenges* *complicates* *criticizes* *qualifies* *counters* *contradicts* *refutes* *rejects* *denies* *questions*	*admires* *endorses* *supports* *affirms* *corroborates* *verifies* *reaffirms*	*illustrates* *conveys* *reveals* *demonstrates* *points out* *exemplifies* *indicates*

Notes

1. *D. Scheidt and H. Middleton "The tacit values of sourced writing: A study of source 'engagement' and the FYW Program as community of practice," WPA. Writing Program Administration, vol. 45, no. 1, 2021*

5.5 Citing Sources

Regardless of whether you are quoting, paraphrasing or summarizing, you must ***cite*** *your source any time you use someone else's intellectual property, whether in the form of words, ideas, language structures, images, statistics, data, or formulas.*

Perhaps more than ever before, it is critical to give the reader confidence in the reliability of the information you are sharing. ***Citational Practice*** *— or citing and documenting your sources — is a crucial component of using research in your writing in both academic and professional contexts. Citing sources is required as part of maintaining Academic Integrity, and is also required in professional practice to acknowledge how you have used someone else's intellectual property and give credit where credit is due. In addition to simply abiding by rules and expectations, there are significant benefits to citing your sources:*

- *By giving credit to the experts who have helped you build an argument, you show that you have done the appropriate reading and research to write confidently and credibly about this topic. This strengthens your credibility and shows how you are engaging in this scholarly conversation.*
- *By synthesizing research sources effectively, you save your reader considerable time and allow them to digest a lot of complex information quickly*
- *By distinguishing your ideas clearly from those of your sources, and providing thorough references, you make it easy for your reader to follow up if they want to review those sources in more detail.*

Using IEEE Style

Different disciplines use different "styles" to cite sources, and the conventions used within each of these styles are designed to meet the needs of those using them.

MLA Style *(Author page number) is generally used in the Humanities*

APA Style *(Author, date) is often used in Social Sciences*

IEEE Style *[#] is generally used in Engineering and Computer Science.*

Explanations and examples used here will focus on the conventions used in IEEE Style. If you want

to learn more about APA style, I recommend reading Citing in APA Style by Natalie Boldt and Loren Gaudet.

Citational practice is essentially a cross-referencing system made up of two parts: the in-text citation within the body and the References list at the end of the document

> ***In-text citations**: when you (a) first refer to a source, (b) quote, paraphrase or summarize a source, or (c) use data or graphics from a source, you must place an in-text citation referring to that source within paragraph or caption. The citation takes the form of a number in a square bracket [1] typed inline with your sentence text (generally not super-scripted). Citations are numbered in chronological order as they appear in your paper. Thus, the first source that you cite is [1]. The second source is [2], etc. Once a source is given a number, it always retains that number. So if you cite the first source later on in your paper, it is still (and always) cited as [1] throughout your paper.*
>
> ***References List**: include a numbered list of all the sources you have cited in your paper in chronological order, documented properly in IEEE style, at the end of your paper. A reader familiar with academic conventions will be able to tell what kinds of sources you have referenced by the way you have formatted the information, and will be able to find the source based on the information included. Be sure to include the URL and/or DOI for each source, so that the reader can easily click and go to the source.*

In-text Citations FAQ

1. Where should I place the citation?

In-text citations alert the reader that you have used source material. Thus, it is crucially important to place the citation strategically so that your reader can distinguish the source material from your ideas. You have several choices of where to place the citation, depending on context:

At the end of the sentence (*default position*):

This theory was first put forward in Johnson's 1996 study [1].

When referring directly to sources:

Several recent studies such as [2], [3], [4]-[7] have further developed Johnson's theory...

Immediately after the author's name:

For example, Chan and Stuart [2] claims that...

Immediately after the quotation or paraphrase:

Smith concludes that "insert a quotation here" [3], but other scientists [4]-[7] argue that her conclusions are flawed. Indeed, Mehta et al. call for a complete "reworking" of the theory [4].

Some critical thinking is necessary to determine the best place to insert your citation (and where to place punctuation) to clearly indicate what information comes from the source, and avoid confusing the reader about where source information ends and your ideas begin. For example, following sentence would likely confuse a reader, as the sentence clearly presents the author's own opinion, yet ends in a citation:

Confusing Citation:

I believe it is essential that our team create a Team Charter during the "forming stage" [1].

What is being cited here? This seems like a "random act of citation." If a citation is needed, make sure that you are clearly indicating where the information comes from by using a narrative signal phrase:

Clear Citation:

I believe it is essential that our team create a Team Charter during what Tuckman refers to as the "forming stage" [1].

2. Should page numbers go in the citation?

When citing a direct quotation from a print source, your citation should indicate the page where that quotation can be found:

[2, p.7]. or, if referring to 2 or more consecutive page [2, pp. 7-8]

If the source is a web based or does not have pagination, you don't have to indicate page numbers (nor paragraph numbers).

When citing equations, figures, tables, and appendices, use the same format you use for citing the page number:

> *[3, eq. (2)]*
>
> *[3, Fig. 7.2]*
>
> *[3, Appendix B]*

If you create your own visual (table or graph) based on the data from a source, then your citation should refer to the source you got the data from. You might include a note such as

> *… data in Figure 1 has been adapted from [3].*

3. Do I need to keep citing a source every time I refer to it?

If you are discussing the ideas in a source at length (for example, in a summary), you do not need to cite every consecutive sentence. Cite the first time you mention the source. As long the following sentences clearly indicate that the ideas come from the same source—for example, you are using ***signal phrases****, such as "the authors further clarify the problem by… they illustrate the importance of the issue with…"—you do not need to keep citing.*

If you stop using signal phrases, be sure to include a citation. If you introduce material from another source or add your own analysis between references to that source, you will have to re-cite the source when you refer to it again. Always make sure your reader knows which ideas come from a source, and which come from you, and when you shift from one to the other. If in doubt, cite.

4. What if there is more than one author?

If the source you are citing has one or two authors, use their names in your signal phrase:

- *Brady [5] argues that ….*
- *Mehta and Barth's study [6] demonstrates that ….*

If the source has three or more authors, use the name of the lead author, followed by et al., the Latin term meaning "and the others." Like all Latin words, et al. should be italicized:

- *Isaacson et al., in their study on fluid dynamics, found that ….*

NOTE: *in your Reference at the end of your paper, it is a courtesy to list the names of* ***all*** *the contributing authors (rather than using et al.). However, if there are more than 6 authors, it is acceptable to use et al. in your reference list after naming the first 6 authors.*

References List

The Reference List *serves several purposes. Most importantly, it provides complete bibliographical information for each source you have used so that readers can easily find and read them if they want more information. The way each source is formatted also tells the experienced reader, who is familiar with the conventions, what kind of source you have used. A reference to a book is formatted differently from a journal article, which differs from a website, and so on. Below are some of the typical conventions used in IEEE when formatting your reference list.*

Guidelines for Setting up an IEEE References List

1. Create a bold **References** heading, aligned with the left margin. If you are using headings, make this heading consistent with other first level headings in your document.
2. The references should be presented in chronological order, following the order they are introduced in the body text. Each source has its own unique reference number and thus should only appear once in the References list. Source [1] is always referred to as source [1].
3. The numbers in the square brackets should be flush with the left margin, and should form a column of their own, with the text of the references indented so the numbers are easy for the reader to see (use the "hanging indent" function to format this, or use a 2 column table with invisible grid lines).
4. Provide the names of all authors (up to six), but only use the first initial. Don't invert the order (write **S. Last**, not Last, S.). Separate authors' names with commas and include the word "and" before the final author.
5. Capitalize only the first word (and the first word after a colon, as well as proper nouns) in titles of articles *within* journals, magazines and newspapers, chapters in books, conference papers, and reports. Only use ALL CAPS for acronyms. These titles should be placed in quotation marks. (think of these as "contained" titles, as they are contained in a larger work and contained in quotation marks).
6. Use Title Case for the titles of books, journals, magazines and newspapers. These titles should be

italicized. (think of these as the container titles).

7. Add a space between references if you single space each reference. Use a hanging indent to create a "column" for the bracketed numbers so they are easily distinguished.
8. If you use a citation generating software, be sure to review all references to ensure that they are accurate and complete. Algorithms can introduce errors; you are responsible for reviewing and revising them for accuracy and completeness.
9. Be sure to add URLs and/or DOIs to each reference, so that your reader can easily access your sources. Check to make sure the links work before submitting.

NOTE: *if you are using Gen AI tools as part of your research process, you must review and evaluate all content it generates to ensure that it has summarized and cited sources correctly (and that it has used sources that actually exist!) If you cite a source in your paper, you are indicating that you have actually read it, or at least portions of it. Citing sources that you have not read yourself is a form of academic dishonesty, and can result in you misrepresenting the source or even fabricating data. In "Tracing the social half-life of a zombie citation," Ben Williamson, an academic editor, recounts his experience of finding a citation referencing himself as author of a work he did not write (a "hallucinated" or "zombie" source) in a paper submitted to his journal. He searched Google Scholar to find that this source seemed to have been cited numerous times in other publications.*[1]

If you cannot find the original source, consider that maybe it does not exist! In such cases, you might ask a librarian to help you. If you are confident that the source actually exists, you can create what is called a " secondary citation" where you indicate the source that you actually did read, which contains the information you have used. This might look something like (Author A, as cited in Author B, 2007). In older sources (pre 2022), this might be fine; however, in this age of quickly proliferating "zombie" sources, proceed with caution!

Recommended Resources

Murdoch University Library has an excellent IEEE Referencing Guide that provides templates and samples for how to cite various kinds of sources – including AI generated material.

MS Word includes a system for creating, integrating and citing sources and creating your References list within your document. Learning how to use this system will save you time, especially if you are incorporating a large number of sources and writing collaboratively.

Notes

1. B. Williamson, "*Tracing the social half-life of a zombie citation*," *Code Acts in Education*, 30 *January*, 2026.

5.6 Engagement and Consultation

One important area of primary research undertaken when embarking on any large scale project entails engaging or consulting with relevant and interested parties. ***Public engagement*** *is the broadest term used to describe the increasingly necessary process that companies, organizations, and governments must undertake to achieve a "social licence to operate." Engagement can range from simply informing the public about plans for a project, to engaging in more consultative practices like getting input and feedback from various groups, and even to empowering key community members in the final decision-making process.*

For projects that have social, economic, and environmental impacts, engagement and consultation is an increasingly critical part of the planning stage. Creating an understanding of how projects will affect a wide variety of people, organizations, and the natural world is beneficial for both the company instigating the project and those who will be affected by it. Listening to feedback and concerns can be helpful in identifying and mitigating risks that could otherwise slow down or even derail a project. For impacted parties, the consultation process creates an opportunity to be informed, as well as to inform the company about local contexts that may not be obvious, to raise issues and concerns, and to help shape the objectives and outcomes of the project.

Who should be consulted?

When determining who you need to consult or engage with, you need to consider who (or what) will be impacted by the project, and who has the potential to impact or influence project decisions and implementation.

Consider using the Four I Framework (shown in ***Figure 5.6.1****) for engagement and consultation:*

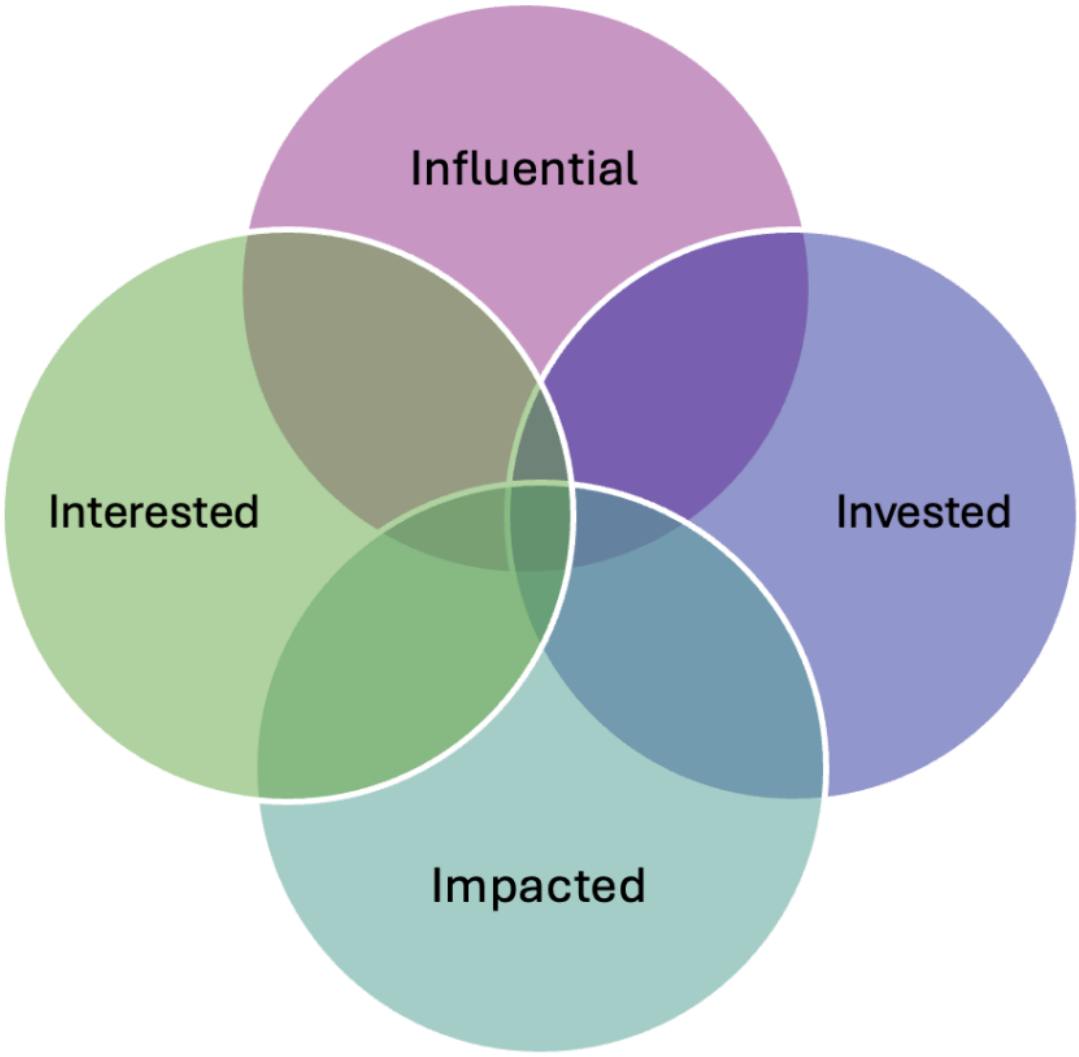


Figure 5.6.1 *Four I Framework for determining relevant parties to engage and consult with.*

"Relevant parties" include individuals and groups who have the power to ***influence*** *the project (decision makers, people with political or economic power), those who are* ***invested*** *(financially or otherwise), those who might simply be* ***interested*** *in the project, and those who will likely be* ***impacted*** *by the project, either positively or negatively. They can be internal – people from within the company or organization (owners, managers, employees, shareholders, volunteers, interns, students, etc.) – and external, such as community members or groups, investors, suppliers, consumers, policy makers, etc. Increasingly, arguments are being made for considering non-human parties such as wildlife and the natural environment.*[1]

Historically, the term "stakeholder" has been used as a catch-all term to refer to any individual or group who may have a direct or indirect "stake" in the project. However, in the Canadian context, this

term has come to be seem as problematic, especially in Indigenous contexts. Here is an explanation from the BC Government website on Terminology in Indigenous Content:

> 'Stakeholder' is a common corporate term for partners which has negative connotations to many Indigenous Peoples. When land acquisition was happening, this term referred to the allotment of land to settlers. Settlers were given wooden stakes to claim their plot of land prior to any treaty or land negotiations with Indigenous Peoples. It's more appropriate to refer to Indigenous Peoples as partners rather than stakeholders. Indigenous Peoples are not stakeholders; they're Aboriginal rights holders whose rights are protected under the Constitution of Canada.

When engaging in projects, it is becoming increasingly important to engage and consult with a wide variety of relevant and interested parties, and this usually includes Indigenous communities and organizations. Therefore, it's wise to consider alternatives to the word "stakeholder" that you might use in various contexts to more precisely determine who should be consulted and what kind of engagement is needed.

Engaging and consulting with relevant parties can contribute significantly to the decision-making and problem-solving processes. People most affected by the problem and most directly impacted by its effects can help you to

- *understand the context, issues and potential impacts more fully*
- *determine your focus, scope, and objectives for solutions*
- *establish whether further research is needed into the problem.*

People who are also attempting to solve the same or similar problem can help you

- *refine, refocus, prioritize solution ideas*
- *define necessary steps to achieving them*
- *implement solutions, provide key data, resources, etc.*

There are also people who could help solve the problem, but lack awareness of the problem or their potential role to influence outcomes. Consultation processes help create the awareness of the project to potentially get these people involved during the early stages of the project.

Mapping the Social Landscape

The more a group will be materially affected by the proposed project, the more important it is for them to be identified, properly informed, and encouraged to participate in the consultation process. It is therefore critical to determine who the various relevant parties are, as well as their level of interest in the project, the potential impact it will have on them, and power they have to shape the process and outcome. You might start by brainstorming or mind-mapping all the people and groups you can think of in the "social landscape" that might influence or be affected by your project. See ***Figure 5.6.2*** *as an example.*

Social Landscape Map for Traffic Citation System

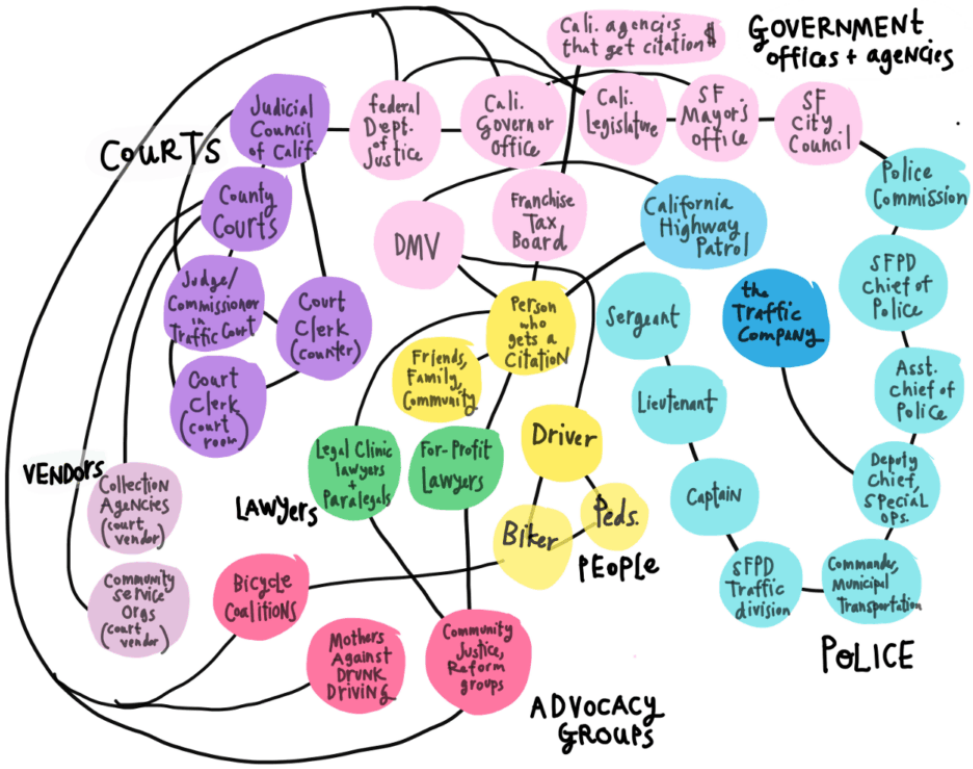


Figure 5.6.2 *Example of a social landscape map for a new traffic citation system* (M. Hagan, "Stakeholder mapping of traffic ticket system," *Open Law Lab*, Aug. 28, 2017. CC-BY-NC-SA 4.0)

Once you have identified the individuals, groups and organizations that may be impacted, organize them into categories or a matrix. One standard method of organizing is to determine which ones are likely to be in support of the project and which are likely to oppose it, and then determine how much power or influence each of those groups has (see ***Figure 5.6.3****). For example, a mayor of a community*

has a strong level of influence. If the mayor is in full support of the project, they would go in the top right corner of the matrix. Someone who is deeply opposed to the project, but has little influence or power, would go at the bottom left corner.

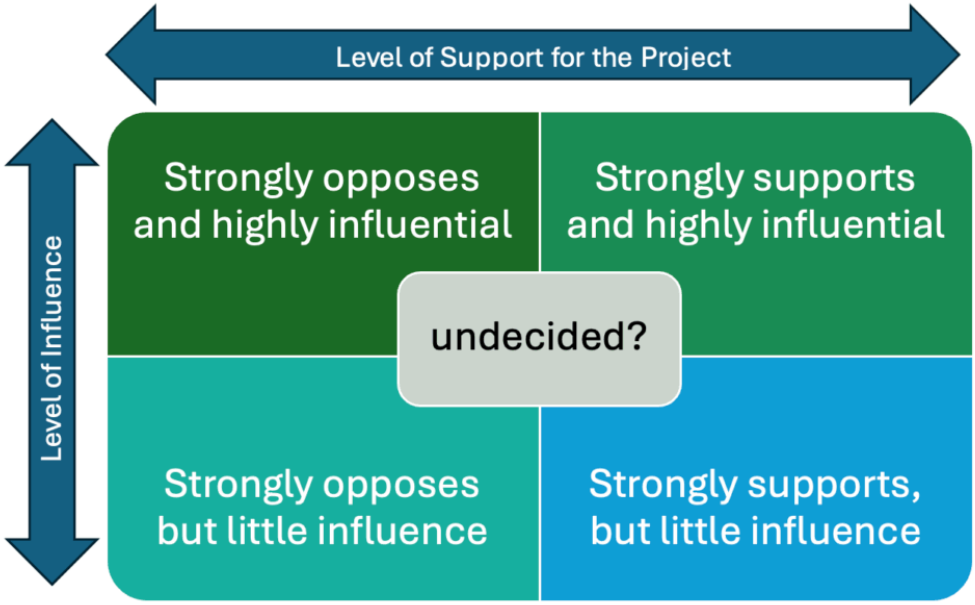


Figure 5.6.3 *Matrix mapping the influence and support level of various interested parties*

A matrix like this can help you determine what level of engagement is warranted: where efforts to "consult and involve" might be most needed and most effective, or where more efforts to simply "inform" might be most useful, or even where you might try to recruit volunteers. You might also consider the level of knowledge each party has on the issue, level of commitment (whether in support or opposed), and resources available.

Levels of Consultation and Engagement

There are various levels of engagement, ranging from simply informing people about what you plan to do, to actively seeking consent and placing the final decision in their hands. This range, presented in ***Figure* 5.6.4***, is typically presented as a "spectrum" of engagement from the least to most amount of engagement.*

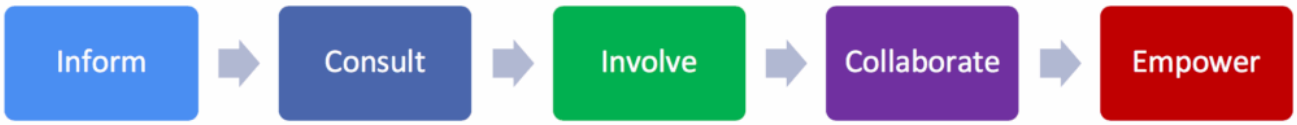


Figure 5.6.4 *Spectrum of public engagement*

Depending on the type of project, the potential impacts and the types and needs of those involved, you may engage in a number of levels and strategies of engagement across this spectrum using a variety of different tools.

Spectrum of Public Engagement

1. ***Inform***: Provide balanced and objective information to help people understand the project, the problem, and the solution alternatives. There is little or no opportunity at this level for providing input or helping with decision-making.
2. ***Consult***: Gather feedback on the information given. Level of input can range from minimal interaction (online surveys) to extensive (focus groups). These can be a one-time or ongoing/iterative opportunities to give feedback to be considered in the decision-making process)
3. ***Involve***: Work directly with interested and impacted parties during the process to ensure that their concerns and desired outcomes are fully understood and taken into account at each stage. Final decisions are still made by the consulting organization, but with well-considered input from those engaged.
4. ***Collaborate***: Partner with relevant parties at each stage of the decision-making, including developing alternative solution ideas and choosing the preferred solution together. The goal is to achieve consensus regarding decisions.
5. ***Empower***: Place final decision-making power in the hands of those being consulted. Voting ballots and referenda are common examples. This level of engagement is rare and usually includes a small number of people who represent highly invested community groups.

Many tools are available to help structure different kinds of engagement. ***Table 5.6.1*** *lists many options, categorized by where they tend to fall on the spectrum.*

TABLE 5.6.1 Typical tools for public engagement

Inform	***Consult***	***Involve / Collaborate / Empower***
• *Public meetings* • *Briefings* • *News media* • *Public Presentations* • *Info Kiosks* • *Hotlines* • *Newsletters* • *Bulletins* • *Social media* • *Websites* • *Fact sheets*	• *Public meetings, hearings, workshops* • *Focus groups* • *Study circles* • *Interviews* • *Surveys* • *Opinion polls* • *Questionnaires* • *Social Media* • *Suggestion boxes* • *Comment forms*	• *Consensus workshops* • *Charrettes* • "*World Cafes*" • *Study groups* • *Focus groups* • *Task Force* • *Think Tanks* • *Advisory boards, committees* • *Citizen panels or juries* • *Polling* • *Votes, referenda*

Planning an Engagement Project

There is no single "right" way of consulting. Each situation will be different so each consultation process will be context-specific and will require a detailed plan based on research and analysis. A poorly planned consultation process can backfire as it can lead to a lack of trust between those being engaged and the company doing the engagement. In such cases, the "engagement" can seem like a public relations stunt, or even an attempt to deceptively persuade. Therefore, it is critical that the process be carefully mapped out in advance, and that preliminary work is done to determine the needs and goals of the process and who the relevant parties are that should be involved. In particular, make sure that whatever tools you choose to use are fully accessible to all parties you plan to consult; an online survey is not much use to a community that lacks robust internet infrastructure. Consider the steps outlined below.

Steps for Planning Your Engagement Strategy

Situation Assessment: Who needs to be consulted about what and why? Define internal and external parties, determine their level of involvement, interest level, and potential impact, their needs and conditions for effective engagement.

Goal Setting: What is your strategic purpose for consulting at this phase of the project? Define clear understandable goals and objectives for the role of those participating in the consultation and decision-making processes. Determine what questions, concerns, and goals the participants will have and how these can be integrated into the process.

Planning/Requirements: Based on situation assessment and goals, determine what engagement strategies to use and how to implement them to best achieve these goals. How will you promote the engagement event to ensure appropriate participation? Ensure that strategies consider issues of accessibility and inclusivity and consider the needs of vulnerable populations. Consider legal or regulatory requirements, policies, or conditions that need to be met. Determine how you will collect, record, track, analyze and disseminate the data.

Process and Event Management: determine how you will keep the planned activities moving forward and on-track, and adjust strategies as needed. Make a plan for recording of responses of participants and tracking documentation.

Evaluation: Design an evaluation metric to gauge the success of the engagement strategies; collect, analyze, and act on the data collected throughout the process. Determine how will you report the results of engagement process back to the participants.

As you can see from the above list of steps, consultation and engagement processes require strong communications skills. Effective communication is the foundation for meaningful engagement, which relies on the following skills:

- ***Written and Visual Rhetoric***: *Creating and disseminate useful written and visual information that will interest relevant parties in participating in the consultation*
- ***Interpersonal and intercultural skills:*** *Relate to people in face-to-face situations, developing meaningful relationships, building trust, and actively listen to those being engage; making participants feel comfortable and secure; being mindful of cultural factors that may affect interest level, accessibility, impact, values, or opinions.*
- ***Public speaking:*** *presenting information to large audiences in a comfortable and understandable way. The ability to present effective visual information that assists the audience's understanding*
- ***Active Listening:*** *The ability to focus on the feedback from participants and react in ways that provide them with the time and safety needed to be heard and understood. The ability to report back accurately and fully what you have heard from participants.*

Engaging Responsibly

Engagement and consultation activities in a university setting may require ***Human Research Ethics Approval****, which is a complex process (see Ch. 5.7 Human Research Ethics for more details on this). Collecting data from human participants is a form of "human research" and you must be aware of and follow strict ethical guidelines of your academic institution. Doing this is part of your responsibility to maintain academic integrity. Thus, if you plan to implement an engagement strategy such as conducting surveys or interviews with participants outside of your class, please make sure you have explicit permission from your instructor before you begin, and that you are following the Human Research guidelines of your institution.*

In Canada, post-secondary educational institutions must ensure that all research involving humans conducted at that institution complies with the Tri-Council Policy Statement. These rules are in place to protect people and communities from potential risk or harm and to ensure ethical conduct while doing research.

Please note: *Engagement and consultation with certain groups and communities requires specialized knowledge and should only be undertaken by engagement professionals who have had the requisite training to engage respectfully with vulnerable or marginalized groups about sensitive issues. For more information, see the following resources:*

> ***Cana Uluak itchuaqiyaq***: *Equipping Organizations, Researchers, and Educators in Effective, Equitable, and Respectful Engagement with Marginalized Knowledges, Communities, and Issues*
>
> ***Brenden Boyd and Sophie Lorefice***: *"Understanding Consultation and Engagement with*

Indigenous Peoples in Resource Development." *The School of Public Policy Publications, vol. 12(22), 2019.*

Dimayuga, D. McGregor, & K. Murphy. "A review of collaborative research practices with Indigenous Peoples in engineering, energy, and infrastructure." *Energy, Sustainability and Society, vol.13(1), 2023. pp. 1–17.*

University of Victoria's "Campus Greenway Engagement Plan."[2] offers an example of an engagement project on campus. A significant step in this plan — a Design Charrette — was implemented in the fall of 2018; the results of that engagement activity, presented in a Summary Report (.pdf) [3] resulted in changes and augmentation of the original plan based on participant feedback. Most notably, participants did not like the term "Grand Promenade" and the whole project was renamed the Campus Greenway.

Notes

1. *C. Driscoll and M. Starik, "The primordial stakeholder: Advancing the conceptual consideration of stakeholder status for the natural environment," Journal of Business Ethics, vol. 49, no. 1, 2004, pp. 55-73. Available: https://doi.org/10.1023/B:BUSI.0000013852.62017.0e*
2. *University of Victoria Campus Planning and Sustainability, "Engagement plan for: The University of Victoria Grand Promenade landscape plan and design guidelines," Campus Greenway [Online]. Available: https://www.uvic.ca/campusplanning/current-projects/campusgreenway/index.php*
3. *University of Victoria Campus Planning and Sustainability, "The Grand Promenade Design Charrette: Summary Report 11.2018," Campus Greenway [Online]. Available: https://www.uvic.ca/campusplanning/current-projects/campusgreenway/index.php*

5.7 Human Research Ethics

"Primary research" is any research that you do yourself in which you collect raw data directly from the "real world" rather than from articles, books, or internet sources that have already collected and analyzed the data. If you are collecting data from human participants, you are engaging in "human research" and you must be aware of and follow strict ethical guidelines of your academic institution. Doing this is part of your responsibility to maintain academic integrity.

In Canada, any post-secondary educational institution that receives funding from one of the three federal granting bodies must ensure that all research involving humans conducted at that institution complies with the Tri-Council Policy Statement. These rules are in place to protect people and communities from potential risk or harm and to ensure ethical conduct while doing research. In some cases, your instructors may have applied for "course-based ethics approval" for students in their classes to conduct certain kinds of carefully limited research (such as surveys or interviews) for a class project or assignment. Ethics approval is generally required for research that collects data from human subjects in the following ways:

> ***Interviews***: *one-on-one or small group question and answer sessions. Interviews will provide detailed information from a small number of people and are useful when you want to get an expert opinion on your topic. For such interviews, you may need to have the participants sign an informed consent form before you begin (see sample Sample Participant Recruitment Scripts).*
>
> ***Surveys/Questionnaires***: *a form of questioning that is less flexible than interviews, as the questions are set ahead of time and cannot be changed. These involve much larger groups of people than interviews, and provide larger data sets, but result in less detailed responses. Like interviews, surveys require that you get the participants' informed consent before you begin (see sample Consent Form Template).*
>
> ***Naturalistic observation in non-public venues***: *Observations involve taking organized notes about occurrences related to your research. Observations allow you to gain objective information without the potentially biased viewpoint of an interview or survey. In naturalistic observations, the goal is to be as unobtrusive as possible, so that your presence does not influence or disturb the normal activities you want to observe. If you want to observe activities in a specific work place, classroom, or other non-public place, you must first seek permission from the manager of that place and let participants know the nature of the observation. Observations in public places do not normally require approval. However, you may* ***not*** *photograph or video your observations without first getting the participants' informed voluntary consent and permission.*

These are the most common methods used in undergraduate courses. There are many other methods, including engaging with people and their information via social media, organizing focus groups, engaging in beta-testing or prototype trials, etc. But for the purposes of your writing course, these other methods are generally not recommended because they involve additional ethical considerations for you and your instructor.

Guidelines for Conducting Human Research

In order to adhere to the ethical requirements involved in conducting human research for your course project, you should abide by the following ethics guidelines when recruiting participants, gaining their informed consent, and managing the data you collect.[1]

Ethics Guidelines for Conducting Course-Based Human Research

Recruiting Participants

When recruiting potential participants, you must give them the following information before you begin:

- ***Student researcher(s)' name(s):*** inform them of your name and contact information
- ***Affiliation***: provide (a) the name of your institution, (b) your course name and number, and (c) your instructor's name and contact information
- ***Purpose***: describe the purpose of your research (your objectives), and the benefits you hope will come from this research (overall goal). Your research should not involve any deception (*e.g.*: claiming to be gathering one kind of information, such as "do you prefer blue or green widgets?", but actually gathering another kind, such as "what percentage of the population is blue/green colour blind?").

Informed Consent

You must gain the informed consent of the people you will be surveying, interviewing, or observing in non-public venues. This can be done using a consent form they can sign in person, or an "implied consent" statement on an electronic survey. The consent form should include all the information in the "recruiting" section above; in addition, you should

- Inform participants that their participation is voluntary and that they may withdraw at any time without consequence, even if they have not completed the survey or interview

- Disclose any and all risks or discomfort that participation in the study may involve, and how these risks or discomfort will be addressed
- Ensure that all participants are adults (19 years of age or older) and fully capable of giving consent; do not recruit from vulnerable or at-risk groups, and do not collect demographic data regarding age, gender, or any other information not relevant to the study (e.g.: phone numbers, medications they are taking, whether they have a criminal records, *etc.*)

Managing the Data

Participants should be told what will happen to the data you gather:

- In the case of surveys, the data is anonymous if you will not track who submitted which survey. In anonymous surveys, let participants know that once they submit their survey, it cannot be retrieved and removed from the overall results.
- Let survey participants know (a) that your research results will be reported without their names and identifiers, (b) where the data will be stored, (c) how it will be "published", and (d) what will happen to the raw data once your project is complete
- Let interview participants know how their information will be used and if their names will be included or cited.

There may be additional issues that must addressed, such as accessibility and cultural considerations, but those listed above are the most essential. If you are unsure whether a particular line of inquiry or method of data collection requires ethics approval, you should ask your instructor, and your instructor should contact the Research Ethics Office. Most importantly, you should always be completely up front and honest about what and how you are conducing your research.

For larger scale research projects, such as for a capstone course, an honour's or master's thesis, or a dissertation, students must apply for ethics approval with their academic supervisor before doing any research involving human subjects. Failure to obtain ethics approval before conducing research may result in the data not being accepted as part of the project, thesis or program. It may prevent work from being accepted for publication, and can result in a university audit or academic integrity investigation.

It may seem like "a lot of fuss" to go through simply to ask people whether they prefer blue widgets or green widgets, but there are important reasons for these guidelines. In the past, people posing as students have conducted "surveys" on campus for unethical reasons, asking students questions that were inappropriate and even harassing. People participating in your research need to be reassured that you are doing this for a legitimate reason, and must be able to contact the relevant faculty member or the campus research ethics office to verify that you have authority to do this research.

Notes

1. *For more in-depth information, see the University of Victoria's "Human Research Ethics" page: https://www.uvic.ca/research/conduct/home/regapproval/humanethics/index.php*

6. USER EXPERIENCE DESIGN AND TECHNICAL COMMUNICATION

JUSTIN LEWIS

Every time you tap a button on your phone, search a library catalog, or register for classes through a university portal, you're having a user experience. Sometimes it's effortless: you barely notice the interface because everything just works. Other times you're left staring at a screen wondering why it takes six clicks to do something that should take two. That gap isn't random. Someone made choices, good or bad, about how the thing should work.

This chapter treats user experience design as an extension of what you've already been learning about the rhetorical situation. Audience analysis, information design, research methods—these overlap significantly with what UX professionals do. The rhetorical situation framework from Chapter 2 is essentially the same question UX designers ask: who's using this, how, and why? What do they need and under what circumstances? Just as we focus on the needs of the audience when writing, UX design focuses on the needs of the user, but applies that thinking specifically to digital products and interactive systems.

Learning Objectives

6.1 What is User Experience Design: Understand UX Design and its relevance to technical communication principles

6.2 Rhetorical Foundations of UX: Apply rhetorical principles (such as audience purpose and context) to UX research and design

6.3 Five Planes of UX: Understand and apply a framework for user experience

6.4 UX Research Methods: Recognize the role of qualitative research methods from technical communications in UX research, and conduct basic UX research activities, such as heuristic evaluations, usability testing, and user interviews.

6.1 What is User Experience Design?

JUSTIN LEWIS

Jesse James Garrett defines ***user experience*** (UX) *as "the experience the product creates for people who use it in the real world."*[1] *Simple enough on the surface, but the phrasing matters: the focus is on experience, not the product. A website can be beautifully designed and still confuse everyone who visits it. An application can be packed with features and still overwhelm anyone trying to use it for the first time. Technical impressiveness doesn't guarantee a good experience. UX design is about shaping how people actually perceive and interact with what you've built.*

> **User Experience (UX) Design** addresses all aspects of a product or service as perceived by users. This includes not just the interface itself but the user's initial awareness, discovery, learning, use, support, and eventual discontinuation of the product. UX design extends traditional Human-Computer Interaction (HCI) by considering the total experience rather than only the moments of direct interaction.
>
> Have a look at Jakob Nielson's 10 Usability Heuristics for User Interface Design to get a sense of the many apects of the user's experience that we need to consider.

UX design often gets lumped in with nearby disciplines of UI and product design, so it helps to draw some lines.

> ***User Interface (UI) design*** *is the part you can point to on the screen. It's the buttons and menus, the typography choices, spacing, color, layout, icon styles, or, all the visual and interactive pieces people directly use. UI is important, and it's usually part of UX work, but it's only one slice of it.*
>
> ***Product design*** *is another neighbour term. Products can be physical or digital, or both, with an emphasis on what the thing is and how it's built: features, form, function, constraints, tradeoffs. UX design overlaps with that, but it keeps pulling you back to a different question: what does this product actually feel like to use in real life? You can ship something that's feature-complete and looks great and still make people miserable if you didn't account for how they behave, what they expect, or the situation they're in when they're using it.*
>
> **UX** *stretches across the whole relationship a person has with a product. It starts before they ever sign up: how they hear about it, what they assume it does, what the first few minutes are like. It includes discovery and learning and day-to-day use: can people get their job done without wrestling with the tool?*

And it doesn't stop there. UX also covers what happens when something breaks, how user support systems work, how errors are explained, and even how someone leaves—canceling, exporting data, switching to something else. Every one of those moments can either feel smooth and respectful or turn into a source of friction.

EXERCISE 6.1 *Defining Boundaries*

The boundaries between UX design, UI Design and Product design can be a bit fuzzy at times. Try sharpening your understanding of the distinctions by applying them to a real world example. Choose a digital product you are very familiar with, such as a banking app, a streaming service, your university's course registration system, or a social media platform.

Identify at least one specific example for each category below, and provide a 1-2 sentence rationale for why it belongs in that category.

UI Design (Visual and interactive elements that users directly touch)

Product Design (features, forms, functions, technical constraints)

UX Design (the overall experience across the full relationship with the produce)

Discuss: Where did you find it most difficult to "draw the line" between categories? What does that difficulty tell you about how UX, UI, and Product Design relate to each other in practice?

UX Design and Technical Communications: Shared Foundations

You might be thinking, "Why is UX design showing up in a technical communication textbook?" The short answer is that the two fields are closer than they look.

Both grew out of the same basic realization: communication works well only when you understand the people on the other end. Clarity beats cleverness. And the best results usually come from doing a version, getting feedback, and improving it. UX design is, in a lot of ways, technical communication applied to interactive digital spaces.

Take audience analysis, for example. In Chapters 1 and 2, you looked at questions like: Who's going to read this? What do they already know? What are they trying to do? UX designers ask the same things, just with "users" instead of "readers." They conduct interviews, surveys, and observation to figure out what people need, what they expect, and what gets in their way. If you're comfortable with task and audience analysis from Chapter 2, you already have a mental model that fits neatly with UX research.

The overlap shows up again in document design. The principles from Chapter 3—readability, visual

hierarchy, purposeful formatting—don't stop working just because the content is on a screen. Headings, spacing, and consistency help someone scan a report; the same ideas help someone find their way through an app or a website. Good interfaces rely on the same kind of structure and cueing that good documents do (see ***Figure 6.1.1****).*

The key connection, though, is the process. Technical communication is iterative: you plan, research, draft, revise, and edit based on feedback. UX follows a similar loop: research, design, test, refine. In both cases, the first pass is rarely the final one, and "done" usually means "good enough for now, with a plan to keep improving."

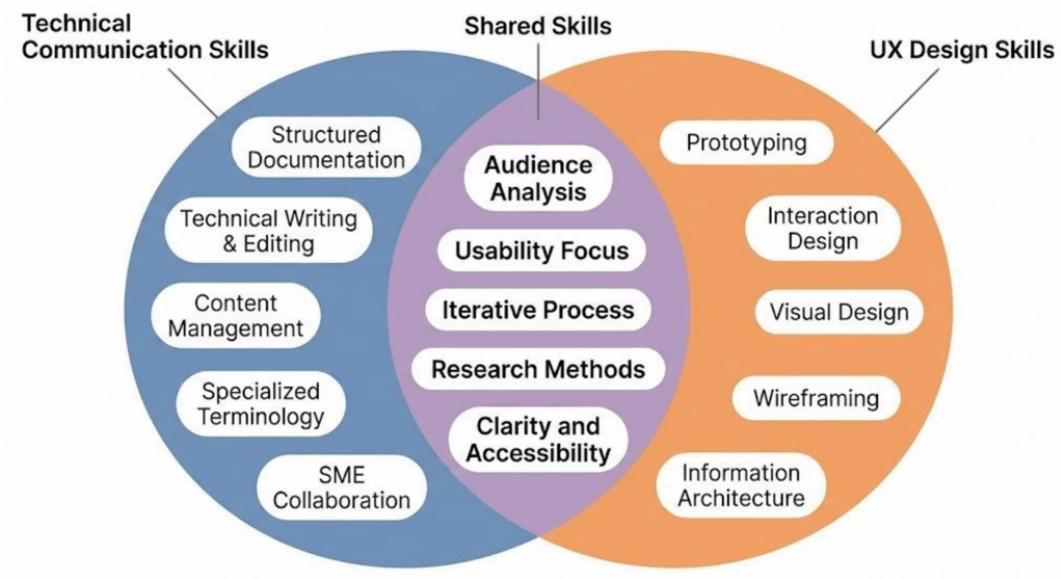


Figure 6.6.1 *Overlapping Competencies in Technical Communications and UX Design*

This overlap matters in practical, career-shaping ways. A lot of technical communicators now work in jobs that mix "classic" documentation with UX work, especially in companies building digital products. Job titles like ***Content Strategist, UX Writer, Information Architect****, and* ***UX Researcher*** *lean heavily on the same skills you develop in technical communication: figuring out what people need, organizing information so it's easy to use, and testing whether the result actually works.*

Learning UX principles isn't about leaving technical communication behind. It's more like adding range. You're still doing the core work (e.g., making complex things understandable and usable) but you're doing it in environments where the "document" might be an onboarding flow, a settings screen, an error message, or an in-app help article. As more work moves into digital systems, employers want people who can think about communication as part of the product itself, not just something that sits beside it.

EXERCISE 6.2 *Examine the Overlap in Document Design and Interface Design*

Technical Communications and UX design share a set of core competencies: audience analysis, document design, iterative revision, and research. Test that claim against your own experience:

Think of a digital product you used today (e.g., an app, a website, a self-service kiosk, a registration portal, anything interactive). Then think of a document you've read or written recently in this course (an email, a set of instructions, a report draft). In a short paragraph for each, answer the following:

1. What was the purpose of the product or document? Who was it designed for?
2. Where did the design help you accomplish what you needed? Where did it create friction?
3. What design choices (layout, language, structure, visual cues) seemed intentional? What seemed like an afterthought?

Share your examples with a partner or small group. As you compare, look for patterns: which kinds of design strengths and weaknesses showed up in both the digital product and the document? Where do the overlaps between technical communication and UX design feel strongest to you? Where do the two seem to diverge?

A Brief History of UX in Technical Communication

The phrase "user experience" started circulating in the 1990s, especially after cognitive scientist Don Norman joined Apple and pushed for a more big-picture way of thinking about design. Norman (and his book The Design of Everyday Things,[2] which people still recommend constantly) argued that designers shouldn't stop at technical specs or a good-looking interface. They needed to pay attention to how products fit into real human behaviour: how people understand them, stumble through them, and make them part of their routines. That idea may sound modern, but a lot of what we now call UX has been building inside technical communication for decades.

A major piece of that history is the ***usability movement*** *in technical communication, which picked up speed in the 1980s and 1990s. Scholars and practitioners like Janice Redish helped make the case that "expert review" wasn't enough. If you want documentation to work, you have to put it in front of actual users and see what happens. Watching real people try real tasks, paying special attention to where they hesitate, what they misread, what they skip, what they assume, became a practical method, not an academic luxury. That approach sits at the center of usability studies, and it later became one of the standard pillars of UX work.*

Then the web changed the scale of the problem. In the mid-1990s, websites moved from novelty to necessity, and soon after, mobile computing made digital interfaces even more constant and personal.

Suddenly, products weren't being used by a narrow group of trained users. They were being used by everyone: people with different levels of experience, different devices, different access needs, and wildly different expectations. The methods that once mattered mostly for specialized software or workplace documentation started to matter for basically any organization trying to communicate online. Today, UX thinking reaches beyond apps and websites into physical products, services, and the larger systems people have to navigate.

For students of technical communication, this background is useful because it reframes UX as less of a "new field you have to learn" and more of a continuation of work you already recognize. UX designers ask questions that technical communicators have asked all along: Who is this for? What are they trying to do? What's getting in their way? How do we help them succeed? The difference is the setting and the number of ways you can respond—screens, flows, microcopy, support content, onboarding, and more.

In the next sections, we'll connect rhetorical ideas to UX practice, look at a widely used framework for thinking through user experience, and walk through research methods you can start using right away. The goal isn't to toss out what you've learned so far, but to build on it and run basic UX research in your own projects.

Notes

1. *J.J. Garrett, The Elements of User Experience: User-Centred Design for the Web. New York: American Institute of Graphic Arts, 2003.*
2. *D. Norman, The Design of Everyday Things, Revised and Expanded Edition. New York: Basic Books, 2013.*

6.2 The Rhetorical Foundations of UX Design

JUSTIN LEWIS

If you've worked through the earlier chapters, you've already met one of the most useful tools in the book: the rhetorical situation (Ch. 2.2). It's introduced as a way to break down any communication event: who's doing the communicating, who they're trying to reach, what's being communicated, the medium or form it takes, and the purpose behind it.

What isn't always obvious at first is how well that same framework fits UX design. Designing a digital product is still a communication problem. The "speaker" might be an app, a website, a service, or the organization behind it. The "message" shows up in labels, flows, prompts, and defaults. The "how" is the interface, the interaction design, the content, the timing. And the "why" is the outcome you're trying to help the user achieve (alongside whatever goals the organization has). Look at it that way and UX starts to resemble applied rhetoric: using familiar principles of clarity, emphasis, and audience awareness, then translating them into interactive environments where people aren't just reading—they're doing.

The Rhetorical Situation in UX Contexts

The rhetorical situation is usually described as five connected pieces: purpose, writer, audience, message, and context/culture. When you write a document, you're constantly balancing those elements against each other. What are we trying to get done? What knowledge, constraints, or biases do we bring as the writer? Who's going to use this, and what are they trying to accomplish? What information belongs here, and how should it be organized? What situational or cultural expectations shape how it will be read?

UX designers work through the same set of questions, even if the labels shift a bit (see ***Figure 6.2.1****). Put another way, a screen is never "just a screen." It's a response to a rhetorical situation, shaped by purpose, people, content, and context. These are exactly the same forces you've already been trained to notice in written communication.*

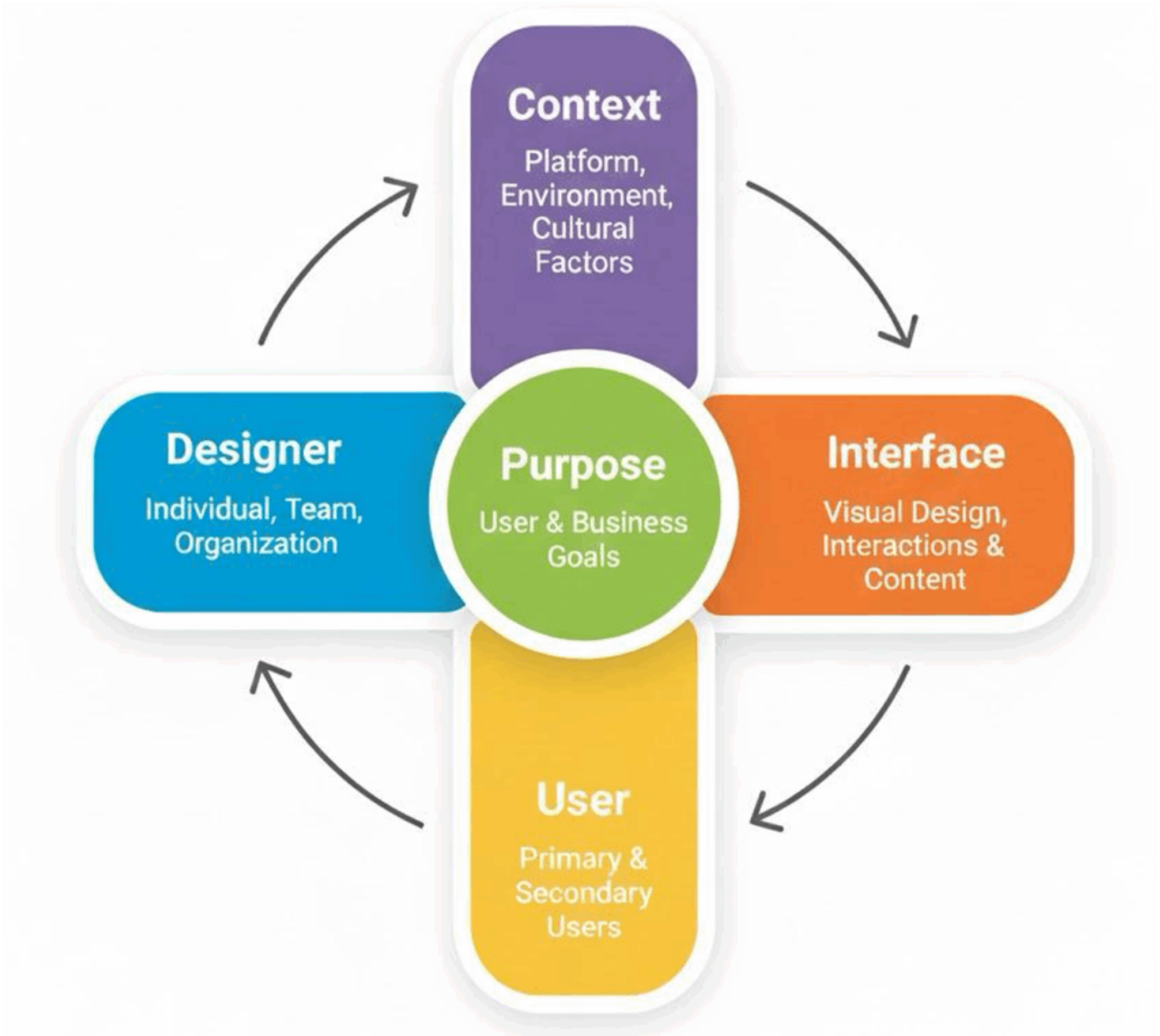


Figure 6.2.1 *The Rhetorical Situation adapted for UX Design*

PURPOSE, *in UX design, usually has two layers:*

> ***The user's purpose*** *is the reason someone showed up in the first place. They open a banking app to check a balance, move money, deposit a check. They go to a library site to find a title, renew items, reserve a study room. Getting clear on those goals takes the same kind of task analysis you'd do before writing instructions or a user guide: what are people trying to accomplish, what steps do they expect, where do they get stuck?*
>
> ***The organization's purpose*** *is what the company or institution wants the product to achieve. Maybe it's higher engagement, fewer support calls, more completed applications, better*

retention, stronger brand trust. Good UX is often about negotiating the overlap. When the product helps users succeed quickly and confidently, it usually helps the organization too. When those goals fight each other, people feel it immediately.

THE WRITER *in a rhetorical situation maps pretty cleanly to the* ***designer*** *in UX, with one wrinkle: in product work, "the designer" is rarely a single person. Decisions come from teams of designers, engineers, product managers, content producers, legal, and marketing. That mix of labor shapes what gets built. Still, the same self-awareness applies. Designers bring their own habits, assumptions, and technical comfort into the work, and those can quietly steer the design. A core UX lesson is simple, but sometimes hard to keep in mind: you are not your user. What feels obvious after months inside a project can be baffling to someone seeing it for the first time. This is why user testing is so important.*

AUDIENCE *becomes* ***users****, but UX tends to treat user diversity as unavoidable rather than optional. One product can serve people with very different levels of experience, physical abilities, languages, cultural expectations, and constraints. The same banking app might be used by a twenty-year-old who lives on their phone and a seventy-year-old who finds touchscreens finicky. The same library site might be used on a large monitor in a quiet room and on a phone while someone is juggling a coffee and a backpack. That's why UX research (which you'll get into later in 6.4) leans on systematic ways of learning about users instead of guessing.*

THE MESSAGE *in UX is the* ***interface*** *itself. It's the words, yes, but also the whole system of cues: layout, buttons, icons, navigation, confirmations, error states, animations, and feedback. Every choice communicates something about what's possible, what's important, and what happens next. The document design skills you already know transfer well here. Interfaces also rely on hierarchy, consistency, and spacing to help people scan, orient themselves, and make decisions. Clear, user-centred writing still matters too: keep it tight, stay consistent, anticipate confusion, and assume people will misread things when they're moving fast or stressed.*

CONTEXT *and* CULTURE *shape everything around that interface. Context includes where someone is using the product (quiet office vs. noisy train), what device they're on (desktop, phone, watch), and the conventions they've learned from the platform (iOS vs. Android patterns, web vs. native expectations). Culture is broader than nationality: it can mean workplace norms, industry expectations, accessibility norms, privacy expectations, even generational attitudes toward technology. If you ignore context, you can end up with designs that look great in a lab and fall apart in real life, when someone's using them one-handed, on poor Wi-Fi, with three distractions competing for attention.*

***Table* 6.2.1** *Mapping the Rhetorical Situation to UX Design*

Rhetorical Component	Traditional Tech Comm	UX Design Context
Purpose	Inform, instruct, persuade through documents	Enable users to accomplish goals through interaction
Writer/Creator	Technical writer, documentation team	UX designer, product team, organization
Audience	Readers with varying expertise levels	Users with diverse abilities, contexts, and goals
Message	Content of document (text, visuals, structure)	Interface elements, interactions, feedback systems
Context/Culture	Workplace, discipline, organizational norms	Platform, device, cultural expectations, use environment

Audience Analysis as User Research

Chapter 2.2 gave you a practical set of questions for building an audience profile: Who are the primary readers? What's their relationship to you? What do they already know? What situation created the need for this communication? If you swap "readers" for "users," you can see how naturally that framework slides into UX research. The main difference is that UX teams often answer those questions with more structured, evidence-based methods: interviews, surveys, observation, and usability tests, rather than relying mainly on inference.

When UX designers study users, they're looking at many of the same dimensions you'd cover in audience analysis, just with a wider lens. They pay attention to users' goals and expectations: the specific tasks people are trying to complete, and the assumptions they bring from using similar products. They consider physical abilities and limitations, because real users have different motor skills, vision, hearing, and cognitive capacities. Based on these factors, they develop designs that work across that range of accessibilities. They think about perception and attention, too. People don't read screens the way they read essays; they scan, they look for cues, and they miss things when the page is crowded or the wording is vague. And they don't ignore enjoyment. If something technically "works" but feels annoying or slow, users will avoid it when they can.

A key UX insight that's worth holding onto is that users never arrive empty-handed. People bring a lifetime of learned patterns, or "conventions," to every new interface. They expect settings to be in a familiar place, common icons to mean familiar things, and standard gestures to behave the way they've behaved everywhere else. When a design leans into those conventions, users can borrow their existing knowledge instead of relearning basics. When a design breaks them, it can still succeed; however, there's a design price to pay: more effort, more mistakes, and a higher chance the user quits. That's why UX designers treat convention as a tool, not a lack of creativity. Familiar patterns reduce cognitive load and make the experience feel "obvious" in the best sense.

Culture adds another layer, and it's where simple demographic checklists stop being enough. Researchers such as Huatong Sun have argued that usability is culturally situated: what feels straightforward in one context can feel confusing or even inappropriate in another, even when the language is translated correctly.[1] *Jennifer Sano-Franchini's work (including analysis of Asian eyelid surgery apps*[2]*) is a good reminder that interfaces aren't neutral; rather, they can quietly bake in cultural assumptions about bodies, identity, and "normal" users. Taken together, this line of research pushes UX beyond "design for age group X" and toward something more reflective: noticing how identity, culture, and context shape what people expect from technology, and being honest about the limits of the designer's own viewpoint.*

EXERCISE 6.3 *Assumption Audit: "You are not your user"*

Designers bring their own habits, assumptions, and comfort levels into the work, and those can quietly steer the design. This activity asks you to examine those assumptions in yourself

> Think about the last time you helped someone use a piece of technology—a family member, a friend, a coworker. What did they struggle with that seemed obvious to you? Write a brief account of the situation: what was the task, where did they get stuck, and what did you have to explain?
>
> Now flip it. Think about a piece of technology that you find frustrating or confusing, even though other people seem fine with it. Describe the friction: what do you expect to happen, and what actually happens?

Compare your experiences with a partner's. What patterns emerge? When you helped someone else, what assumptions were you making about what "should be obvious"? When you were the frustrated user, what assumptions did the designer seem to be making about you? How does this connect to the audience analysis work you practiced in Chapter 2.2?

Technology as Rhetorical Genre

One more rhetorical concept turns out to be especially handy for thinking about UX: ***genre****. In rhetoric, genres aren't just categories based on shape or format. As Carolyn Miller argues, genres are "typified responses" to recurring situations.*[3] *A job application letter counts as a genre less because it has a standard structure and more because it's a recognized way of handling a familiar social moment: someone asks to be hired, and both sides have expectations about what that request should include and how it should sound.*

You can take that same idea and apply it to digital products. A mobile banking app, a social media feed, a search results page: these are all responses to situations that keep coming up. People need to manage money without going to a branch. They want to share updates and keep tabs on friends or communities. They need to look things up quickly. Over time, designers build common solutions to those needs, and those solutions harden into patterns users come to expect. A new banking app doesn't start from zero; it gets compared to everything else people have used. If it can't do the basics, or if it hides them in weird places, users feel that friction immediately.

Seeing technology as genre gives you a few useful angles.

First, it makes it harder to pretend products are neutral. A technology is built to solve certain problems in certain settings. What it makes easy, what it makes annoying, what it requires you to do in what order, those are design decisions. They reflect assumptions about who the "normal" user is, what they want, what they're willing to tolerate, and what the organization wants from them.

Second, genre helps explain why design conventions repeat. The shopping cart icon shows up across e-commerce sites because it's become a shared response to the recurring situation of buying online. It's not a law of nature; it's a convention that stuck because it works well enough and users learned it.

Thinking this way turns "interface critique" into something broader. You're not just judging whether a screen looks clean; you're asking what kind of social situation the technology is built for, what expectations it relies on, and what it nudges people to do.

Analyzing Technology as Rhetorical Genre

When examining a digital product as a rhetorical genre, consider:

Structural: What recurring design elements characterize this type of technology? What interface patterns appear consistently?

Substantive: What social actions does this technology enable? What purposes does it serve for users and organizations?

Contextual: When, where, and under what circumstances do people use this technology? What situational factors shape its use?

Critical: What assumptions about users does this technology embed? Whose needs does it serve well, and whose does it neglect?

That last question of whose needs a technology serves well, and whose it ignores gets at the part of rhetorical analysis that's hardest to dodge. Technologies aren't neutral. Every design choice helps some people and makes things tougher for others. It can privilege certain workflows, certain bodies,

certain languages, certain levels of time and attention. It can quietly assume a "default" user and treat everyone else as an edge case. Even decisions that seem purely technical (e.g., what gets prioritized, what's buried, what's required, etc.) end up reflecting values.

Noticing these issues isn't a reason to be cynical about design. It's a reason to take design seriously. When you see technologies as rhetorical artifacts, as objects shaped by human choices inside real organizational, economic, and cultural constraints, you also see that they can be changed. The current version isn't inevitable. It's a set of decisions that could have gone differently, and that can be revisited. That's where agency comes in: designers can push for alternatives, and users can demand better ones.

The rhetorical concepts in this section give you a vocabulary for doing that kind of analysis without drifting into vague criticism. They let you talk concretely about purpose, audience, message, context, and genre, and about what gets left out when those elements are defined too narrowly.

EXERCISE 6.4 *Analyze familiar technology through the lens of Genre*

We have used Caroline Miller's concept of genre to argue that digital products are "typified responses to recurrent situations." Let's put that to the test.

1. Pick a common type of digital product: a search engine, a social media feed, an e-commerce checkout flow, a messaging app, a calendar tool, or anything else you use regularly.
2. Identify three to five design conventions that are shared across most products of this type. (For example: most e-commerce sites use a cart icon; most messaging apps put the newest messages at the bottom.) These are the genre's structural patterns.
3. Now find one place where a specific product breaks or modifies a convention. Describe the departure. Does it work? Does it create confusion? What might have motivated the designers to depart from the pattern?
4. Technologies are not completely "neutral" in that every design choice helps some people and makes things harder for others. Pick one of the conventions you identified and consider: whose needs does it serve well? Whose needs might it overlook?

Next, we'll move from that vocabulary to a more structured UX framework: Jesse James Garrett's five planes of user experience. It's a useful model for tracing how high-level goals and strategy turn into the actual screens, interactions, and content people deal with day to day.

Notes

1. *H. Sun and G. Getto*, "*Localizing user experience: Strategies, practices, and technique for culturally sensitive design*," *Technical Communications, vol. 64 (2), May 2017.*
2. *J. Sano-Fanchini*, "*What can Asian eyelinds teach us about User Experience Design?* A *culturally reflexive framework for UX/I Design*," *Rhetoric, Professional Communication and Globalization, vol. 10(1), 2017.*
3. *C. R. Miller*, "Genre as social action." *Quarterly Journal of Speech*, 70(2), pp.151–167, 1984. *https://doi.org/10.1080/00335638409383686*

6.3 The Five Planes of User Experience

JUSTIN LEWIS

When you're told to design a digital product, it's tempting to start with the obvious stuff: what it should look like, what features it needs, maybe a quick list of screens. The problem is that starting there can produce a product that's nicely polished but oddly hollow. The UI might be attractive, the feature set might look impressive on paper, and people still end up feeling lost because no one sorted out, early on, who and what the product is really for, and how it's supposed to fit into a user's life.

That's why experienced UX designers lean on frameworks. A good framework keeps you from treating design as a pile of disconnected decisions. It forces you to work from the inside out: define the purpose, clarify what success looks like, and make sure each layer supports the one beneath it.

Jesse James Garrett's "five planes" model, laid out in The Elements of User Experience,[1] *is one of the most widely used ways to do that. Garrett describes five levels of UX decisions, moving from the most abstract to the most concrete:*

- ***Strategy*** *(what we're trying to achieve, for users and for the organization)*
- ***Scope*** *(what the product will and won't include)*
- ***Structure*** *(how the experience is organized and how users move through it)*
- ***Skeleton*** *(the arrangement of interface elements: layout, navigation, information design)*
- ***Surface*** *(the final look and feel: visual design, styling, micro-interactions)*

Each plane builds on the one below it. If you're unclear at the strategy level, everything above becomes guesswork. If the scope is bloated or inconsistent, structure turns into a maze. And if structure is shaky, no amount of surface-level polish will fix the experience. The value of the model is that it gives designers a shared map: a way to talk about where a problem really lives, and a way to keep "make it prettier" from becoming the default solution to deeper confusion.

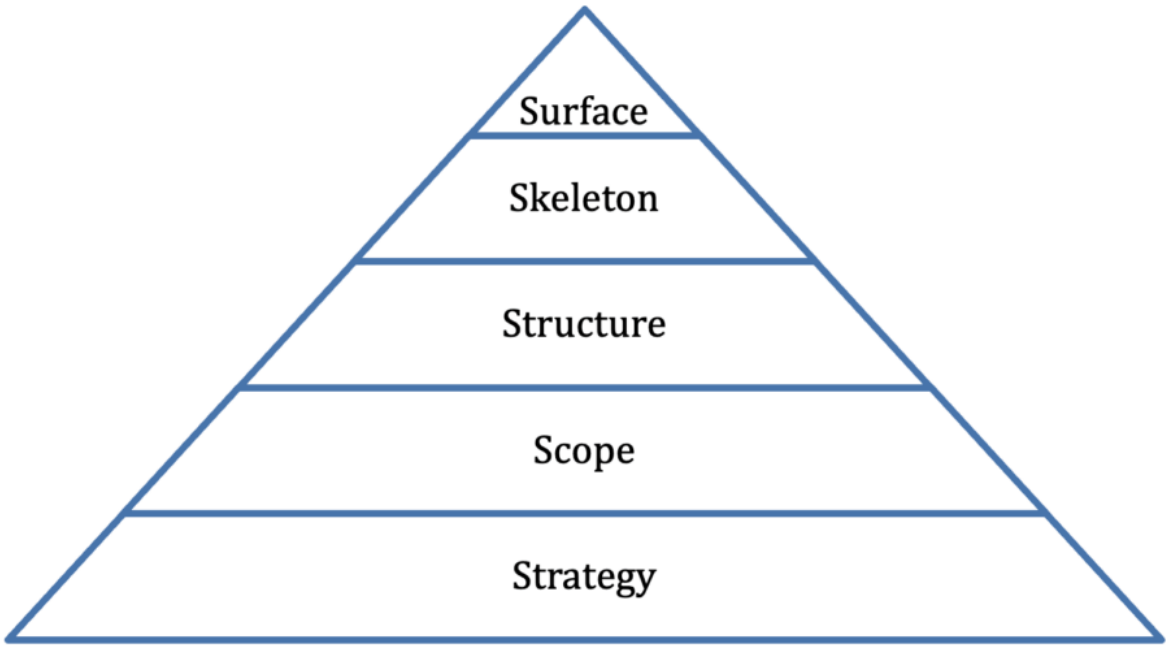
Before you dig into the five planes, Garrett asks you to notice a basic split in how digital products work: functionality and information:

> ***Functionality****: the product is basically a tool for completing a task. People show up to do something: write in a word processor, build a spreadsheet, manage tasks in a project tool. Success looks like completing work efficiently, with as little friction as possible.*
>
> ***Information****: the product is mainly about information. News sites, library catalogues and corporate intranets help people find, understand, and use content. Here, success is about clear organization, easy discovery, and content that's legible and trustworthy.*

Most real products are a blend. A banking app is a functional tool (pay bills, transfer funds) and an information source (check balances, review transactions). A university website provides information (program details, faculty pages) and also enables actions (registering for courses, submitting forms). Garrett's model still holds in mixed cases, but the way each "plane" shows up can look a little different depending on whether you're focusing on the product's tool side or its information side. As we move through the planes, it helps to keep both in view.

Understanding the Five Planes

Garrett's five planes work like a stack from an abstract foundation (strategy) to concrete surface.



A house-building analogy fits well if you don't push it too hard. You start with the reason for the house and who will live there (strategy). Then you decide what rooms you need and what features matter (scope). Next you plan how the rooms connect and flow (structure). After that you figure out the placement of doors, windows, and major fixtures (skeleton). Only then do you pick paint, materials, and finishes (surface). If you jump straight to paint colours before you know whether you need two bedrooms or four, you end up with a lot of expensive rework . . . or a house that looks fine but functions badly.

The STRATEGY Plane: What is our Purpose?

Strategy is the foundation: why the product exists, who it's for, and what success means. Think Purpose, Audience, and Goals, but in two connected contexts: What do ***users*** *need from this product, and what does the* ***organization*** *need from it?*

Those answers aren't always compatible, and a lot of UX work is the process of finding a workable overlap: an experience that helps people accomplish what they came for while also supporting the organization's goals.

> ***User needs*** *are the reasons people show up. What are they trying to get done? What problem are they trying to solve, or what information are they trying to confirm? You can't guess your way to reliable answers here. You need research like interviews, surveys, field observation, and usability testing. You also need the discipline to see the product from the user's point of view instead of your own. People don't use products the way teams imagine they will; they use them in the middle of messy lives, with limited patience and divided attention.*
>
> ***Organizational objectives*** *(business goals) are the other half of the picture. These might be revenue, fewer support tickets, higher retention, increased sign-ups, improved completion rates, stronger trust in the brand, the list goes on. The important thing is that objectives have to be specific enough to steer decisions. "Make the product better" doesn't help anyone decide what to build. "Reduce checkout time by 20%," "cut password-reset requests in half," or "increase successful account onboarding" gives you something you can test and measure.*

This is where the strategy plane connects directly to the rhetorical idea of purpose from Section 6.2. Just as a document without a clear purpose tends to wander, a product without a clear strategy tends to sprawl. It tries to satisfy every possible user and every internal business request, and it ends up feeling scattered. It has lots of features, no clarity, and no strong reason for anyone to stick with it.

The SCOPE Plane: What are We Building?

Once you've nailed down strategy, the next step is scope: turning those big goals into a concrete list of what the product will actually deliver – and what it won't! Every project has limits: time, budget, technical constraints, staffing. If you try to include every feature someone suggests or cover every possible edge case, you usually end up with a product that feels bloated and harder to use. Good scope work means saying no (or "not yet") to ideas that are interesting but don't serve the strategy.

Scope is where "we want to help users do X" turns into features, content, and requirements. On the

functionality side, scope shows up as functional requirements, or, what the product will do. On the information side, it shows up as content requirements, or, what the product will contain, what topics it covers, what information users can expect to find.

The STRUCTURE Plane: How Does it Fit Together?

The structure plane is where the things you decided to include (scope) get organized into a system that makes sense. It answers a basic question: how do all these pieces relate? It organizes the user experience and determines how things are arranged, and how the users will move through tasks (functionality) or information.

> ***Functionality**: structure is about designing the user interactions. If someone taps a button, what happens next? Do they get immediate feedback? Is there a confirmation step? What does the system do when something goes wrong, or when the user tries an unexpected path? Interaction design is basically the rules of the conversation: what the product "says" in response to what the user does.*
>
> ***Information architecture:** The structure determines the underlying organization of content: categories, labels, navigation, and relationships between pages or sections. Information architecture asks questions like: What belongs together? What needs to be separated so it doesn't get confusing? What are the main pathways users will follow? If you've ever been stuck clicking around a site that seems to hide the one thing you need in a random menu, you've felt what weak information architecture looks like. Good information architecture is often invisible! Users simply find the content intuitive to navigate. Poor information architecture forces users to think about the system rather than their goals.*

The SKELETON Plane: Where Does Everything Go?

The skeleton plane is where that theoretical blueprint of the structural plane gets translated into an actual screen layout. It's still not "final design," but it's concrete enough that you can point to where things like navigation and interface elements will live and how people will use them.

Three kinds of design work come together here:

> ***Interface design** is about the controls people use to take action: buttons, form fields, dropdowns, toggles, sliders, and the other pieces that make functionality usable. Strong interface design makes it obvious what's clickable, what's editable, what's required, and what will happen next.*

It usually leans on patterns users already know, and it only introduces new ones when there's a real payoff.

***Navigation design** is about movement through the product's content and sections: menus, links, tabs, breadcrumbs, search, site maps, and any "you are here" cues that keep people oriented. There's always a tradeoff here. You want users to be able to reach everything, but you don't want to throw twenty options at them on every screen and call it clarity.*

***Information design** is about how content is presented so it's easy to understand and act on. That includes the layout of text, the formatting of numbers and dates, the way data is visualized, what gets emphasized, and how the interface signals meaning. This is where a lot of document-design skills transfer directly: hierarchy, chunking, alignment, consistency, and using visuals with a purpose.*

*Designers often capture the skeleton plane with wireframes (see **Figure 6.3.1**). These simple page diagrams show layout and placement without the "surface" details like colours, photography, or polished typography. The point is to keep the conversation focused on whether the arrangement supports user tasks before the team spends time perfecting the look.*

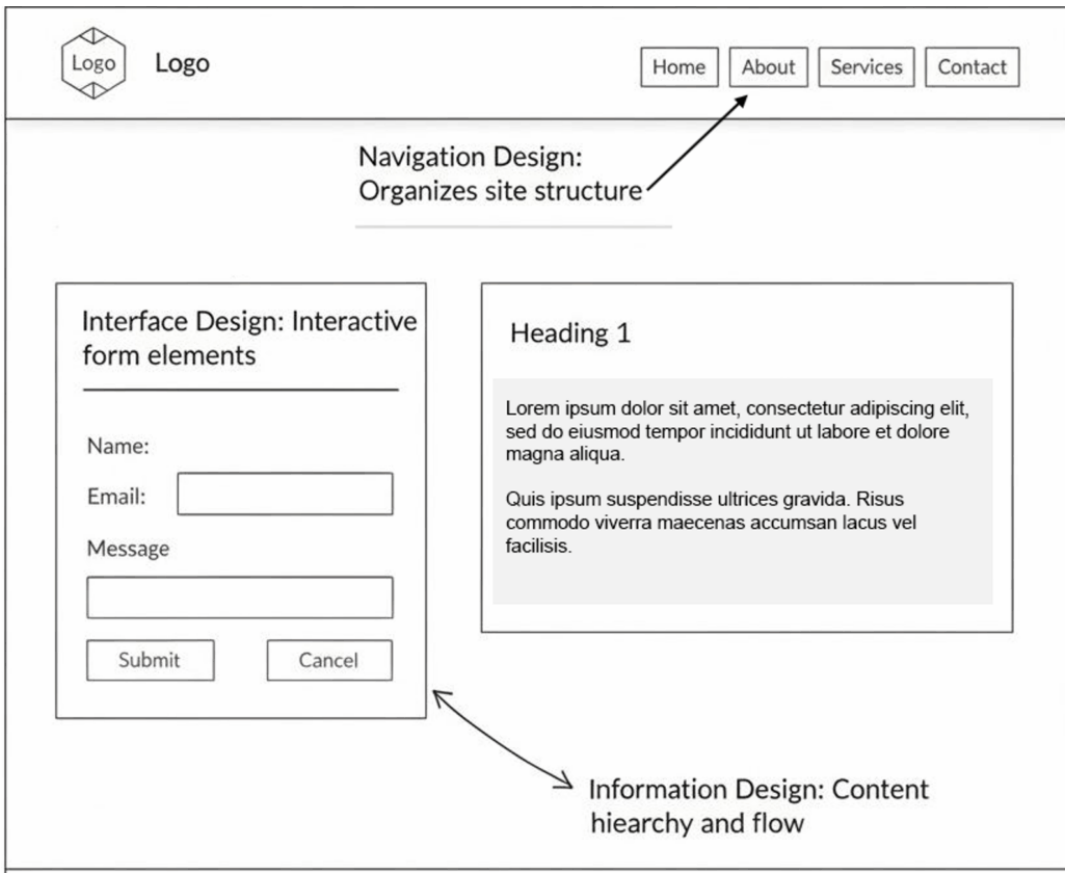


***Figure 6.3.1** Sample Wireframe Showing Interface, Navigation, and Information Design*

The SURFACE Plane: What Do Users See?

At the top of Garrett's model is the surface plane, the part of the experience users actually perceive: the visual design, typography, colour palette, spacing, imagery, and sensory layer of the interface. In some products, this might also include motion, sound, and haptics (touch).

It's easy to treat the surface as "the important part" because it's what people notice first. Garrett puts it last on purpose. Surface design sits on top of everything else and depends on it. A gorgeous interface can't rescue a product with a muddled strategy or a structure that sends users in circles. On the flip side, when the foundation is solid and includes clear strategy, disciplined scope, sensible structure, a workable skeleton, etc., the product can still succeed even if the visuals are a bit rough around the edges. Function can carry you farther than people expect.

Still, surface design isn't decoration. It's part of the visual rhetoric that shapes how people move through the product moment to moment. Visual hierarchy tells users what to look at first and what can wait. Consistent styling helps people build trust in the interface: if two elements look the same, users assume they behave the same. Typography affects readability and scanning. Color can set mood and also communicate meaning (errors, warnings, success states). The same layout principles you've learned for documents, including contrast, alignment, proximity, repetition, show up here too, just translated into screens.

And "surface" can mean more than sight. Motion matters: do animations feel smooth and informative, or do they slow users down and pull attention away from the task? Sound matters in some contexts: is it helpful feedback or unwanted noise? On a mobile device, haptics can either reassure users ("your action registered") or annoy them if overused. These details don't replace good structure, but they do change the feel of the experience. They're often the difference between a product that seems carefully made and one that feels slightly sloppy, even if the features are the same.

Working with the Five Planes

Garrett is careful to say the five planes are a way of thinking, not a step-by-step recipe. Real projects don't move neatly from strategy to surface in a straight line. Work overlaps, and you often learn things "late" that force you to go back and adjust earlier decisions.

That's normal. A designer building wireframes at the skeleton level might suddenly notice that a key task takes too many steps, which points back to a structure problem: the information architecture isn't supporting what users are trying to do. Or a visual exploration at the surface level might expose

something more fundamental: there are simply too many features to present clearly. Based on this feedback, the team has to revisit scope and cut or postpone work.

The value of the model is that it gives you a grounding rule: decisions at each level should make sense given the levels underneath. Before you lock in surface design, you should have confidence in the skeleton. Before you lock in the skeleton, you should understand the structure. Before you finalize structure, you need a clear scope. And before you commit to scope, you need strategy: why this product exists and who it's meant to serve.

That discipline is what helps teams avoid a classic trap: picking solutions early (a layout, a feature, a visual style) before they've really understood the problem they're trying to solve.

EXAMPLE: Applying the Five Planes to A Library Website Redesign

Strategy: User research reveals that students primarily need to find and access resources quickly, often on mobile devices between classes. The library's goal is to increase digital resource usage and reduce in-person reference questions.

Scope: The redesigned site will include: search (books, articles, databases), account management (renewals, holds), research guides by subject, and library hours/locations. Features like event calendars and staff directories are deprioritized.

Structure: Information architecture organizes content around user tasks (Find, Borrow, Get Help) rather than library departments. Search is integrated across resource types.

Skeleton: Wireframes place a prominent search box at the top of every page. Mobile layouts prioritize search and account functions, with secondary content accessible through a menu.

Surface: Visual design uses university brand colors, clear typography optimized for screen reading, and minimal decoration to keep focus on functionality.

From Framework To Practice

Garrett's five planes work in two directions at once. They're a thinking tool, because they help you sort decisions by level and keep you from treating UX as a grab bag of screens and features. And they're a communication tool, because they give teams a shared set of terms. This is especially useful when you're talking with colleagues, clients, or stakeholders who don't speak "design" fluently but still need to weigh in on what's being built.

For students of technical communication, the model should feel familiar. It reinforces the same basic discipline you've practiced in writing: you start by getting clear on purpose and audience, then you

make choices about what to include, how to organize it, and how to present it. And the process is likely iterative, forcing you to revisit previous steps as needed. Working from strategy through surface mirrors the process of working from task analysis through document design. In both cases, the aim is the same: build something that fits what people actually need, not what the creator assumes they need.

EXERCISE 6.5 *Diagnosing Problems within the 5 Planes*

Garrett's model argues that problems at lower planes (strategy, scope) can't be fixed by work at higher planes (skeleton, surface). This exercise asks you to practice diagnosing where a problem really lives.

Read each scenario below. For each one, identify

(a) which plane the core problem belongs to
(b) explain your reasoning in one to two sentences.

Some scenarios may involve more than one plane; if so, identify the deepest one (the one closest to strategy), since fixing it there will likely resolve the higher-level symptoms.

1. A university's course registration portal lets students add courses to a cart, but there's no clear way to see whether a course conflicts with their existing schedule until after they try to enroll.
2. An employee onboarding app has a clean, modern visual style but organizes content by department rather than by task, so new hires can't figure out the sequence of steps they need to complete.
3. A city transit app shows real-time bus locations, but the icons and text are so small on mobile that riders can't read route numbers without zooming in.
4. A hospital patient portal was designed to help patients manage prescriptions, but it was never tested with elderly users, who make up 60% of the patient base. The team only realized this after launch.
5. A nonprofit's website has a prominent "Donate" button and an elegant donation flow, but the organization's actual goal for the site was volunteer recruitment. Donations aren't the problem—nobody can find the volunteer sign-up page.

Compare your answers with a partner. Where did you disagree? What made certain scenarios harder to pin to a single plane? How does this exercise change the way you might approach giving feedback on a design?

EXERCISE 6.6 *Defining a UX Problem*

Use the Hyman Problem Formulation framework, applied to the Strategy Plan to define a UX problem.

Choose a real digital product or service you've found frustrating: Your university's website, a government services portal, a workplace tool, an app you've given up on—anything you have firsthand experience with. Define the UX problem using the Hyman framework below (remember, you are defining the problem; do not propose solutions yet).

- **Need/Unsatisfactory Situation**: What is the current experience like? What's going wrong for users? Be specific about what you've observed or experienced.
- **User Goals:** What are users trying to accomplish when they use this product?
- **Organizational Goals**: What does the organization behind the product likely want the product to achieve?
- **Measurable Objectives:** If you were going to improve this product, what specific, measurable outcomes would tell you the improvement was working? (e.g., "reduce average task completion time," "increase successful form submissions," "decrease support requests about X")
- **Constraints**: What limits would any solution have to respect? Consider budget, technology, legal requirements, accessibility standards, existing user expectations, and organizational politics.

EXERCISE 6.7 *Negotiating Scope: What gets cut?*

Garrett emphasizes that scope is as much about what you leave out as what you include. This exercise gives you practice with that tradeoff.

Imagine you are redesigning your school's library website. The team has brainstormed the following feature and content ideas. However, due to budget and timeline constraints, you can only include 6 of the 10 items in the first release. The rest will have to wait. Here are the 10 features:

- Search the full catalog by keyword, title, author, or subject
- Real-time availability for each item (checked out or on the shelf)
- User account page showing items checked out, holds, and due dates
- Online reservation system for study rooms
- Interactive floor map showing where each call number range is shelved
- Integration with the campus course management system so students can see items on reserve for their courses
- Blog with librarian-curated reading recommendations
- FAQ and help documentation for using library databases
- Event calendar for workshops, guest speakers, and exhibits
- Accessibility checker that lets users report barriers on any page

Your task: Choose the 6 items you would keep for the first release.

For each item you keep, write one sentence explaining why it belongs in the first release, connected to what you understand about user needs and organizational goals.

For each item you cut, write one sentence explaining why it can wait.

Compare your choices with a partner or group. Did you make the same cuts? What principles guided your decisions? How did you weigh user needs against organizational goals? Did anyone argue for keeping the accessibility checker as a first-release priority, and if so, on what grounds?

Of course, a framework is only helpful if you can use it. That's where methods come in. Research methods are the hands-on techniques that let you learn about users, test ideas, and improve what you've made. In the next section, we'll look at research methods that support the UX process. Many of these approaches come straight from qualitative research traditions in technical communication, adapted for the realities of interactive digital products.

Notes

1. *J.J. Garrett, The Elements of User Experience: User-Centred Design for the Web. New York: American Institute of Graphic Arts, 2003*

6.4 UX Research Methods

JUSTIN LEWIS

The frameworks and principles we've covered so far on the rhetorical situation and the Five Planes of User Experience are useful ways to think about UX design. But thinking only gets you so far. If you want to design products that actually work for people, you have to understand those people: who they are, what they're trying to do, how they behave in real situations, and what trips them up. You don't get that understanding from gut instinct. You get it from research.

If you've already worked through Chapter 5, you're not starting from zero here. The habits you've been practicing like finding and evaluating sources, narrowing a research focus, setting boundaries, and doing ethical research with human participants carry directly into UX. This section builds on that foundation by introducing a set of research techniques UX designers use to learn about users and make better design decisions: **User Personas, Interviews, Contextual Inquiry,** *and* **Surveys**

None of these methods belong exclusively to UX. Many come from social science, anthropology, and technical communication research. What UX has done is adapt them to the realities of interactive products, where "understanding" isn't just about what people say they need, but what they actually do when they're trying to use the design to complete a task.

The Role of Research in UX Design

Research shows up in different ways depending on where you are in the design process.

Early on, it's mostly about ***empathy****: getting a grounded sense of users' lives, goals, constraints, and everyday frustrations, along with the context in which they'll use the product. That kind of work feeds directly into the strategy plane. It helps teams define user needs and set product goals that actually connect to those needs, instead of guessing or designing for an imaginary "average user."*

UX folks often talk about a design lifecycle, and the names vary by organization, but the rhythm is pretty consistent: learn about users and their context, define the problem, create and refine possible solutions, test those solutions with users, then iterate based on what you learned (see illustration in ***Figure 6.4.1****). The important point is that research isn't a one-time "discovery phase" you check off at the beginning. It comes back throughout the project, with different methods depending on what you're trying to find out.*

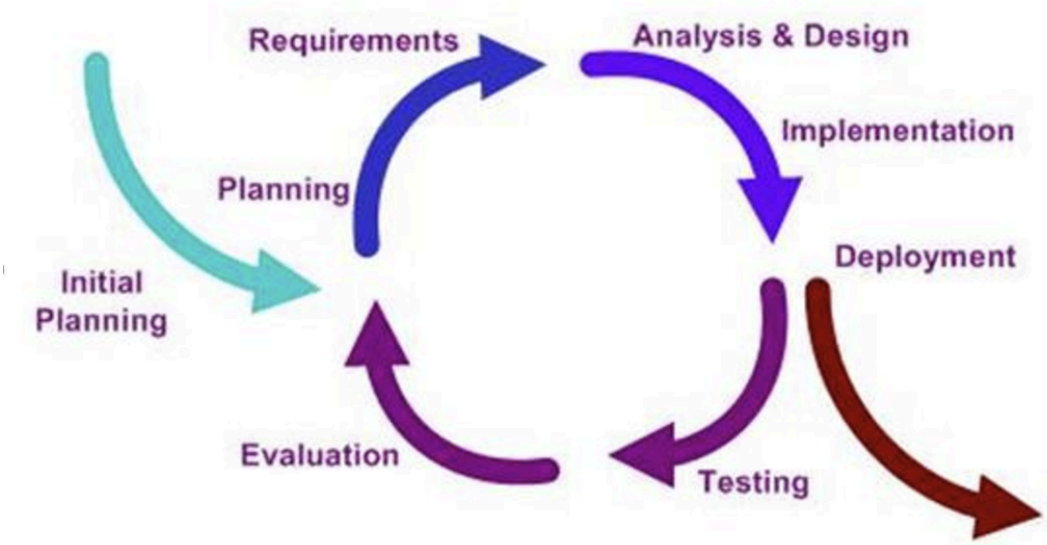


Figure 6.4.1 *The UX Design Life Cycle*

User Personas

One of the most common ways UX teams capture and share what they've learned about users is developing a "persona." A persona is a research-based portrait of a user type. In other words, it is a fictional composite character that represents a real segment of your audience. The point isn't to invent a cute character. It's to make research findings easier to remember and easier to use when the team is making decisions.

The "research-based" part is doing a lot of work there. Strong personas are derived from interviews, observation, surveys, support logs, analytics, and anywhere else you can gather evidence about actual users. When a persona is created without that grounding, it usually turns into a stereotype of bundled assumptions dressed up with a name and a headshot. Research-backed personas do the opposite. They keep the team oriented toward real needs and real constraints, even when the users aren't in the room.

A solid persona usually includes a few standard pieces:

- *Name and photo (often a stock image or AI-generated picture) to make it memorable. The persona isn't a real person, but the human framing helps the team talk about user needs in concrete terms.*
- *Basic background details like age range, role/occupation, location, and relevant context. Useful for setting the scene, but rarely the main driver of design decisions.*
- *Goals: what this user is trying to accomplish with the product, and what "success" looks like for*

them.

- *Pain points: what gets in their way: confusing steps, missing information, accessibility barriers, time pressure, anxiety about making mistakes, and so on.*
- *Often, you'll also see behaviours (how they currently do the task), motivations (what matters to them and why), and a short quote written in a natural voice that captures their mindset.*

Used well, personas are less about pretending you "know" a user and more about keeping the team honest: reminding everyone that every feature, label, and workflow lands on a person with a goal, a context, and a limited amount of patience. You can find and create Persona templates , like the one in ***Figure 6.4.2****, in various online platforms such as Canva and Figma.*

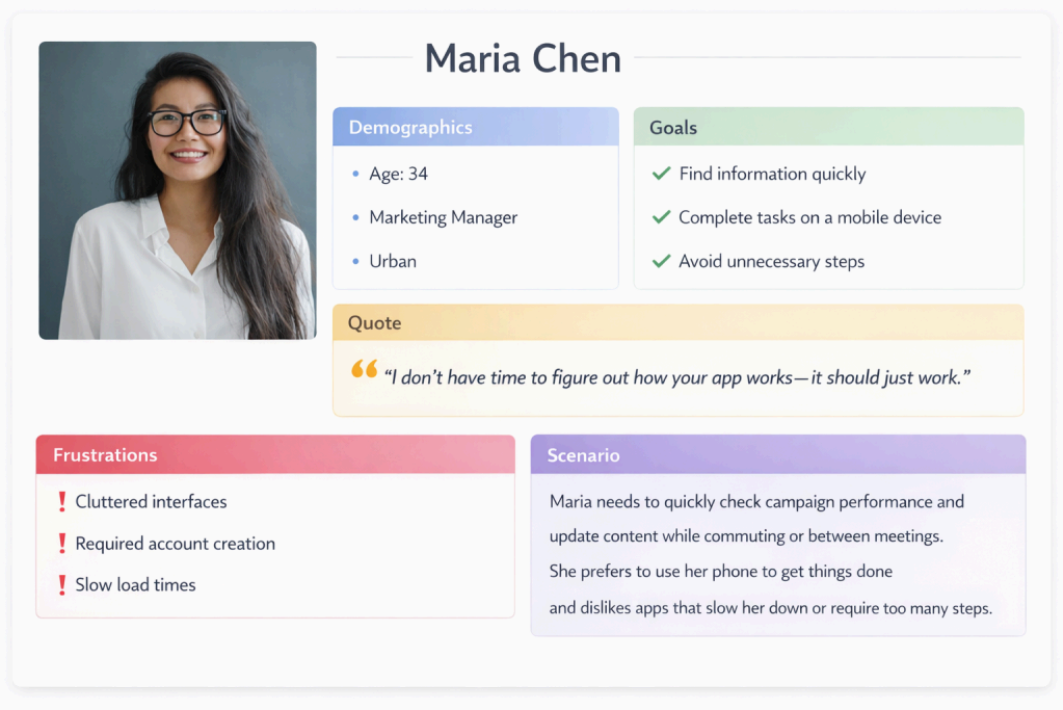


Figure 6.4.2 *Sample User Persona (created using Figma and Copilot)*

Personas only pay off if a team actually uses them, not if they get filed away in a slide deck and never mentioned again. In design discussions, they give you a simple way to stay grounded: "How would Maria approach this? Would she understand what this button does? Would this flow help her finish the task, or would it add friction?"

They're also useful when new ideas start flying around. If someone proposes a new feature, personas let you respond with something more concrete than opinion: "Which persona is this for?" "What goal does it support?" "Does it solve a problem we've actually seen, or are we designing for a hunch?" That shift away from "I think users want…" and toward "Our research suggests…" can defuse a lot of unproductive debate.

Most products need more than one persona, because different groups come to the same system for different reasons. A university site is a good example: prospective students, current students, parents, faculty, and community members all show up with different questions, time pressures, and levels of familiarity. At the same time, more personas aren't automatically better. Three to five strong, research-backed personas usually beat a dozen thin ones. The goal isn't to cover every demographic category; it's to capture the differences that actually change what the design needs to do.

EXERCISE 6.8 *Build a Persona from Observation*

You are part of a team that has been asked to improve the self-checkout system at your campus bookstore. Your job is to start creating a user persona. You will begin this task by using direct observations and experience following these steps:

1. Observe three to five people using the self-checkout system. Note their approximate age range, how confidently they approached the machine, where they hesitated, and whether they needed help.
2. Based on those observations, draft a single persona using the format described above. Include a **name** and brief **background**, **goals** (what they're trying to accomplish), **pain points** (where the current system makes things harder), and a **short quote** capturing their mindset.
3. Write a brief paragraph (three to five sentences) explaining what additional research you would need to do to strengthen this persona. What are you guessing about that you'd want evidence for?

Share your persona with a partner. How do your personas differ? What assumptions did you catch yourself making? How does this connect to the audience profile questions from Chapter 2.2?

Interviews and Contextual Inquiry

INTERVIEWS *are one of the best ways to understand users because they not only tell you what people do, they also instead help you uncover why they do it. A good interview can surface motivations, workarounds, mental models, and small frustrations users have gotten so used to that they don't even think to report them in a survey. It also gives you something you can't get from a fixed questionnaire: the ability to follow the conversation where it needs to go, especially when a participant says something unexpected or reveals a problem you didn't know to ask about.*

Most UX interviews are semi-structured. You might have a list of key topics, a rough sequence, a few must-hit questions, etc.; however, you don't treat it like a script. If the participant brings up something important, you pause and dig in. That flexibility is where a lot of the value comes from.

The best interview questions are open-ended and grounded in real events. You're trying to get participants to describe what actually happened, not to agree with your framing. "Tell me about the last time you tried to..." will usually get you a story: what they were doing, what they expected, where they got stuck, what they did next. A question like "Do you find it easy to...?" tends to produce a quick yes/no (or a polite answer) and doesn't give you much to work with. The goal is simple: get people talking about their experience in their own terms, then listen for the details that reveal needs, assumptions, and pain points.

Crafting Effective Interview Questions

Ask about specific experiences: "Walk me through the last time you renewed a library book online."

Avoid leading questions: Instead of "Was the checkout process confusing?" ask "How did you find the checkout process?"

Probe for details: "You mentioned that was frustrating—can you tell me more about what happened?"

Ask about workarounds: "When the app doesn't do what you need, what do you do instead?"

Explore the context: "Where are you usually when you use this? What else is going on around you?"

CONTEXTUAL INQUIRY *is basically what happens when you stop relying on people's memory and watch them work in real life. Instead of interviewing someone in a conference room and asking them to describe what they usually do, you observe them doing the task in their actual environment. If you're studying how nurses use an electronic medical records system, you learn far more by being at the nursing station during a shift than by showing them screenshots in a quiet room. The real setting exposes the stuff people forget to mention: interruptions, time pressure, noisy surroundings, handoffs between coworkers, and the little workarounds they've built to cope.*

The mix of observation and interview is what makes it so useful. You can see what someone does and then ask about it right away. When a participant takes an unexpected path, you can follow up in the moment: "I noticed you clicked there instead of using the menu. What were you looking for?" Those quick questions often uncover the best insights, because they reveal the user's logic and expectations, not just the "official" workflow.

Interviews and contextual inquiry also raise the ethical stakes, especially when you're in workplaces or other sensitive environments. The basics from Chapter 5.5 Engagement and Consultation apply directly: you need to consider issues like informed consent, confidentiality, and participant welfare. People should know what they're agreeing to, how recordings or notes will be used, and that they can

stop at any time. Researchers also need to be careful about privacy both in terms of the participants and anyone else who might appear in the background. Making a better product is a good goal, but it doesn't outweigh the responsibility to treat participants with respect.

EXERCISE 6.9 *Mini Contextual Inquiry: Observe, then Ask*

Contextual inquiry is a method where you observe someone performing a task in their real environment and then ask follow-up questions in the moment. Try this simplified classroom version.

Setup: Form into pairs where one person is the "user" and one person is the "researcher." The user will attempt a task on a real digital product while the researcher observes and takes notes. After five minutes, switch roles with a different task.

Suggested User Tasks:

- Find the office hours and email address for a specific instructor on your university's website or LMS.
- Figure out how to request a transcript through your school's student portal.
- Find and compare two products on an e-commerce site using only the site's filtering tools.
- Locate the return policy for a specific online retailer without using the site's search bar.

Researcher Instructions: Watch silently for the first two minutes. Note where the user clicks, pauses, backtracks, or shows signs of frustration. Then, during the remaining time, ask short follow-up questions in the moment: "What were you expecting to find there?" "What made you click that link?" "What would you try next?"

After both rounds, discuss:

- What did you notice as a researcher that the user didn't mention on their own?
- What did you learn as a user from being observed—did the experience make you more aware of your own habits or assumptions?
- How does this compare to the kind of audience analysis you'd do before writing a document (Chapter 2.2)? What can observation reveal that inference alone cannot?

Surveys

Interviews are great for depth, but they don't tell you how common something is. That's where surveys shine. With a well-built survey, you can reach hundreds or thousands of users and start seeing patterns you'd never pick up from a dozen interviews: how many people are primarily on mobile, whether satisfaction differs by user segment, which features matter most, where people tend to drop off, and so on.

The catch is that surveys are easy to do badly. A vague question produces vague data. A leading question produces the answer you were hoping for. A long survey produces half-finished responses as people bail. Keep questions clear and specific, avoid loaded wording, make response options cover the full range without overlapping, and keep the survey as short as you can while still getting what you need. Here are 10 Best Practices for writing good survey questions.

In UX work, surveys tend to show up in a few common roles:

- *Screeners to recruit the right participants for interviews or usability tests (e.g., "Have you done X in the last month?" "What device do you use most?").*
- *Satisfaction surveys to track attitudes over time, often using standardized scales so results are comparable.*
- *Feature prioritization surveys to help teams make tradeoffs when they can't build everything at once.*
- *Post-task surveys given right after someone completes a task, when their reaction is immediate and specific.*

Used well, surveys don't replace interviews; rather, they complement them. Interviews help you discover what to ask. Surveys help you find out how widespread the answers are.

The System Usability Scale (SUS)

One widely used survey instrument in UX research is the System Usability Scale, a ten-item questionnaire that provides a quick, reliable measure of perceived usability. Developed in 1986 and validated across thousands of studies, the SUS yields a score from 0 to 100 that can be compared against established benchmarks. A score above 68 is considered above average; scores above 80 indicate excellent usability. The SUS is freely available and can be administered after any user interaction with a product.

Surveys are strongest when they're part of a mixed-method approach. They're good at telling you what is happening at scale (e.g, what people use, where they struggle, how satisfaction differs across groups) but they usually can't tell you why.

So when a survey shows that users are abandoning a feature or rating it poorly, you bring in interviews, contextual inquiry, or usability testing to figure out why that is happening. Conversely, when interviews uncover a need or a frustration, a survey can help you answer the next question: is this a niche issue, or something many users experience?

That's why mature UX research programs rarely lean on a single method. They combine approaches

so the weaknesses of one method get covered by the strengths of another: breadth plus depth, numbers plus stories, patterns plus explanations.

From Research to Design

Research gives you raw material. Design asks you to make choices. The bridge between the two is analysis and synthesis: figuring out what the data is really telling you and turning it into something a team can act on. This is where the qualitative research skills you've built in technical communication start to matter a lot.

After interviews, researchers usually go back through recordings and notes looking for patterns. What comes up again and again across participants? Which problems show up independently in multiple conversations? Where do people seem to share the same mental model, and where do they interpret the product in totally different ways? That pattern-finding work, often called ***thematic analysis****, is what turns a pile of individual stories into insights you can design around.*

Those insights can be captured in a few common formats:

- *Personas, which condense patterns into a handful of user types.*
- *Journey maps, which lay out the steps users take to reach a goal and spotlight friction points and missed opportunities.*
- *Empathy maps, which organize what users say, think, feel, and do so the team keeps the user's perspective in view.*

These artifacts aren't just "research deliverables." They're reference points the team can come back to when discussions around design choices drift toward assumptions or personal preference.

One of the most important outcomes of synthesis is a clear statement of user needs and design requirements. The best requirements are specific and tied to evidence. If research shows that users abandon checkout because they don't see shipping costs until the end, a requirement might be: Show estimated shipping costs before checkout begins. If research shows mobile users are squeezing tasks in between other activities, a requirement might be: Make core tasks completable in under 60 seconds on mobile. These become criteria you can use to judge design solutions: does the new flow meet the requirement or not?

SYNTHESIS EXERCISE: ***From Research to Requirements***

The information above describes how research findings get turned into personas, journey maps, and design requirements. This exercise asks you to practice that synthesis step.

Scenario: Imagine you've just completed five interviews with students who use your university's online financial aid portal. Here are condensed findings from those interviews:

- Student A: "I never know where I am in the process. Did I submit everything? Is something missing? I just get silence until there's a problem."
- Student B: "I filled out the FAFSA on my phone because I was at work, and half the form didn't display right. I had to go home and redo it on my laptop."
- Student C: "My parents don't speak English well, and they had to verify some of the financial information, but the portal doesn't offer anything in Spanish."
- Student D: "Every time I call the financial aid office, they tell me something different than what the portal says. I don't know which one to trust."
- Student E: "I got an email saying my aid was adjusted, but when I logged in, nothing looked different. I still don't know what changed or why."

Your Task:

Identify three to four themes or patterns across these responses.

Write two concrete, evidence-based design requirements that address the most critical user needs. Follow the format described above: each requirement should be specific and tied to something you observed in the data. (For example: "Provide a visible status tracker showing each step of the financial aid process and its current state.")

Identify one question you'd want to investigate further, either through more interviews, a survey, or contextual inquiry. Explain what method you'd choose and why.

Discussion: Compare your themes and requirements with a partner. Did you prioritize the same issues? How did you decide what was most critical? This is where the "learn, build, test, revise" cycle from Section 6.1 starts to become concrete.

Taken together, the research methods in this chapter give you a practical way to move from guesswork to understanding. They help you see users more clearly, identify the problems that actually matter, and translate what you learn into personas, maps, and concrete design requirements a team can use. That's the through-line of UX research: creating user-centred decisions grounded in evidence, not assumptions.

7. COMMON DOCUMENT TYPES

Just as literary genres contain many sub-genres that each conform to their own set of conventions (for example the poetry genre contains specific forms such as sonnets, haiku, epics, limericks, etc.), technical writing also includes many forms, and each form has conventions to be followed. This chapter discusses several of the most common document forms, and reviews the generic expectations for content, formatting, and style conventions.

These forms are somewhat flexible, and can sometimes overlap, adapting to the needs of context, purpose and audience. However, since these forms have arisen to meet the needs of recurring rhetorical situations in the workplace, readers and writers of these genres generally expect them to follow certain conventions.

Chapter 7 Learning Objectives

In the following sections, you will learn about the general format, structure, style and content expectations for the following types of professional documents:

- **7.1 Correspondence: Text Messages, E-mails, and Letters**
- **7.2 Memos**
- **7.3 Technical Descriptions**
- **7.4 Proposals**
- **7.5 Progress Reports**
- **7.6 Short and Long Reports** (including Executive Summaries, Comparative Analysis, and Weighted Objectives Charts)
- **7.7 Lab Reports**
- **7.8 Instructions**

7.1 Correspondence: Emails and Letters

Netiquette

A great deal of business communication takes place over the internet. Text messaging, emailing, and posting on social media in a professional context requires that you be familiar with "netiquette," or appropriate etiquette for using the internet. We have all heard the news stories about people who have been fired for posting content online that contravenes company policies by being offensive, harassing, or discriminatory. There are also many examples of companies that have been boycotted for making social or marketing missteps. People have even gone to prison for illegal use of private messaging. The digital world may seem like a free-for-all, "wild wild west" with no clear rules or regulations; however, this is clearly a dangerous perspective for a professional to take, as the consequences for breaking implicit rules, expectations, and guidelines for professional communications can be costly.

We create social media accounts, post messages, and interact via online technologies as a normal part of professional communication. How we conduct ourselves online and represent ourselves in writing carries significant weight and can leave a lasting image, literally. Writing in an online environment requires tact, skill, and an awareness that what you write may be there for a very long time and may be seen by people you never considered as your intended audience. The photograph you posted on an Instagram page may have been seen by your potential employer or client, or that insensitive remark posted on X may come back to haunt you later. Avoid embarrassment by by following these "netiquette" guidelines.

Netiquette: Guidelines for Communicating Online

Know your context

- Familiarize yourself with policies on Acceptable Use of IT Resources at your organization.
- If you are not yet familiar with your "workplace culture", err on the side of formality.

Remember the human

- Avoid making assumptions about your readers; remember there is a person behind the words and ask for clarification if something seems "off." Remember that culture, gender and age can play a significant part in how people communicate

- Check your tone before you publish; avoid (or use with extreme caution) jokes, sarcasm, and irony as these can often be misinterpreted and get "lost in translation" in the online environment
- Respond to people using their names
- Remember that people may not reply immediately. People choose to work at different times (late in the day instead of early morning) and to participate in different ways (some just by reading the communication rather than jumping into into the conversation).

Recognize that text is permanent

- Be judicious and diplomatic; what you say online may be difficult or even impossible to retract later.
- When working collaboratively, agree on ground rules for text communication (formal or informal, etc); seek clarification whenever needed

Avoid flaming: research before you react

- Accept and forgive mistakes; we all make them at some point
- Consider your responsibility to the group and to the working environment
- Seek clarification before reacting; what you heard is not always what was meant
- If you must respond to an upsetting message, try waiting 24 hours if possible, to let emotions subside. Ask a colleague or peer to review your response before you send it.
- Ask your supervisor for guidance.*

Respect privacy and original ideas

- Quote the original author if you are responding with a specific point made by someone else
- Ask the author for permission before sharing or forwarding the communication.

** Sometimes, online behaviour can appear so disrespectful and even hostile that it requires attention and follow up from qualified individuals. In this case, let your supervisor know right away so that the right resources can be called upon to help.*

For further information on netiquette, check out this LinkedIn article: Email etiquette: Setting the tone for your professional communication

---

Email

1

Email is familiar tool for most students and workers, and in the workplace, has largely replaced hard copy letters for external (outside the company) correspondence, and in many cases, it has taken the place of memos for internal (within the company) communication.

The tone and style of professional emails can vary, depending on the context, but keep in mind professional communication still requires attention to detail, respectful tone, and an awareness that your email communication reflects you and your company. Remember also that an email can be forwarded to other readers, so never write or send anything that you wouldn't want read by other colleagues, your boss, or someone outside your organization. Follow the guidelines below to present yourself as a professional when sending emails.

Guidelines for Professional Emails

Use Your Professional Email: Avoid sending business emails from your personal email, especially if your email address sounds unprofessional or does not clearly identify who you are. Recipients might hesitate to open an email from "hoodooman21@me.com"

Subject Line: Including a clear, brief, and specific subject line helps the recipient understand the essence of the message. For example, "Electrical specs for project Y" or "Elevator maintenance in MacLauren D wing." Keep in mind that your email may be going out to all employees, but perhaps not everyone needs to read about the elevator being out of commission in the D wing of the MacLauren Building. If I never go into that building, I may see the subject line and delete the email without having to reading it.

Salutation: Beginning your message with an appropriate salutation, addressing your reader by name if possible, demonstrates respect and can avoid mix-ups in case a message is accidentally sent to the wrong recipient. For example, use a formal salutation like "Dear Ms. Xi" (external) or "Hello Mei" (internal).

Message Format: divide your message into clear paragraphs for ease of reading. Be as concise as possible. A good email should (a) convey the main point quickly, (b) add whatever details are necessary, and (c) indicate what actions you might expect from the reader.

Style: Use a formal style unless you are confident that the rhetorical situation allows for an informal approach. Explain abbreviations and acronyms unless you are sure your reader is familiar with them. Avoid sarcasm, irony, or humour that may be misinterpreted.

Close with a signature: identify yourself by creating a signature block that automatically contains your name, title, and business contact information.

Reread, review, and revise: catch and correct spelling and grammar mistakes *before* you press "send." Make sure you have actually attached that document you said is attached; make sure any links you have embedded work and take the reader where they are supposed to go. It will take more time and effort to react to the problems caused by a hasty, poorly-written email than to proactively take the time to get it right the first time.

Reply promptly: comply with the standard reply time of your organization. Often, readers will expect a response within 24 hours (during the work week), even if your reply is simply to acknowledge the message and indicate when the reader may expect a more detailed response. Some contexts have faster or slower expectations for turn around times. When dealing with sensitive or emotional topics, try to maintain a calm and reasonable tone and stick to factual information; never reply in anger.

Use "Reply All" sparingly: do not send your reply to everyone who received the initial email unless your message absolutely needs to be read by the entire recipient list.

Understand CC and BCC: CC stands for carbon copy; you can CC someone on an email to keep them in the loop, but not necessarily expect a response from them. BCC means "blind carbon copy" — if you use this, your main recipient will not know that you have also sent this message to the BCC recipient. It can be seen as deceptive to BCC, so be careful how you use it.

Avoid using ALL CAPS: using all capital letters in an online context tends to suggest emphatic emotion or "yelling" and can be considered rude.

Test links: if you include a link, test it to make sure it works.

Email ahead of time if you are going to attach large files: audio and visual files are often quite large; be careful to avoid exceeding the recipient's mailbox limit or triggering the spam filter. If possible, send a link to where the reader can access the file online.

Follow up: if you don't get a response in twenty-four hours, email or call. Spam filters may have intercepted your message, so your recipient may never have received it. Don't assume they are ignoring you.

Pro Tip: Add the email address of your recipient **last,** after you have written and proofread your message. This will prevent you from sending prematurely. Take the time to do a last review of what you've written, make sure links work, and make sure you've added the attached document, before adding the recipient's email address and hitting send.

Letters

Letters are typically sent to recipients who are outside the organization. They are often printed on letterhead paper that represents the business or organization, and are generally limited to one or two pages (but can be longer). While email may be used more frequently today, the business letter remains a common form of written communication. A cover letter can serve to introduce you to a potential employer; a sales letter can announce a new product or service; a complaint letter can alert a company to a problem with its product; and a letter of transmittal can introduce a longer formal report.

There are many types of letters, and many ways to format them. The most formal way to format a letter is to use the traditional ***block*** *style, illustrated in* ***Figure 7.1.1,*** *a sample letter of transmittal meant to introduce a technical report to its recipient. Block style means everything on the page (except perhaps the logo and/or letterhead) is aligned on the left margin.*

Blue Fish Design Team (*Sender*)
123 University Way
Our Town
Email: abc123@somemail.com

23 November 2022

Ms. Client, Director of Operations (*Receiver*)
Green Innovations R Us
ABC Synergy Road,
Any Place

Dear Ms. Client:

Please find enclosed our recommendation report in response to your RFP of September 2022.

Our report provides detailed descriptions of two prototype designs developed and tested in our lab. The designs are compared according to the criteria outlined in your request, as well as some additional criteria determined by our design team. The two prototypes offer advantages and disadvantages for different contexts; given the stated preference to cause as little disturbance to the environment as possible, we recommend Prototype A for further development. However, given the strengths of prototype B in other areas, we are including it in the report in case you wish to give it further consideration.

Thank you for taking the time to consider our design proposals and recommendation. If you have any further questions, please feel free to contact us at the email address provided. We look forward to hearing your feedback, and to working with you in the future.

Sincerely,

Stu Dent — Ann Onymous — I. M. Writer

Stu Dent — Ann Onymous — I. M. Writer

Attachment: Blue Fish Design Recommendation Report

Figure 7.1.2 *Sample Letter of Transmittal*

Typical Elements of a Business Letters

Letterhead or logo	Companies typically have a standard letterhead that everyone uses when writing letters. This may or may not include a return address
Sender and Return address	Include your name and the address where replies can be sent (unless this information is included in the letterhead)
Date	Follow the standard date conventions used in your workplace (e.g. year-month-day is standard in Canadian government writing)
Recipient name and address	Include the name and title (if you know it) of the intended recipient, and the mailing address you have sent the letter to.
Re:	Some letters will include a subject line, like in a memo, indicating what the letter is in reference to (e.g. RE: your letter of August 12 requesting additional information…) or explaining the purpose of the letter.
Salutation	Formal letters generally start with "Dear" followed by first and last name, if you know them, or the title or position of the recipient, if you don't know their name. Avoid assuming gender with terms like Ms. or Mr.
Message	Follow a logical structure by first indicating your purpose; then provide the details; and conclude by indicating what action or response you expect from the reader.
Sign off	Formal letters typically end with "Sincerely" followed by the signature of the sender(s), and their name(s) typed below.
Enclosure	If your letter introduces an attached document (form, report, or resume), use the word "Enclosure" (or ENC) followed by the title of the document, to indicate that the reader should find this attached.

Letters with Specific Purposes

There are many possible reasons you might write a letter in a professional context. Here is a list of the most common kinds of letters:

Transmittal Letters: *when you send a report or some other document, such as a resumé or brochure, to an external audience, you typically introduce it with a cover letter — called a letter of transmittal — that briefly explains the purpose of the enclosed document and a brief summary. Click the link to download a Letter of Transmittal Template (.docx).*

Letters of Inquiry: *you may want to request information about a company or organization such as whether they anticipate job openings in the near future or whether they fund grant proposals from non-profit groups. In this case, you would send a letter of inquiry, asking for additional information. As with most business letters, keep your request brief, introducing yourself in the opening paragraph and then clearly stating your purpose and/or request in the second paragraph. If you need very specific information, consider placing your requests in list form for clarity. Conclude in a friendly way that shows appreciation for the help you will receive.*

Follow-up Letters: *any time you have made a request of someone, write a follow-up letter expressing your appreciation for the time your recipient has taken to respond to your needs or consider your job application. If you have had a job interview, the follow-up letter thanking the interviewer for his/her time is especially important for demonstrating your professionalism and attention to detail.*

Letters can have numerous additional purposes, such as communicating with suppliers, contractors, partner organizations, clients, government agencies, potential funders, and so on. See this resource on Business Letters for more detailed information and guidance on writing various kinds of business letters. As with any professional writing, your letter is most likely to be successful if you take the time to understand your audience, context and purpose.

Notes

1. *[Email icon]. [Online]. Available: https://www.iconfinder.com/icons/4417125/%40_email_envelope_letter_icon. Free for commercial use.*

7.2 Memos

A *memo*, *or* ***memorandum*** *(meaning reminder) is one of the most versatile document forms used to communicate professionally. Memos are generally "in house" documents (sent within an organization, between departments or offices) to provide or request information, outline policies or agreements, provide short reports, introduce longer reports, and propose ideas. They are often used to send information from one person to all members of an organization, unit, department or office, to update them on policies, procedures, and activities. They can also be intended for a smaller audience or even a single recipient. While they are often used to inform, they can also be persuasive documents, proposing ideas, recommendations, and calls to action. Clearly, this form is the "work horse" of professional communication!*

Memos typically focus on one key idea, making the point efficiently, so that the reader will understand what action may be needed. Taking the time to craft a clear and concise message pays off in creating efficient workflow down the line.

Memo Format

Despite its versatility in terms of purpose, a memo has a fairly standard conventional format that looks similar to an email format (or rather, an email looks similar to a memo format, since memo pads were around long before email was invented). A company or institution may have its own "in house" memo template, but this will generally conform to a generic memo format illustrated in the sample memo below.

MEMO **LOGO**

To: Students in ENGR 120-A01
From: Suzan Last, Instructor
Date: Sept 20, 2026
Subject: Memo assignment description

Assignment Overview
This assignment asks you to present your preliminary ideas for…. (*add info about background, context and purpose as needed*)

Assignment Specifications
Your memos should contain the following content elements and should abide by the formatting requirements outlined in the course Style Guide…. (*provide the details the reader needs*)

Submission Requirements
Please submit all memos to …
If you have questions, please … (*indicate action items for the reader*)

Memos are one of the few document forms that announces its form (letters do not include the word LETTER at the top of the page). The word MEMO or Memorandum is usually place in the top left corner using the largest font in the document (a hold-over from the memo pad days). The company logo usually appears on the top right corner or centre.

***The Header Block**, if crafted well, can efficiently offer a great deal of information about the rhetorical situation of the memo*

> **To**: *Identifies the intended **audience** of the memo; this could a specific group or an individual; include their name and job title or position within the organization whenever possible to help establish context.*
>
> ***From***: *Identifies the **author** of the memo, indicating who the message is coming from. Again, this should include the author's position or job title.*
>
> ***Date***: *Including the date the memo was sent can provide important **context**, especially since the memo are often saved or archived and can be read several weeks, months, or even years later in needed to clarify why a decision was made or how a policy might have changed.*
>
> ***Subject***: *The subject line should clearly indicate the **purpose** of the memo as precisely and concisely as possible in a short phrase. If your message is sent to everyone in the office, but not everyone really needs to read it to do their job, the subject line can let them know that they can ignore this. Be careful to craft the subject line to ensure that those who need to read it will do so.*

There is often a dividing line between the header block and the memo's message.

***The Message** portion of the memo can range from a few short sentences to a multi-page report that includes headings, figures, tables, and appendices. Whatever the length, there is a straightforward*

organizational principal you should follow. Organize the content of your memo so that it answers the following questions for the reader:

Opening: *Why am I reading this? (do I have to read this?)*

Details: *What do I need to know?*

Closing: *What am I expected to do now?*

OPENING: *Memos are generally very direct and concise. They typically do* ***not*** *start with salutations (Dear Mr. Jiang), friendly openers ("I hope you are enjoying the warm weather"), or general introductions before getting to your point. Your readers are colleagues within the same organization, and are likely at least somewhat familiar with the context in which you are writing. Your opening should clearly and quickly indicate your purpose in writing and provide any necessary context. The opening sentences of the memo's message should make it clear to the reader whether they need to read this entire memo and why (if the memo is informing me about an elevator that's out of service in a building I never enter, then I don't really have to read any further).*

DETAILS: *The middle section of the message should give all of the information needed to adequately inform the readers and fulfill the purpose of the memo. If they need to make a decision, this section should give them all the data and persuasive arguments they need to fulfill that purpose. Start with the most general information, and then add the more specific facts and details. Make sure there is enough detail to support your purpose, but don't overwhelm your readers with unnecessary details or information that is already well known to them. The length of this will depend on your purpose, but may range from a few sentences to multiple paragraphs or titled sections.*

CLOSING: *The final part of the message indicates what, if any, action is expected of the readers. If you are asking your readers to do something, be as courteous as possible, and try to indicate how this action will also benefit them. Let the reader know how to follow up if necessary.*

Traditionally, memos ended in a signature (back when we had actual Memo Pads); but since memos are now typically sent digitally, and the author is clearly indicated in the header block, a signature is now optional.

EXERCISE 7.1 *Create an Outline for a Memo*

Imagine you have a memo to write — perhaps it's an upcoming assignment, or maybe you'd like to present a formal proposal to your roommate for upgrading your internet service. Use a formal process to start outlining your content and structure:

1. **Task Analysis**: what is your goal? what do you want to accomplish by writing this memo? Have you been given some instructions or criteria to follow? Review them carefully to make sure you understand them.
2. **Audience Analysis**: What do you know about your audience? How do they fit into the context of what you are writing about? Why might they want to read your memo? What is their purpose? What do they want to accomplish? What do they need to know in order to do what you want them to do after reading it?
3. **Header Block:** Try to get as much specific, concrete information into your header block in the most concise way possible so that you establish a clear rhetorical situation. After "**TO**" place the name and position of the person you are sending this to. After "**FROM**" put your own name and relevant position. The date is self-evident, but put serious thought into the "**SUBJECT**" line. How can you convey your purpose clearly using as few words as possible? You don't want your subject line to go over one line, but you want to reader to get a clear sense of what this memo is about and why it's important to read it.
4. **The Message:** outline your message, paying attention to the 3-part structure outlined above, and drawing on your task and audience analysis. Try to imagine this from the reader's perspective and address these questions:

   Why am I reading this? Quickly and clearly get to the point of your memo

   What do I need to know? Outline the details you will need to include, keeping the task requirements and the needs of your reader in mind. Consider how best to organize and structure these ideas. Will you make use of headings, lists, and/or visuals to help enhance readability and clarity? What is the most logical order to use when presenting the details? Will some ideas need additional supporting data and research? What rhetorical strategies will most effectively persuade this audience?

   What do you expect me to do now? Clarify what you want the reader to do after reading your memo as politely as possible. You may want to reinforce the key arguments you have presented in order to drive the message home. For example, you might have a "call to action" (*I look forward to receiving your reply/ feedback*); or a recommendation (*I hope you agree that the tangible benefits of implementing the new system are worth the cost*); or simply an invitation to "please feel free to contact me if you would like more information."

7.3 Technical Descriptions

Descriptive technical writing uses a combination of visuals and text to both "show" and "tell" the reader about the information being conveyed. Like more creative descriptions, technical descriptions sometimes draw on the "five senses" and figurative comparisons (similes, metaphors, and analogies) to allow the reader to fully conceptualize what is being described. More often, however, they rely on concrete, measurable descriptors. Technical descriptions can take many forms, depending on purpose and audience. Depending on the reader's need, the description may range from a general overview requiring only a few sentences to a multi-chapter manual detailing every aspect of the mechanism's parts and functions in order to troubleshoot technical problems and complete repairs. For a fun fictional example of the latter, see the Star Trek: The Next Generation: Technical Manual (cover depicted in ***Figure* 7.3.1**), *which provides detailed descriptions of all equipment and technology used aboard the fictional U.S.S. Enterprise-D.*

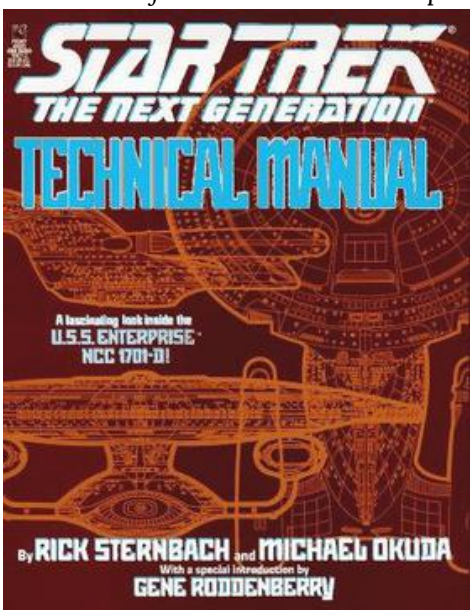


***Figure* 7.3.1** *Cover Page of "Star Trek: The Next Generation: Technical Manual".*[1]

Technical product descriptions are often legally required to ensure safety and compliance. Poorly written technical descriptions can cause confusion, waste time, and even result in catastrophe! Attention to detail is critical.

Product specifications require detailed descriptions of design features; instructions often require specific descriptive detail to "show" the reader what to do and what something should look like at each stage of a process. Some general categories of technical descriptions include the following:

Mechanism Descriptions *provide a detailed overview the physical aspects of a tool, machine or*

other mechanical device that has several parts and is designed to perform a specific function. These could be product descriptions for sales or manufacturing, documentation of design specifications, infographics, etc. This chapter focuses in detail on this kind of description.

***Process Descriptions** detail a series of events (natural/biological/ecological, mechanical, social, or psychological phenomenon) that happen in particular sequence in order to achieve a specific outcome. These can be categorized into **non-instructional** processes (such as a process analyses of how an internal combustion engine works, or natural processes like photosynthesis) and **instructional** process (such as recommended/required procedures and explicit step-by-step instructions to be followed). (See Section 7.3 for detailed information on Writing Instructions). A scientific lab report contains a description of the process, or methodology, used in conducting the experiment. The description must be detailed enough to allow the reader to replicate the process.*

Technical Description of a Mechanism

Mechanism descriptions should provide a clear understanding of the object being described, including

- *Its name (or general category of items it belongs to)*
- *Overall function/purpose*
- *General appearance and physical properties*
- *Component parts*
- *How the parts interact to create a functioning whole*
- *Any background information or warnings necessary to understand or operate the device.*

The reader should be able to clearly picture, and therefore understand, the nature of the object being described, what it does, and how it works.

In order to achieve this clarity for the reader, the writer must choose which details to include and organize information logically. Consider which of the characteristics in the box below might be relevant to the mechanism you want to describe.

colour	*materials*	*texture, smell, taste*
shape	*component parts*	*finish*
size, mass, weight	*properties*	*patterns, designs*
dimensions	*principles at work*	*interactions*

*Before you begin to draft your description, you must consider your **purpose** and **audience**: Why does your audience need this description? What will they use it for? Are you describing different types of solar panels for the average consumers to help them choose the one that best fits their needs or to electrical engineering students to help them understand how the technology works? Are you explaining a mockup for a website to client with little technical knowledge or to the IT person who must implement your mockup design? Are you providing schematics to technicians and installers to help them implement plans or to inspectors who need to make sure you are following code requirements? Your descriptions might differ depending on the audience and purpose.*

Technical Description Worksheet

First, take notes that help you identify your purpose and audience. Once these are clearly in focus, take notes on each of the following typical elements of a technical description and use your notes to write a draft:

1. ***Definition***: Identify what the device is, what it's called, and explain its purpose.
2. ***Overview***: Describe the mechanism's overall appearance ("big picture" description of its overall size, shape, general appearance to give the reader a mental picture).
3. ***Components***: Describe the main component parts in labelled sections; consider the order of information carefully here. Create a logical flow that explains the connection between each component described. It should be clear why you describe component X before you describe component Y.
4. ***Explanation:*** how do the parts work together to fulfill its function? What key principles govern its functioning? Consider how much detail is necessary here for your intended audience.
5. ***Visuals:*** include graphics that clearly illustrate the mechanism as a whole and its relevant component parts. Will you use a photo or diagram? Consider showing specific details in expanded views, cut-aways, exploded views, or labelled diagrams. You may even embed or link to videos showing the device in action.
6. ***Conclusion***: depending on the purpose, you might review the product's history, availability, manufacturing information, warnings, *etc.*)
7. ***References***: Cite any sources you have used in your description, or provide links to additional sources of information available (if relevant).

Sample Descriptions

Examine the description of the "Up Goer Five" in **Figure 7.3.2** *(click on image for larger version). Who might the intended audience be?*

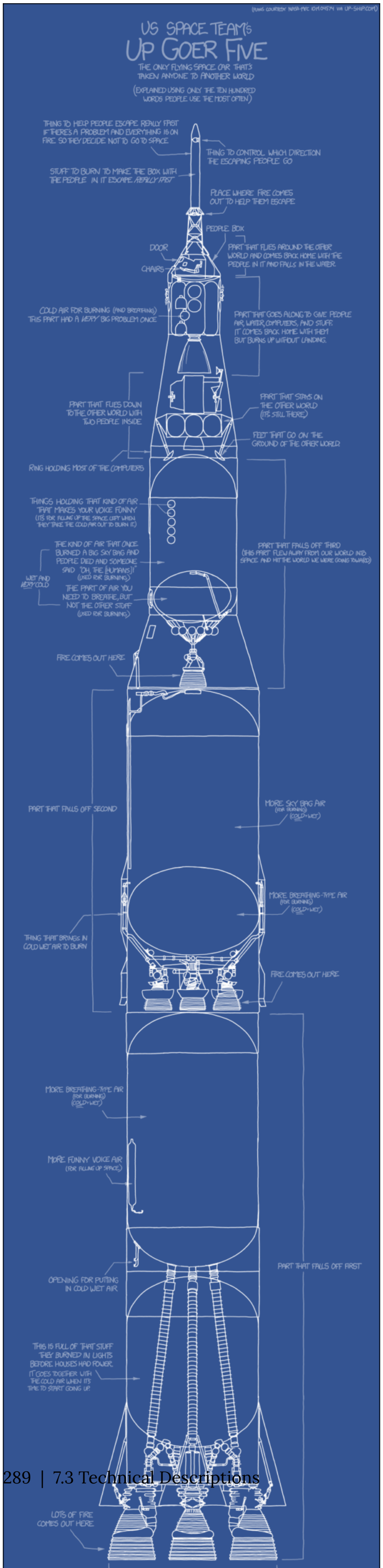

(PLANS COURTESY NASA-MFC 10M04574 VIA UP-SHIP.COM)
US SPACE TEAM'S
UP GOER FIVE
THE ONLY FLYING SPACE CAR THAT'S TAKEN ANYONE TO ANOTHER WORLD
(EXPLAINED USING ONLY THE TEN HUNDRED WORDS PEOPLE USE THE MOST OFTEN)
THING TO HELP PEOPLE ESCAPE REALLY FAST IF THERE'S A PROBLEM AND EVERYTHING IS ON FIRE SO THEY DECIDE NOT TO GO TO SPACE
THING TO CONTROL WHICH DIRECTION THE ESCAPING PEOPLE GO
STUFF TO BURN TO MAKE THE BOX WITH THE PEOPLE IN IT ESCAPE REALLY FAST
PLACE WHERE FIRE COMES OUT TO HELP THEM ESCAPE
PEOPLE BOX
DOOR
CHAIRS
PART THAT FLIES AROUND THE OTHER WORLD AND COMES BACK HOME WITH THE PEOPLE IN IT AND FALLS IN THE WATER
COLD AIR FOR BURNING (AND BREATHING) THIS PART HAD A VERY BIG PROBLEM ONCE
PART THAT GOES ALONG TO GIVE PEOPLE AIR, WATER, COMPUTERS, AND STUFF. IT COMES BACK HOME WITH THEM BUT BURNS UP WITHOUT LANDING.
PART THAT FLIES DOWN TO THE OTHER WORLD WITH TWO PEOPLE INSIDE
PART THAT STAYS ON THE OTHER WORLD (IT'S STILL THERE)
FEET THAT GO ON THE GROUND OF THE OTHER WORLD
RING HOLDING MOST OF THE COMPUTERS
THINGS HOLDING THAT KIND OF AIR THAT MAKES YOUR VOICE FUNNY (IT'S FOR FILLING UP THE SPACE LEFT WHEN THEY TAKE THE COLD AIR OUT TO BURN IT.)
THE KIND OF AIR THAT ONCE BURNED A BIG SKY BAG AND PEOPLE DIED AND SOMEONE SAID "OH, THE [HUMANS]!" (USED FOR BURNING)
WET AND VERY COLD
THE PART OF AIR YOU NEED TO BREATHE, BUT NOT THE OTHER STUFF (USED FOR BURNING)
PART THAT FALLS OFF THIRD (THIS PART FLEW AWAY FROM OUR WORLD INTO SPACE AND HIT THE WORLD WE WERE GOING TOWARD)
FIRE COMES OUT HERE
PART THAT FALLS OFF SECOND
MORE SKY BAG AIR (FOR BURNING) (COLD+WET)
MORE BREATHING-TYPE AIR (FOR BURNING) (COLD+WET)
THING THAT BRINGS IN COLD WET AIR TO BURN
FIRE COMES OUT HERE
MORE BREATHING-TYPE AIR (FOR BURNING) (COLD+WET)
MORE FUNNY VOICE AIR (FOR FILLING UP SPACE)
PART THAT FALLS OFF FIRST
OPENING FOR PUTTING IN COLD WET AIR
THIS IS FULL OF THAT STUFF THEY BURNED IN LIGHTS BEFORE HOUSES HAD POWER. IT GOES TOGETHER WITH THE COLD AIR WHEN IT'S TIME TO START GOING UP.
LOTS OF FIRE COMES OUT HERE

***Figure* 7.3.2** *A description of the blueprints for NASA's Saturn Five rocket using only the 1000 most commonly-used English words* [2]

Compare the description in ***Figure* 7.3.2** *to the information given on the NASA website about the Mars Curiosity Rover.*

Note the differences in the level of detail, vocabulary, and overall purpose of the descriptions. If you used the information on the NASA site to fill in the **Technical Description Worksheet** *above, you might end up with something like the following chart.*

Template for Description of Mars Curiosity Rover

Definition	Curiosity Rover – a robot designed by NASA to explore Mars, collect data and send it back to Earth
Function	Launched in 2011, Curiosity travels around the Gale Crater on Mars, collecting information about the planet to send back to Earth. Its mission is to see if Mars could ever have supported microbial life, and to help determine if Mars could someday be inhabited by humans.
Overview	Car-sized, 6 wheel robot, about 7' tall, with a roughly square chassis that has several appendages connected to it that house sensors of various types
Components	• Main body protects the computer, electronics and instrument systems • "Neck and head" like a mast coming out of the centre of the chassis, this houses many of the rover's cameras • Six legs – "rocker bogie" design – wide apart, allows all wheels to remain on uneven terrain • Arm – roughly 7 ' long, (with "shoulder, elbow and wrist" joints), with a "hand" at the end, extends out of the front of the chassis. This contains many tools for drilling, collecting samples, etc. • "Tail" – contains radio-isotopic power source that powers the rover • Click here for more detail about Curiosity's Science Instruments
Visuals	• Overall view (front and side? Top view?) • View of arm with labeled components (see NASA figure) • View of head and neck with labeled components
Conclusion or Supplemental information	Information about lifespan? Travel speed? Energy use?
References	NASA Mars Science Laboratory – Curiosity Rover page

You may find that some of these elements are not necessary; again, consider what your target audience already knows and needs to know. Strike a balance between unnecessarily stating the obvious and incorrectly assuming your readers have knowledge that they may lack.

In refining the details of your description and its component parts, consider your organizational strategy and language style:

Organization: *Determine the most logical principle to organize your description:*

- *Steps in a process it completes*
- *Top to bottom (or foundation upward)*
- *Left to right (or right to left)*
- *Most important to least important features*
- *Central component to peripherals (or external frame to internal components)*
- *Material properties, etc.*

Language: *Use specific, precise, concrete terms – avoid vague or overly-general terms*

- *Use correct terminology, and define terms as necessary for your audience*
- *Use analogy to describe an unfamiliar thing by comparing it to a familiar thing*
- *Use concrete objective language, avoid subjective terms*
- *Use present tense, active verbs to describe how the device appears and what it does*
- *Use words that create vivid and specific pictures in the reader's mind.*

EXERCISE 7.2 *Practice technical description*

Choose a common, everyday object (such as the object below) and draft a technical description for an audience unfamiliar with this mechanism. Start by imagining a target audience and purpose, and then try filling in the Technical Description Worksheet with detailed information. Using the information in your worksheet, draft a short description of 1-2 paragraphs, and add properly-captioned visuals.

bicycle,red,bike,cycle,cycling,sport,ride,biking,wheel,pedal,vehicle,exercise,icon,gear,free vector graphics,free pictures, free photos, free images, royalty free, free illustrations, public domain

I**mage source**: https://www.needpix.com/photo/180712/

Notes

1. *R. Sturnback and M. Okuna, Star Trek: The Next Generation: Technical Manual. New York: Pocket Books, 1991.*
2. *R. Munroe, "Up Goer Five" [Online]. Available: https://xkcd.com/1133/ Also see "1133 Up Goer Five – explained," Explain xkcd wiki [Online]. Available: https://www.explainxkcd.com/wiki/index.php/*

1133:_Up_Goer_Five . CC-BY-NC 2.5.

7.4 Proposals

A proposal, in the professional writing context, is a document that tries to persuade the reader to implement a proposed plan or approve a proposed project or idea. Most companies and organizations rely on effective proposal writing to ensure successful continuation of their business and to get new contracts. The writer tries to convince the reader that the proposed plan or project is worth doing (worth the time, energy, and expense necessary to implement or see through), that the author represents the best candidate for implementing the idea, and that it will result in tangible benefits.

Not that kind of proposal. [1]

Proposals are often written in response to a ***Request For Proposals*** (RFP) *by a government agency, organization, or company. The requesting body receives multiple proposals responding to their request, evaluates the submitted proposals, and chooses the best one(s) to go forward. Their evaluation of the submitted proposals is generally based on how well the proposal demonstrates a clear understanding of the problem and how well the proposed solution idea meets the requirements outlined in the RFP. Thus, your proposal must* ***persuade*** *the reader that you understand the needs, values and goals of your reader, and your idea is the one most worth pursuing. Proposals are persuasive documents intended to initiate a project and get the reader to authorize the course of action proposed in the document.*

Proposals can have various purposes and thus take many forms. Depending on the kind of proposal you are writing, they may include some of the following sections:

- *Introduction and/or background context*
- *Statement of problem to be solved (or opportunity to improve or innovate)*
- *Purpose/motivation/goal/objectives*

- *Definition of scope and approach (limitations)*
- *Review of the state of the art; market analysis*
- *Social Landscape Analysis*
- *Technical background*
- *Project description*
- *Schedule of work/timeline*
- *Validation plan; or Marketing plan*
- *Budget*
- *Qualifications*
- *Conclusion*

A proposal in a business context might have sections that focus on market analysis, customer profiles, financial planning and promotional strategies. A technical proposal might place more emphasis on technical descriptions, reviewing the state-of-the-art technology, and creating a plan for validating the solution.

Four Kinds of Proposals

There are 4 kinds of proposals, categorized in terms of whether or not they were requested, and whether they are meant to solve a problem within your own organization or someone else's. From the following descriptions, you will see that can they also overlap to some degree:

> ***Solicited Proposals:*** *an organization identifies a situation it wants to improve or problem that it wants to solve and issues a Request for Proposals (RFP) on how to address or solve it. The requesting organization will vet proposals and choose the most convincing one, using a detailed scoring rubric to determine which proposal best responds to the request.*
>
> ***Unsolicited Proposals:*** *a writer perceives a problem or an opportunity and takes the initiative to propose a way to solve the problem or take advantage of the opportunity (without being requested to do so). This can often be the most difficult kind of proposal to get approved, especially if they require significant resources that were not budgeted for previously.*
>
> ***Internal Proposals:*** *these are written by and for someone within the same organization. Since both the writer and reader share the same workplace context, these proposals are generally shorter than external proposals, and usually address some way to improve a work-related situation (productivity, efficiency, profit, etc.). As internal documents, they are often sent as memos, or introduced with a memo if the proposal is lengthy.*

External Proposals: *these are sent outside of the writer's organization to a separate entity (usually to solicit business). Since these are external documents, they are usually sent as a formal report (if long), introduced by a cover letter (letter of transmittal). External proposals are usually sent in response to a Request for Proposals (solicited), but not always.*

EXERCISE 7.3 *Task Analysis*

Identify the kind of proposals you are tasked with writing by placing them within the grid below. Given the kind of proposal you are writing and the rhetorical situation you are in, what forms will be most appropriate to use (memo, letter, short or long report, oral presentation, *etc.*)?

	Solicited	**Unsolicited**
Internal		
External		

Structuring Your Proposal

Each proposal will be unique in that it must address a particular audience, in a particular context, for a specific purpose. However, the following offers a fairly standard organization for many types of proposals:

Introduction/ Background	*Clearly and fully define the problem or opportunity addressed by the proposal. You may need to include background to convince the reader that you fully understand the problem or "unsatisfactory situation" and can solve it. Rubrics that assess proposals generally place significant weight (~20%) on clarity and accuracy of the problem definition.* ***Briefly** presents the solution idea that you will describe in more detail in the following sections.*
Project Description	*Detailed description of the proposed solution idea, including its scope (what it will and won't do), and information necessary to understand **how** and **why** it should be implemented (implementation plan or methodology, potential obstacles, costs and benefits). This will likely be the most detailed part of the proposal and may be broken down into several sub-sections.*
Credentials	*Establish writer's qualifications and experience to pursue this project.*
Timeline and Budget	*Provide a detailed timeline (often with a Gantt Chart) for completing the project. Provide an itemized budget for resources necessary to complete the proposed project.*
Conclusion	*This is your last chance to convince the reader that your proposal has significant merit and can offer tangible benefits; sum up persuasively, but avoid hyperbole.*
References	*List your research sources, including links.*

Language Considerations

All proposals must be convincing, logical, and credible, and to do this, they must consider audience, purpose and tone.

> *"An engineering proposal is not an advertisement. It must show, with objective language, clarity, and thoroughness, that the writers know what they are doing and will successfully complete the project."*[2]

Proposals are fundamentally persuasive documents, so paying attention to the rhetorical situation—position of the reader (upward, lateral, downward or outward communication), the purpose of the proposal, the form, and the tone—is paramount.

- *Clearly define your purpose and audience before you begin to write*
- *Be sure you have done research so you know what you are talking about and can sound credible*
- *Remain positive, constructive, and solution-oriented: you are seeking to improve a situation,*

but avoid writing overly negative descriptions of the current "unsatisfactory situation" that might be seen as "blaming" or judging.
- Make your introduction very logical, objective, and empirical; don't start off sounding like an advertisement making hyperbolic claims about "revolutionizing" anything; avoid logical fallacies and claims that damage your credibility.
- Use primarily logical and ethical appeals; use emotional appeals sparingly; appeals to values, pride, and compassion can be effective if used carefully.

As always, adhere to the 7 Cs by making sure that your writing is

- **Clear and Coherent**: don't confuse your reader with unclear ideas or poorly organized information.
- **Concise and Courteous**: don't annoy your reader with clutter, unnecessary padding, inappropriate tone, or hard-to-read formatting.
- **Concrete and Complete**: provide specific, precise and detailed information; avoid vague generalities and ambiguity. Provide all requested information, plus any additional information necessary to achieve your purpose.
- **Correct**: don't undermine your professional credibility by neglecting the mechanics of style, or by including inaccurate information. Fact check and proofread!

The Life Cycle of a Project Idea

A great idea does not usually go straight from proposal to implementation. You may think it would be a great idea to construct a green roof on top of one of the campus buildings, but before anyone gives you the go ahead for such an expensive and time-consuming project, they will need to know that you have done research to ensure the idea is cost effective and feasible, and that it will be acceptable to the community and organizations involved. **Figure 7.4.1** breaks down the various stages a project might go through, and identifies some of the typical communications tasks that might be required at each stage.

Most ideas start out as a proposal **to determine** if the idea is really feasible, or **to find out** which of several options will be most advantageous. So before you propose the actual green roof, you propose to study whether or not it is a feasible idea. Before you recommend a data storage system, you propose to study 3 different systems to find out which is the best one for this particular situation. Your proposal assumes the idea is worth looking into, convinces the reader that it is worth spending the time and resources to look into further, and gives detailed information on how you propose to "look into" this idea more fully.

Figure 7.4.1 *Phases of a project and some accompanying communications tasks [Image Description]*

Once a project is in the implementation phase, the people who are responsible for the project will likely want regular status updates and/or progress reports to make sure that the project is proceeding on time and on budget, or to get a clear, rational explanation for why it is not. To learn more about Progress Reports, go to the next chapter: *7.5 Progress Reports**.*

Image descriptions

Figure 7.4.1 image description:

A project goes through a design process made up of five stages.

1. *Inspiration*
    - *You have a great idea! Share it with others*
    - *Convince them it's worth pursuing. Get approval to go ahead.*

1. *Pre-project planning.*
    - *Form a team*
    - *Define the problem*
    - *Conduct research*
    - *Public engagement*
    - *Possible approaches*

- *Project Development.*
    - *Create or respond to an RFP; write a proposal*
    - *Create or respond to a request for proposals, evaluate proposals.*
    - *Develop design concepts*
    - *Project management plan*
    - *Feasibility Studies*
- *Project Implementation.*
    - *Contracts and permits*
    - *Progress reports and documentation*

    - *Continued research and development*
    - *Collaboration with contractors, clients, users, etc.*
- *Project completion.*
    - *Close contracts*
    - *Final reporting*
    - *Supporting documentation: User Guides, FAQs, Troubleshooting.*

[Return to Figure 7.4.1]

Notes

1. *[Proposal image]. [Online]. Available: https://pixabay.com/en/couple-love-marriage-proposal-47192/. Pixabay License.*
2. *R. Irish and P. Weiss, Engineering Communication: From Principle to Practice, 2nd Ed., Don Mill, ONT: Oxford UP, 2013.*

7.5 Progress Reports

The Progress Report is a particularly important genre used in almost all businesses and organizations to inform supervisors, associates, or clients about progress you have made on a project over a specific period of time. Periodic progress reports are common on projects that go on for several weeks, months, or longer. Whoever is responsible for (or paying for) this project wants to know whether tasks are being completed on schedule, on budget, and according to plan. If the project is not on schedule or on budget, they want to know why and what additional time and resources will be needed. If changes are needed, people need to be alerted as soon as possible.

Progress reports answer the following questions for the reader:

- *How much of the work is complete?*
- *What part of the work is currently in progress?*
- *What work remains to be done?*
- *When and how will the remaining work be completed?*
- *What changes, problems or unexpected issues, if any, have arisen?*
- *How is the project going overall?*

Purpose of a Progress Report

Progress reports have a surprisingly persuasive element: you want to reassure clients, supervisors and other interested parties that you are making progress, that the project is going smoothly, and that it will be completed by the expected date — or to give credible and reasonable explanations for why any of those might not be the case. They also offer the opportunity to do the following:

- *Provide a brief look at preliminary findings or in-progress work on the project*
- *Give your clients or supervisors a chance to evaluate your work on the project and to suggest or request changes*
- *Give you a chance to discuss problems in the project and thus to forewarn the recipients, manage expectations, and request additional resources*
- *Establish a work schedule that will encourage you to complete the project on time.*

Format of a Progress Report

Progress reports can take a variety of forms. Depending on the amount of information you need to convey, importance of the project, and the recipient, a progress report can take forms ranging from a short informal conversation to a detailed, multi-paged report. Most commonly, progress reports are delivered in the following forms:

- ***Memo**: a short, semi-formal report to someone within your organization (typically ranges in length from 1-4 pages)*
- ***Letter**: a short, semi-formal report sent to someone outside your organization*
- ***Formal report**: a long, formal report sent to someone within or outside of your organization*
- ***Presentation**: an oral presentation given directly to the target audience.*

Organizational Patterns

The recipient of a progress report wants to see what you've accomplished on the project, what you are working on now, what you plan to work on next, and how the project is going in general. The information is usually arranged with a focus either on time or on task, or a combination of the two:

- ***Focus on time:** shows time period (previous, current, and future) and tasks completed or scheduled to be completed in each period. For example: Last quarter, we completed X ; this quarter, we are working on Y; next quarter, we will focus on Z.*
- ***Focus on specific tasks:** shows order of tasks (defined milestones) and progress made on each task in each time period. For example: Phases 1 & 2 are complete; phase 3 in progress, and phase 4 has yet to be started.*
- ***Focus on larger goals**: focus on the overall effect of what has been accomplished. For example: We've achieved a 70% participation rate so far by doing A,B, and C; we plan to do X, Y and Z to increase this rate to 90% over the next 6 months.*

You should refer to established milestones or deliverables outlined in your original proposal or task specifications. Whichever organizational strategy you choose, your report will likely contain the elements described below.

Structural Overview for a Task-Focused Progress Report

1. Introduction

Review the details of your project's purpose, scope, and activities (your reader may be supervising many projects and need a reminder about what you are working on and why). Depending on context, the introduction may also contain the following:

- date the project began; date the project is scheduled to be completed
- people or organization working on the project
- people or organization for whom the project is being done
- overview of the contents of the progress report.

2. Project status

This section (which could have sub-sections) should give the reader a clear idea of the current status of your project. It should review the work completed, work in progress, and work remaining to be done on the project, organized into sub-sections by time, task, or topic. These sections might include

- Direct reference to milestones or deliverables established in previous documents related to the project
- Timeline for when remaining work will be completed
- Any problems encountered or issues that have arisen that might affect completion, direction, requirements, or scope.

3. Conclusion

The final section provides an overall assessment of the current state of the project and its expected completion, usually reassuring the reader that all is going well and on schedule. It can also alert recipients to unexpected changes in direction or scope, or problems in the project that may require intervention or extension.

4. References section if required.

EXERCISE 7.4 P*ractice the Progress Report Genre*

Focus on Goal: Practice giving a short progress report in an informal verbal form to a classmate. Fill them in on where you are currently at with an upcoming assignment: what work you have completed, what's in progress, what you still need to do, and what problems you've encountered. Note that in this case, you are focusing on the larger goals.

Focus on Time: Create an outline for more detailed written progress report, focusing on time: Create a list all your assignments this term and break the term up into 4 time periods. Indicate which assignments need to be submitted in the each time period, and where you are currently at in this process.

Focus on Tasks: If you are working on a complex team project, do a task analysis to determine what all of the main tasks and sub-tasks are, when they need to be done, and by whom. Consider how you might present this

information as a progress report to your instructor, and how you might incorporate a request for feedback or additional support.

7.6 Short and Long Reports

Workplace reports are written for a wide variety of purposes and can vary significantly in length, format, and style. In a technical context, these documents generally describe the process, progress, or results of technical or scientific research, recommend solutions to defined problems, or review the current state of a technical or scientific issue or design. They can be informational, analytical, and/or persuasive. Content, style, and structural elements will vary, depending on purpose, audience, and genre; however, they tend to follow similar conventions and formats that help readers digest the content quickly and use the information strategically.

The box below contains a list of many types of reports. It's not an exhaustive list, but if gives you a sense of the many reasons why people working in government agencies, companies, research organizations, and universities write reports. Consider what kinds of content and structures you might expect to find in the following common types of reports:

Incident or Accident Reports	*Progress Reports*
Expense Reports	*Feasibility Studies*
Compliance Reports	*Recommendation Reports*
Operational or Departmental Reports	*Evaluation Reports*
Performance Reviews	*Safety & Risk Reports*
Product Reports	*ESG Reports*
Technical Specifications Reports	*Post Projet Review*
Field/Trip Reports	*Case Studies*
Standard Operating Procedures	*White Papers*
Lab (Primary Research) Reports	*Business Plans*
Strategic Plan	*Proposals*
	Marketing/Sales Reports

If you'd like to see specific examples, Queen's University Library maintains several Technical Report Databases, where you can access a variety of reports on a range of topics.

Short vs Long Reports

The distinction between short and long reports is somewhat arbitrary, but here are some general guidelines to follow.

Short Reports	**Long Reports**
Usually intended for an internal audience to help with quick decision-making or information sharing	*Can be intended for internal or external audiences; usually contain in-depth analysis and extensive data*
typically 2-10 pages long	*typically more than 10 pages*
No (or minimal) pre-matter architecture: *no Title Page, Table of Contents, Executive Summary or Glossary*	**Includes Pre-Matter**: *Title page, Table of Contents, Executive Summary, and may include a Glossary*
Headings and visuals often included, but not always required in shorter reports	*Headings are needed to ensure readability; visuals are generally included to illustrate ideas*
May or may not include research	*Tend to include extensive research*

Note that these are guidelines, not "rules" and therefore, you can deviate from these guidelines if you have good reason. For example, if you have a dense 9 page report that you think would be more accessible and readable for your audience if it had an Executive Summary and Table of Contents, then include them. If you have a 12 page report that contains a lot of visual elements, but not much text, you may not need elaborate pre-matter.

Long Reports

Long reports tend to be one step in a series of documents related to a project, often beginning with a ***Proposal****, and perhaps following one or more* ***Progress Reports****. The reports in this rather loosely defined category are variously called feasibility reports, recommendation reports, evaluation reports, assessment reports, etc. They all perform similar functions: they provide a careful study of a situation or problem, and often recommend what should be done to address the situation. Of the many kinds of reports listed above, we will focus here on* **Feasibility Studies** *and* **Recommendation Reports**, *as these are typical genres you might write in a university writing course and will certainly come across them in most workplaces.*

Feasibility Studies

A *feasibility study examines the viability, practicality and potential success of implementing a proposed initiative. It might study a situation (for example, a problem or opportunity) and a plan for doing something about it, in order to determine whether that plan is "feasible"—whether it is practical in terms of current technology, economics, time frame, social needs and preferences. The feasibility report answers the question "Should we implement Plan X?" by stating "yes," "no," or sometimes a "maybe" or "under certain conditions." It offers a definitive analysis that identifies benefits, risks and potential obstacles to implementing the project, and clearly indicates whether or not it should go ahead, and under what conditions. Doing this kind of study allows decision makers to determine ahead of time if implementing the plan or project will be worth investing the time and resources necessary, and will have sufficient benefits or "return on investment."*

Not only does it indicate whether the idea is feasible, it also provides the data and the reasoning behind that determination, walking the reader through the investigative process and methodology. In some cases, a feasibility study might outline the reasons why the idea cannot or should not be implemented, or what obstacles must be overcome before the idea can become feasible. Typical feasibility criteria include

> ***Technological Feasibility***: *Is it technically possible? What is the current state-of-the-art? What materials, hardware, software, and/or specialized skills will be needed to make this possible?*
>
> ***Economic Feasibility***: *What will it cost to implement the plan? Will the benefits outweigh the costs, or be worth the costs it in terms of benefits to the community? Even if it falls within a reasonable budget, should we do it? Will it have long term benefits that outweigh costs? Is there a less expensive or financially risky way to achieving the same result? How does it compare to the cost of doing nothing about this situation? What is the "return on investment?"*
>
> ***Legal and Regulatory Feasibility***: *does it follow all relevant laws, regulations, industry standards, and guidelines? For example, will the project meet minimum sustainability standards?*
>
> ***Social Feasibility***: *Will people support this idea? Could there be any opposition to it? How might this be addressed? Is there a need for community engagement and consultation? What might that look like? Is Market Analysis needed to determine sufficient demand or possible competition?*
>
> ***Practicality***: *Can the project be implemented within the prescribed time frame? Do we have the organizational structure to manage this project?*

Accessibility: *Can this project be implemented in a way that makes it accessible to users with various abilities? How well does it conform to the 7 Principles of Universal Design?*

Other? *Depending on what you are studying, you may find additional feasibility criteria and heuristics to use when assessing whether or not the project should go ahead.*

Typical Organization of a Feasibility Study

If sending your report to someone outside your organization, introduce it with a letter of transmittal.

Pre-Matter	Title Page, Table of Contents, Executive Summary (Glossary, if needed to define specialized terminology)
Introduction	Background and context needed to understand your purpose Definition of the Problem being addressed
Proposed Solution	Description of the plan or project you are studying, and the feasibility criteria you will apply (these should align with the objectives and constraints of the problem definition).
Feasibility Analysis	Analysis of how well the proposed initiative meets the feasibility criteria; this may be broken down into sections based on each criterion
Conclusions and Recommendations	Summarize key points from the feasibility analysis and make a clear recommendation about whether or not to go ahead with the proposed initiative, and summary explanation for why. Highlight key benefits to be achieved or key obstacles to success.
References	Full reference information for all sources cited within the body of the report, with links to original sources
Appendices	If needed, include additional information that is relevant to the body of the report, but does not fit neatly into the body.

Recommendation Reports

Where a Feasibility Study examines the viability of a single course of action, a Recommendation Report offers a comparative analysis. That is, it compares a selection of 2 or more alternative solutions to a problem, based on clearly stated criteria, and recommends the preferred course

of action. Both kinds of reports will provide not only your final assessment, but also the data and analysis you used to get there. By "showing your work," you allow readers to review your findings, test your logic, and examine your conclusions to make sure your methodology was sound and that they can agree with your final judgment. Your goal is to convince the reader to follow your recommendation by using careful research, detailed analysis, rhetorical style, and clear documentation. Since your reader will want to make an evidence-based decision, it is critical that all of your claims and recommendations are supported by sound research and evidence.

The typical structure of a recommendation report follows the problem-solving approach emphasized throughout this text. Before you present the solution alternatives, you must clearly and fully define the problem you are attempting to address, including why a solution is needed, the measurable objectives that any solution should try to achieve, and the constraints that any viable solution must abide by. This allows the reader to keep these evaluation criteria in mind as they read your solution descriptions and comparative analysis.

The way the report is organized walks the reader systematically through your process of analysis and evaluation. The structure outlined below offers guidelines on the kinds of content you may need to include and overall structure, but ***please note*** *that these are not suggested headings for your document; your headings should more concretely indicate the specific content of your report by incorporating key words and ideas from each section. Each section outlined below may require sub-sections to fully and coherently develop ideas.*

Typical Organization of a Recommendation Report

If sending your report to an external audience, introduce it with a Letter of Transmittal (See Ch. 7.1 for information on and a template for Letters of Transmittal)

Pre-matter	Title Page, Table of Contents, Executive Summary (Glossary, if needed)
Introduction (you may not always need all of these elements, and they may go in whatever order best suits your needs)	Any context or technical background needed to explain your purpose. Definition of the problem being addressed: • why a solution is needed • overarching goals • measurable objectives any solution should achieve (criteria for comparison) • constraints any solution must abide by Define the scope of your approach to the problem (how requirements were determined; what solutions will and will not do, etc.) Introduce solutions to be examined.
Discussion Descriptions and analyses of proposed solution alternatives; this could include several section with headings and sub-headings.	**Criteria for comparison**: Testing/evaluation criteria (aligned with objectives) and protocols; explain how will you comparatively evaluation each design **Technical descriptions** of each proposed solution **Comparative Analysis** of solution alternatives (often using a Weighted Objectives Chart to summarize and visualize key points of your analysis
Conclusions	Summarize key points from your analysis (strengths and weakness of each design) and highlight key data points that lead to your final conclusions. Address any conflicts or ambiguities in the analysis. Indicate which solution best addresses the problem, based on the criteria applied, or indicate which designs best meet specific criteria.

Recommendations	Make recommendations for what your reader should do next, based on your analysis, to address the problem. These recommendations should flow directly from your conclusions. You might recommend one solution as clearly "the best" option, you might rank them based on specific criteria, or you might suggest a hybrid solution. You might even recommend further research and development, a pilot project, or a complete rethinking of design criteria.
References	Full reference information for all sources cited within the body of the report, with links to original sources
Appendices	If needed, include additional information that is relevant to the body of the report, but does not fit neatly into the body.

More information about key elements you should include is outlined below.

The Executive Summary

An Executive Summary (ES), like an abstract at the beginning of a scholarly article, offers a concise yet comprehensive summary of the report that follows. This genre allows the "busy executive" or decision maker to quickly get a sense of what your report entails, and determine if they want to read the whole report, read parts of it, or pass it along to someone else who may find the information more valuable or relevant, or who needs to make a decision based on its contents.

Your goal in writing this summary is to get the audience interested in reading the whole report. Therefore, it is much more than a T.L.D.R. version of your report; it has a clear rhetorical purpose: you want to get the reader interested in learning more about your proposed idea, so you need to include the most important and persuasive parts of your report in your summary. For this reason, the ES is probably the last part of the report that you write, and potentially the most important.

LENGTH: *The length of an Executive Summary will vary depending on the context. General guidelines suggest that an ES should be roughly 5-10% of the length of your report, or 1-2 pages in most cases. Reports that are hundreds of pages long will have much longer executive summaries.*

FORMAT: *Use the conventional heading,* ***Executive Summary****, in large bold font (sometimes in ALL CAPS), either left aligned or centred at the top of the page. The ES should appear directly after your Table of Contents and before your Introduction. It should be self-contained; that is, nothing else*

should appear on the page(s) that contain your ES. They are typically singe spaced, and occasionally use a two column format if they fit on a single page. Some are written simply as a series of paragraphs; others make use of headings and other visual markers. Here are some examples that show a variety of ES formats:

> *Multipolarization: Munich Security Report 2025 contains a 3 page (pp. 9-11) ES written using a simple multi-paragraph format. The full report is 121 pages, plus appendices.*
>
> *Oxfam's 2025 Climate Plunder report (61 pages, plus notes) has an Executive Summary that goes from page 4 – 11 and contains graphics, pull quotes, and numbered lists.*
>
> *The IPCC's Sixth Assessment Report on Impacts, Adaptations and Vulnerabilities related to climate change contains two summaries: a "Summary for Policy Makers" and a "Technical Summary," showing an understanding of the needs of different audiences.*

Key Content Elements of an EXECUTIVE SUMMARY

WHY: The introductory paragraph (or section) should identify any background or context readers might need to understand why this report has been written and what it hopes to accomplish. You might introduce the problem/issue/opportunity your report addresses, describe the goals and objectives you hope to achieve, and define the scope of your project. This might be a summarized version of the key content in your report's introduction.

WHAT & HOW: Provide a summary the contents of the report such as your methodology or framework, main points, key findings, and main takeaways. Highlight how your proposed idea addresses the problem and meets objectives; stress the key benefits or advantages of implementing your proposed idea. Typically, specific details, data, statistics and visuals (figures and tables) are not included, unless they are necessary to highlight key findings or they offer a summary of information.

WHAT NOW: Present the key conclusions and/or recommendations your report makes (your "calls to action"), and summarize the significance or potential impact that implementing your idea will have. Emphasize how this will benefit the reader (be reader-focused) and meet their needs.

NOTE: Everything you include in your summary must also be included in your report. Don't add information here that is not discussed in your report.

Comparative Analysis

A key element of a recommendation report is the comparative analysis. Remember that you include

this section so that readers can follow the logic of your analysis and see how you came to conclusions. They may even come to different conclusions if they have additional information about the problem requirements and goals that you may lack.

Comparisons are typically structured using either a "block" (whole-to-whole) approach, or an "alternating" (point-by-point) approach, or sometimes a combination of the two.

Block (Whole-to-Whole) Approach	**Alternating (Point-by-Point) Approach**
All the information about Option 1	*Compare all Options according to Criteria A (cost)*
All the information about Option 2	*Compare all Options according to Criteria B (functionality)*
All the information about Option 3	*Compare all options according to Criteria C (ease of use)*
Direct Comparative Analysis of all three options (using a WOC) and Summary of Results	*Summary of Results*

You might compare 3 solution options (1, 2, and 3) using three criteria for comparison (A, B, and C). If you were comparing tablets, you might use the point-by-point approach, having a section that compared all three options based on cost (criteria A), another section that compared their battery function (criteria B), and so on.

Each of these comparative structures should end with a conclusion that sums up the relative strengths and weaknesses of each option and indicates which option is the best choice in that particular category of comparison. Of course, it won't always be easy to state a clear winner—you may have to qualify the conclusions in various ways, providing multiple conclusions for different conditions. (For more detail, see *Appendix C: Writing Comparisons**.)*

Weighted Objectives Charts

A comparative analysis is often summarized and presented visually in a decision matrix of some kind. One of the most common is the ***Weighted Objectives Chart (WOC)****.*

In order to evaluate the solution alternatives fairly and in an unbiased way, it is important to devise a way of evaluating the designs before you create or select them. The criteria that go into a WOC should be based directly on the objectives you defined in your problem definition, before proposing

any solutions, and may include additional objectives that will help you measure the effectiveness and desirability of each solution alternative. Then, you build or chose the design alternatives to best fit these criteria. See ***Figure 7.6.1****. for an example WOC (partially filled in) that compares 2 cars to see which one best meets the criteria of the problem.*

Table 7.6.1 Sample Weighted Objectives table for comparing two car purchase options

Objective	**Weight**	**Measurement**	**Car A**			**Car B**		
			magnitude	*score*	*value*	*magnitude*	*score*	*value*
Cost	30	*price range*	4299	2	60			
Fuel consumption	25	*miles per gallon*						
Cost of parts	20	*average cost*						
Ease of maintenance	15	*ease of servicing*						
Comfort	10	*comfort rating*						
					Overall utility value			

Creating a weighted objectives chart entails several detailed steps:

> ***Step 1 – Determine the Objectives:*** *the objectives you use to evaluate the design alternatives should be based on the objectives stated in your problem definition. You may include additional objectives to fine tune your comparative analysis. Aim for a minimum of 5 objectives to create a robust set of evaluation criteria.*
>
> ***Step 2 – Determine the Weights****: Place the objectives in order from most to least important, and assign each objective a weight, giving the most important objective the highest weight. The combined weights of all objectives should sum to a unity (1, 10, or 100).*
>
> ***Step 3 – Define Measurement Parameters****: Create a scoring rubric for each objective, showing how you will assign a "grade" for how well each design meets that criteria. This is usually done using a Likert scale (scale of 1-5 or 1-10), with each score having a specific value or range of values. You will need to determine how you will measure and grade achievement of each objective. These can be quantitative (miles per gallon of fuel consumption) or qualitative (subjective experience of comfort), as seen in the scoring rubric sample below.*

Table 7.6.2 Sample Scoring Rubric for Objectives used in the WOC

Score	Cost (CND$)	Fuel consumption (m/g)	Comfort level
0	*over max budget of* $5000	*less than* 27	*very uncomfortable*
1	4501 – 5000	27-29	*poor comfort level*
2	4001 – 4500	30-32	*below average comfort*
3	3501 – 4000	33-36	*average comfort*
4	3001 – 3500	37-40	*above average comfort*
5	3000 *or less*	*more than* 40	*extremely comfortable*

Once you have determined your objectives, ranked and weighted them, and created scoring rubrics for each one, you can place them all in a table that allows you to easily compare each solution. In the ***magnitude*** *column, you would enter the actual price* ($4299)*, fuel consumption, and comfort level. Under* **score***, enter the score that specific magnitude gets in the objective scoring rubric (as in* **Table 7.6.1**)*. To get the* ***value****, multiply your score by the weight. Adding all the values for each option will give you the* ***overall utility value*** *for each option, and show you which design best meets your objectives.*

For example, if one possible purchase option had a sale price of $4299*, you would enter that under the "magnitude;" that would receive a score of* 2*, based on the scoring rubric in* **Table 7.6.2**; *multiply* 2 *by the weight of* 30*, and the overall score for that objective is* 60*.*

NOTE: *the Weighted Objectives Chart presents a detailed visual summary of your comparative analysis; it does not replace it. You still need to include written explanations for how each design performed in relation to the evaluation criteria and how you tested the performance to arrive at the scores.*

You can download a fully formatted, blank WOC template in Word here: [*Weighted Objectives Chart Template*]

7.7 Lab Reports

Whether your research takes place in a university lab or on some remote work site, you will often have to write up the results of your scientific research in a Lab Report. Most basically, this report will describe the original hypothesis your work attempts to test, the methodology you used to test it, your observations and results of your testing, your analysis and discussion of what this data means, and your conclusions. A key purpose of your report is to clearly present information in a way that allow readers to replicate your research.

In an academic context, especially in early courses, you are often asked to replicate the results of others, rather than conduct your own original research. This is usually meant to instil an understanding of the ***scientific method****, and teach students the proper use of instruments, techniques, processes, data analysis, and documentation. Once you demonstrate your ability to understand and apply the scientific method in these contexts, you will be able to go on to design your own research studies and develop new knowledge. Your reports then become the way you pass on this new knowledge to others in the field and to society at large.*

Students often assume that science is just "facts" and objective information, and are sometimes surprised to learn that science writing makes and defends claims just like writing in other academic genres. For scientists and engineers to make valuable contributions to the sum of human knowledge, they must be able to convince readers that their findings are valid (can be replicated) and valuable (will have an impact). Thus, the way that you write these reports can impact the credibility and authority of your work; people will judge your work partly on how you present it. Yes, even lab reports have a persuasive edge and must make careful use of rhetorical strategies. Careless writing, poor organization, ineffective document design, and lack of attention to convention may cast doubt on your authority and expertise, and thus on the value of your work.

Science and Rhetoric

Some aspects of your report that might require you to think rhetorically are exemplified in how you approach the following questions:

- *Why is this research important? How does it solve a problem or contribute in some way to expanding human knowledge?*
- *What have other researchers already discovered about this? How are you contributing to this conversation?*

- *What gaps are there in our knowledge about this topic?*
- *Why have you chosen this methodology to test your hypothesis? What limitations might it have?*
- *How and why do you derive these inferences from the data you have collected?*
- *What further research should be done? Why?*

Writing a Lab Report

Your report will be based on the work you have done in the lab. Therefore, you must have a plan for keeping careful notes on what you have done, how you have done it, and what you observed. Researchers often keep a notebook with them in the lab, sometimes with pre-designed tables or charts for recording the data they know they will be observing (you might be given a lab manual to use while completing a particular experiment to record your observations and data in a pre-organized format). Try to plan ahead so that you can capture as much information as possible during your research; don't try to rely only on memory to record these important details.

How you choose the content and format for your report will depend on your audience and purpose. Students must make sure to read lab manuals and instructions carefully to determine what is required; if writing for publication, make sure to follow the submission guidelines of the publication you are sending it to. Lab reports typically contain the elements outlined below.

Typical Elements of a Lab Report

Title: craft a descriptive and informative title that will enable readers to decide if this interests them, and will allow key words to be abstracted in indexing services. Ask your instructor about specific formatting requirements regarding title pages, *etc.*

Abstract: write a summary of your report that mirrors your report structure (Hypothesis, Methods, Results, Discussion, Conclusion) in condensed form—roughly 1-2 sentences per section. Ideally, sum up your important findings.

Introduction: establish the context and significance of your work, its relevance in the field, and the hypothesis or question your study addresses. Give a brief overview of your methodology for testing your hypothesis and why it is appropriate. If necessary for your readers, provide a specialized theoretical framework, background or technical knowledge to help them understand your focus and how it contributes to the field. Your instructor may describe a target audience for you; pay attention to that and write for that audience. More detailed reports may require a Literature Review section.

Materials and Methods: this section has two key purposes. First, it must allow any reader to perfectly replicate your method; therefore, you must provide a clear and thorough description of what tools and materials you

used and how you conducted your experiment. Second, you must convince your reader that your chosen methodology and materials are appropriate and valid for testing your hypothesis, and will lead to credible and valid results. This section will generally include 1) a list of all materials needed (which may include sub-lists, diagrams, and other graphics), and 2) a detailed description of your procedure, presented chronologically.

Traditionally, the sciences have required writers to describe what they did using the **passive voice**, as passive mode emphasizes the materials used and actions taken and de-emphasizes the role of the scientist in the process. This is slowly changing, as the use of **active voice** is more concise and recognizes the reality that even scientific observers have unavoidable biases and unique perspectives; however, you should consult your instructor about which is preferred in your context.

Results: this section presents the raw data generated in your experiment, and provides the evidence you will need to form conclusions about your hypothesis. Present only the data that is relevant to your results (but if you omit data, you may have to explain why it is not relevant). You can organize this section based on chronology (following your methodology) or on the importance of data in proving (or negating) the hypothesis (most important to least important). Present data visually whenever possible (in tables, graphs, flowcharts, *etc.*), and help readers understand the context of your data with written analysis and explanation. Make sure you present the data honestly and ethically; do not distort or obscure data to make it better fit your hypothesis. If data is inconclusive or contradictory, be honest about that. In the Results section, you should avoid interpreting or explaining your data, as this belongs in your Discussion section.

Discussion: this section includes your analysis and interpretation of the data you presented in the Results section in terms of how well it supports your original hypothesis. Start with the most important findings. It is perfectly fine to acknowledge that the data you have generated is problematic or fails to support the hypothesis. This points the way for further research. If your findings are inconsistent, try to suggest possible reasons for this.

Conclusion: in 1-2 short paragraphs, review the overall purpose of your study and the hypothesis you tested; then summarize your key findings and the important implications. This is your opportunity to persuade the audience of the significance of your work.

Acknowledgements: formally express appreciation for any assistance you have received while preparing the report (financial/funding support, help from colleagues or your institution, *etc.*).

References: list all references you have cited in your report (such as those you may have included in a "literature review" in your introduction, or sources that help justify your methodology). Check with your instructor or publication guidelines for which citation style to use.

Appendices: any information that does not fit within the body sections, but still adds valuable information to your report, can be placed in an appendix. Where your Results section may present summarized data, the full data tables may appear in an appendix. You may also include logs, calculations, or notes on analytical methods. Be sure to refer to your appendices in the body of your report to signal where readers can find additional information.

How you write up the results of a scientific experiment will generally follow the formulaic pattern described above, but may vary depending on audience and purpose. As a student, you are often writing to demonstrate to your instructor that you have mastered the knowledge and skills required in a particular course. But remember that science writing generally focuses on the observable results, not on your "learning experience." Your report should include what anyone doing this experiment might observe and conclude; these do not typically include personal reflections.

In the professional academic world, your report may have to pass through a rigorous peer review process before being published in a scholarly journal. As a professional, your work may result in the development of products and services that will be used by the public, so documenting your process and findings has financial, safety, and legal implications. It is therefore critical that your writing is accurate and ethical.

A Note on Scientific Writing Style

Lab reports are often written using past tense, 3rd person, and passive verb constructions when describing what was done and what was observed. Why do you suppose that is?

Strict adherence to this style has in recent years been relaxed somewhat, and you might find more science writing that use first person and active rather than passive verb constructions. Can you think of reasons why this is changing?

Additional Resources

For a fun example of Process Report that is similar in many ways to a lab report, see the attached ***Drafting Behind Big Rigs – Mythbusters Report*** *(.pdf)*

When evaluating scientific literature that you read, you might find the the following TED-Ed video by David H. Schwartz helpful: Not all Scientific Studies are Created Equal.

7.8 Instructions

One of the most common uses of technical writing is to provide instructions, those step-by-step explanations of how to assemble, operate, repair, or do routine maintenance on something. Although they may seems intuitive and simple to write, instructions are some of the worst-written documents you can find. Most of us have probably had frustrating experiences trying to use poorly written instructions to complete a task or troubleshoot an issue. But consequences can be much worse than a bit of frustration, especially if engaging in a process that contains risks, or for which the outcome is serious.

Creating effective set of instruction requires the author to have the following:

- *A thorough understanding of the procedure in all its technical detail and*
- *The ability to convey that understanding clearly, precisely and straightforwardly in written and visual form*
- *An understanding of the purpose and perspective of the person trying to use your instructions*
- *Willingness to test your instructions on the kind of person you wrote them for.*

Preliminary Steps

As you prepare to write a set of instructions, do the kind of task and audience analysis you would do for any other kind of writing.

1. Do a careful audience and task analysis

> *Early in the process, define the audience and situation of your instructions. Remember that defining an audience means defining the level of familiarity your readers have with the topic.*

2. Identify Procedure, Tasks, and Steps

> *Let's call the overall purpose that the reader want to achieve the* ***procedure****. Your instructions will let them know how to complete the procedure as a whole. Within that procedure, there may be a number of tasks.* A ***task*** *is a semi-independent group of actions or* ***steps*** *within the procedure.*

A simple procedure like changing the oil in a car contains only one task, with several steps; there are no semi-independent groupings of activities. It is part of the more complex procedure of maintaining your vehicle, which contains many tasks (flushing transmission, rotating tires, etc), each of which requires several steps. Another complex procedure like using a microwave oven contains several semi-independent tasks: setting the clock; setting the power level; using the timer; cleaning and maintaining the microwave, and so on.

3. Determine the best approach

For most instructions, you can focus on tasks, or you can focus on tools (or features of tools). In a task approach (also known as task orientation) to instructions on using a message retrieval system, you'd have these sections:

- *Recording your greeting*
- *Playing back your messages*
- *Saving your messages*
- *Forwarding your messages*
- *Deleting your messages, and so on*

These are tasks—the typical things we'd want to do with the machine. Performing each of these tasks entails completing several steps.

On the other hand, in a tools approach to instructions on using a photocopier, there likely would be sections on how to use specific features:

- *Copy button*
- *Cancel button*
- *Enlarge/reduce button*
- *Collate/staple button*
- *Copy-size button, and so on*

Using a tools approach, you'd write steps for using each button or feature of the photocopier. This approach can be challenging, as sometimes, the name of the button doesn't quite match the task it is associated with; sometimes you have to use more than just the one button to accomplish the task. Still, there can be times when the tools/feature approach may be preferable.

4. Design groupings of tasks

Listing tasks may not be all that you need to do. There may be so many tasks that you must group them so that readers can find individual ones more easily. For example, the following are common task groupings in instructions:

- *Unpacking and setup tasks*
- *Installing and customizing tasks*
- *Basic operating tasks*
- *Routine maintenance tasks*
- *Troubleshooting tasks.*

Typical Elements of A Set of Instructions

Introduction: plan the introduction to your instructions carefully. It might include any of the following (but not necessarily in this order):

- Indicate the specific tasks or procedure to be explained as well as the scope (what will and will not be covered)
- Indicate what the audience needs in terms of knowledge and background to understand the instructions
- Give a general idea of the procedure and what it accomplishes
- Indicate the conditions when these instructions should (or should not) be used
- Give an overview of the contents of the instructions.

General warning, caution, danger notices: instructions may need to alert readers to any possible risks or dangers. For example, how to avoid damaging their equipment, messing up the procedure, and hurting themselves.

Technical background or theory: certain kinds of instructions may need some discussion of background related to the procedure to make the procedure make sense.

Equipment and supplies: most instructions include a list of items you need to gather before you start the procedure. This includes the equipment or tools used in the procedure (such as mixing bowls, spoons, bread pans, hammers, drills, and saws) and *supplies*, the things that are consumed in the procedure (such as wood, paint, oil, flour, and nails). In instructions, these typically are listed either in a simple vertical list or in a two-column list. Use the two-column list if you need to add some specifications to some or all of the items—for example, brand names, sizes, amounts, types, model numbers, and so on.

Structure and format: normally, a set of instructions is formatted as numbered lists. There are some variations, however, as well as some other considerations:

- ***Fixed-order steps*** must be performed in the order presented. Use a numbered list to enumerate these

steps. For example, if you are changing the oil in a car, draining the oil is a step that *must* come before putting the new oil.

- ***Variable-order steps*** can be performed in practically any order, so a bullet list is an appropriate format. For examples, troubleshooting guides offer ways to check for different problems and what might be causing them. You can do these kinds of steps in practically any order.
- ***Alternate steps*** are those in which two or more ways to accomplish the same thing are presented. Alternate steps are also used when various conditions might exist (if A, do X. If B, do Y). Use bulleted lists with this type, with OR inserted between the alternatives, or the lead-in indicating that alternatives are about to be presented.
- ***Nested steps*** may be used in cases when individual steps within a procedure are rather complex in their own right and need to be broken down into sub-steps. In this case, use a nested list (either bulleted or numbered, depending on the context).

Supplementary discussion: sometimes, it is not enough simply to tell readers to do this or to do that. They may need additional explanatory information such as how the thing should look before and after the step; why they should care about doing this step; what could happen if they skip this step; or what mechanical principle is behind what they are doing.

The problem with supplementary discussion, however, is that it can hide the actual step. You want the actual step—the specific actions the reader is to take—to stand out. You don't want it buried in a heap of words. There are at least two techniques to avoid this problem: you can split the instruction from the supplement into separate paragraphs; or you can bold the instructions embedded in the information.

Writing Style

*Placing the key user steps in **bold** can a very helpful way to signal clearly what the reader needs to do. You can either place the **command verb** or the **key components** in bold to highlight them for the reader. Consider instructions you have read for navigating a website or performing a task in a particular software. The instructions might use bold to highlight the specific things the reader needs to find like this:*

To automatically add a table of contents to your document, do the following:

1. Make sure all headings you want to include in the table of contents have been created using the **Styles Pane**
2. Click on the **References** option from the navigation menu at the top of the document.
3. In the **References** tool bar, click on the drop down menu beside **Table of Contents**, and select the first option.

*Use the **active voice** to clearly indicate what the reader should do. Using passive voice in instructions can be problematic. For example: "The **Pause** button should be pressed in order to stop the display temporarily" makes one wonder how the button might be pressed and by whom? It would be more helpful to indicate that the reader should "press the Pause button." Consider this passive example: "The **Timer** button is then set to 3:00." Again, one might ask, "is set by whom? how?" Is this somehow done automatically? Am I supposed to do this? Instructions usually use command verb forms and "you" to make it perfectly clear what the reader should do.*

Illustrating Your Instructions

Visual illustrations often accompany written instructions to "show" as well as "tell" the reader what to do. Sometimes, words alone cannot fully explain the step, or visuals can reduce the number of words required. Illustrations are often critical to the readers' ability to visualize what they are supposed to do. Graphics should represent the image from the reader's perspective.

Formatting Your Instructions

Since people rarely want to read instructions, but often have to, format your instructions to enhance readability for the reluctant reader. Try to make your reader want to read them, or at least not resistant to the idea of consulting them. Highly readable format will allow readers who have figured out some of the instructions on their own to skip to the section where they are stuck. Use what you have learned about document design and visual rhetoric in chapter 3 to create effective and readable instructions:

> ***Headings**: normally, you'd want headings for any background section you might have, the equipment and supplies section, a general heading for the actual instructions section, and subheadings for the individual tasks or phases within that section.*
>
> ***Lists**: similarly, instructions typically make extensive use of lists, particularly numbered vertical lists for the actual step-by-step explanations. Simple vertical lists or two-column lists are usually good for the equipment and supplies section. In-sentence lists are good whenever you give an overview of things to come.*
>
> ***Special Notices**: you may have to alert readers to possibilities in which they may damage their equipment, waste supplies, cause the entire procedure to fail, injure themselves or others—even*

seriously or fatally. Companies have been sued for lack of these special notices, for poorly written special notices, or for special notices that were out of place.

Can AI Write Instructions?

A 2024 study[1] examined how well AI could write instructions for how to take a COVID-19 test, and compared the AI output to human-written instructions provided by the manufacturer. The study found that while the AI generated instructions conformed quite well to the typical genre conventions of instructions, the human-authored instructions were superior in most ways. They concluded that "when it comes to creating high-quality, consequential instructions, ChatGPT might be better seen as a collaborator than a competitor with human technical communicators."

Notes

1. *J. Johnson-Eilola, S.A Selbar, and E.J. York. "Can artificial intelligence robots write effective instructions?" Journal of Business and Technical Communication, Vol. 38, no. 3, https://doi.org/10.1177/10506519241239641*

8. PUBLIC SPEAKING

This entire PART will be revised, pending forthcoming contributions

Public speaking may be one of the most anxiety-inducing prospects for many students and professionals alike. Yet the ability to speak clearly and confidently and present ideas effectively in public is an important competency in many workplaces.

Chapter 8 Learning Objectives

This chapter contains the following sections to help you develop confidence and skills in presenting information orally, both individually and as a team, and designing visually effective presentations:

8.1 Building Confidence as a Presenter

8.2 Developing Presentation Skills

- Systematic process for deliberate practice
- Designing visual aids: PowerPoint basics
- Visual rhetoric: For posters and other displays

8.3 Presenting as a Team

8.3 Presenting as a Team

As discussed in Chapter 4, one of the key goals of working in a team is to develop synergy. A high-performing team can produce better results than any of the individuals could do alone. So how can you show your team's synergy in your team presentation?

In this 12 minute video, Delivering a Successful Team Presentation, a team of business students both ***shows*** *and* ***tells*** *us how to plan and deliver a successful team presentation, using effective visuals and including key topics like assigning roles, planning handoffs, and preparing for Q&A. Watch their "team presentation on team presentations" and take notes on what you think works particularly well.*

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://pressbooks.bccampus.ca/technicalwriting2ed/?p=145#oembed-1

Did you notice how they spoke naturally to their audience in plain, friendly language, and only very minimally relied on notes? how they kept a reasonable pace and didn't rush? how they used humour and questions to engage? how they offered specific examples (positive and negative)? Their visuals were simple, yet effectively illustrated their ideas using minimal text. The hard work they put into planning and practicing made the delivery look easy! Although I'm sure they felt nervous, they projected confidence and positivity. In essence, they used all the "strategies for effective public speaking," and their collaborative efforts resulted in a final product that was "more than the sum of their parts." A single speaker could not have delivered this presentation as effectively as the team did.

Presenting coherent and engaging information as a team takes collaborative planning, deliberate practice, and sustained commitment. Team members can take on different tasks and content to split up the work, but sometimes preparing a team presentation is more work than a solo talk. Be prepared to put in the time needed to synergize your team.

For some more tips, read Nick Morgan's 10 Rules for Presenting as a Team. While there is some overlap with the video above, there are also novel ideas that can help you make your team presentation stand out. Where the student presenters demonstrate ideas, Morgan spells them out in clearly written guidelines.

EXERCISE

Review the two resources above as a team. Take notes, with each teammate identifying at least 3 tips you learned from the resources that you had not considered before and think are important to use in your team's presentation. Use these to collaboratively choose the planning and delivery strategies that will work best for your context.

Planning an Interactive Team Presentation

Let's imagine you are planning to present a prototype design, poster, or infographic to a client. Before you do this, you want to run it by your colleagues (classmates) and get their feedback on how well the current iteration is working and what could use further revision. This could be considered as a modified form of ***focus group*** *activity, as your listeners understands the context and are especially suited to giving you the kind of feedback you need. The goal is to get them to engage, interact, and provide meaningful feedback to help you validate and possibly improve your design.*

Keep in mind that a focus group is different from a presentation: you don't have an audience, you have participants. Thus, the planning tips outlined above are especially crucial for a successful outcome. A suggested process is outlined below.

Planning an Interactive Team Presentation or Focus Group Activity

1. Determine what feedback you want to get and why

Ask yourselves: *What are we struggling with, unsure of? What do we want to "test out" or validate? How will we use this feedback? What kinds of changes are will willing or able to make at this point?*

Create open-ended questions and neutral prompts that will help you elicit this feedback; avoid "leading" questions where you are trying to get a certain response. The kinds of questions you ask will of course depend on what you are getting feedback on. Here are some very general examples:

- What stands out in the design? What seems most/least important?
- What do you think is the purpose of X? What does Y suggest to you?
- Does this seem intended for you? Relevant to you?
- Would you use it/ find it valuable/convincing/credible?
- What changes would you suggest?

2. Select Strategies, Technologies, and Roles

Ask yourselves: *How can we get the feedback we want? What strategies and technologies will we use? Verbal Q&A? Electronic survey? Interactive digital space (Google.doc, Kahoot, Zoom white board, etc). How much time do we have? What can we accomplish in that time frame? How will we collect and save the feedback? Will we share the data with participants?*

Every team member should participate actively, engaging with the participants at some point. But also keep in mind that you need to have a way to record and save your participants' feedback. Don't rely on memory alone. Have a reliable method of collecting and saving the data, even if that is a teammate with a paper and pen.

3. Plan your Structure

> **Engage:** Start with an Engagement Question to gauge your participants' familiarity with your subject (have you ever…? How many of you have…? Etc). Continue using engagement strategies throughout the activity.
>
> **Clarify Purpose**: Explain the purpose of your design, going over the various component parts and your reasons for choosing specific design elements. Describe the intended audience/user and desired impact. Be careful not to spend so much time on this that you don't have enough time actually get feedback from participants.
>
> **Elicit Feedback**: Ask questions and record feedback accurately. You might do this continually (while going over your design and audience) or you might do this at a certain stage in the activity. You might also answer questions from your participants.
>
> **Wrap up**: thank your participants for their time and contributions to your project.

Additional tips:

Depending on the context and who your participants are, it's often wise to avoid asking participants to "justify" their responses (avoid asking "why?") as this might make them feel "judged" and discourage them from further participating. Instead, ask follow ups like "Can you say more about…"

It's important to try to get as many people to participate as possible, so you get diverse perspectives. You can encourage a variety of voices by asking, "Who else has something to say? I would love to hear more from…" You might ask participants to share similar experiences or problems they have had and suggest ideas or solutions.

Don't feel like you have to "stick to the script" – feel free to explore and pursue unexpected ideas that come up. Leaving room for creativity is how innovation happens!

APPENDICES: ACADEMIC WRITING BASICS

Technical Writing Essentials is designed to follow up on the skills learned in a first year Academic Writing course. If you'd like a refresher on some of the skills and ideas you learned in first year, an excellent open textbook used in some first year writing courses is Why Write? A Guide for Students in Canada (2nd Ed). In particular, Chapter 5 of this textbook discusses grammar as a situated practice, offers an excellent overview of "What is grammar?" and provides some very helpful information on "Rules for Academic Writing in English."

The following sections provide a review of some of the basic conventions and expectations of academic writing that students should be familiar with and that are relevant to technical writing:

Appendix A: Referring to Authors and Titles

As Gerald Graff and Cathy Writing Berkenstein point out in They Say, I Say: The Moves that Matter in Academic Writing, writing an academic context often entails writing about or responding to the words and ideas of other authors. Academic writing is often a "dialogue" or conversation between scholars, where you begin by describing what other scholars have said in order to set up what you want to say. Scholarly research generally builds on or reacts to the work of previous scholars. As student writers, you often use the works of published scholars to support your arguments or provide a framework for your analysis. When you do this, you must cite and document your source; you may also need to specifically identify the author and title that you are referring to within the body text of your work. There are some basic conventions to adhere to when you do this.

Referring to Authors

The first time that you mention the author, use the full name (but no titles, such as Mr. Ms, or Dr.). If there are more than three authors, use the Latin abbreviated term et al. to refer to additional authors:

> *Steve Rathje wrote "The power of framing" in 2017[1], but his political examples are still relevant today.*
>
> *Paul H. Thibodeau and Lera Boroditsky use similar examples in "Metaphors we think with" [2], but they take a more academic approach.*
>
> *"Your brain on ChatGPT," a scientific study by Natalia Kosmyna et al.[3], has not yet been peer-reviewed, but because its findings are so startling, a preprint is available online.*

*Every time you refer to the author after the first time, use the **last** name only. Never refer to the author by the first name ("Steve") only. Always use the last name:*

- *Rathje uses an accessible tone in his online piece for The Guardian.*
- *Thibodeau and Boroditsky write for a more scholarly audience.*
- *Kosmyna et al. found that that group using AI performed worse than the groups who did not use AI at all measured parameters (neural, linguistic, and scoring).*

NOTE: *when using IEEE style, you can simply use the authors last names only (you don't need to include the first name unless you have authors with the same last name).*

Referring to Titles

When referring to titles, we use two distinct typographical methods to indicate two kinds of works:

> *The titles of **shorter work**s that are published within a larger work (an article in a newspaper, an academic article in a journal, a poem in an anthology, a chapter in a book) are enclosed in quotation marks; only capitalize the first word, proper nouns, and first word of a sub-title (after the colon):*
>
> > *"The power of framing: It's not what you say but how you say it" provides several examples of how political rhetoric frames ideas to appeal to certain people.*

Tip: Remember to **enclose** in quotation marks the titles of works that are **contained** within other works.

> *When referring to titles of **larger works**, or works that have smaller articles or chapters within them (books, newspapers, magazines, periodicals, movies, novels, etc.), use italics*:*
>
> > *Rathje's article is published in The Guardian, a respected British newspaper.*

* ***Note***: *before computers, people underlined these kinds of titles, as this was the only option available on a typewriter; however, underlining is "so 20th century" and is no longer done unless you are writing by hand.*

Using these conventions help the reader to know what kind of text you are writing about without you having to specify it. Like most specialized terminology or conventions, it offers a kind of short hand to avoid wordiness. If you do this incorrectly, you mislead and confuse the reader.

For example, if you are writing about William Blake's poem, "The Lamb," you must use quotation marks around the title. If you don't use them, and simply write — the lamb — then you are referring to the animal, not the poem. If you italicize The Lamb, you are telling the reader that this is the title of a book (which is incorrect and misleads the reader).

Notes

1. S. Rathje, "The power of framing: It's not what you say but how you say it," The Guardian (online), 20 July 2017. Available: https://www.theguardian.com/science/head-quarters/2017/jul/20/the-power-of-framing-its-not-what-you-say-its-how-you-say-it your footnote content here.
2. Enter P.H. Thibodeau and L. Boroditsky, "Metaphors we think with: The role of metaphor in reasoning. PLOS One (online), 23 Feb, 2011. https://doi.org/10.1371/journal.pone.0016782 footnote content here.
3. N. Kosmyna, et al., "Your brain on ChatGPT: Accumulation of cognitive debt when using an AI assistant for essay writing task." 31 Dec. 2025. Cornell University arXiv (online). Available: https://arxiv.org/abs/2506.08872. Summary available: https://www.brainonllm.com/

Appendix B: Writing a Summary

An academic summary provides an objective, condensed (shortened) description of the content of a piece of writing or presentation. Unlike a review, it does ***not*** *analyze, evaluate, or critique; your opinion of the work is not typically part of the summary (unless you have been asked to add your thoughts afterward). Since summaries usually occur within a context (eg., part of your essay), your thoughts about what you have summarized will probably be relevant to your subsequent analysis. But when writing the actual summary of someone else's ideas, you must neutrally and accurately describe what you take to be the important ideas in the author's work in as few words as possible.*

Occasionally, if the work you are summarizing has an unusual form, style, or tone that affects the content, your summary might objectively describe ***how*** *the author presents those ideas.*

What is the purpose of a summary?

A summary is meant to ***inform*** *your reader—who* ***has not read*** *the source —of what the text is about. It describes its purpose or main idea, and summarizes the supporting arguments that develop that idea. Readers will then know if they will find it useful and want to read it.*

There are many kinds of summaries that serve different purposes:

- *An* ***academic summary*** *of someone else's ideas, in the context of a research essay, helps you to support and develop your ideas. You may summarize someone's ideas because they support your own, or because they differ from yours and allow you to introduce the idea you want to argue. Someone else's theory may provide a framework for your analysis, so you might summarize the theory before beginning your argument. A summary can act as a springboard to launch your ideas.*
- *An* ***abstract****, written by the author(s) of the paper, describes the content and purpose of an academic paper and is included at the beginning of the article. Abstracts are written by the authors, and thus do not use signal phrases.*
- *Government workers often write* ***briefing notes*** *to give the busy ministers and directors a summary of important information needed for a meeting or for a decision*
- *In business, an* ***executive summary*** *gives the busy executive a quick overview of the contents of a formal report.*

Being able to write a clear and useful summary is a valuable skill both in academic and professional contexts.

How do you write an effective summary?

Before you can summarize, you must understand the content of what you are summarizing and do some pre-writing. Some of the most common flaws in summaries come from not completing these pre-writing steps. For example, some summary writers get bogged down in the small details and neglect to present the main idea; or they present a series of unconnected thoughts that directly paraphrase the source, but do not coherently indicate what that source was about or how ideas were developed; occasionally, a writer may summarize the ***structure*** *of a text instead of the ideas in that text. These errors occur because the pre-writing work was done poorly.*

Pre-writing Stage

1. Actively read the article or pay attention to the presentation. *Make notes. Make sure you understand what you are summarizing: what is its main purpose? What is the "thesis"? What are the main points that support the thesis? Explain it verbally to someone else based on your notes. Use your own words to make sure you really understand what you have read or seen.*

2. Reread *the article (or your notes on the presentation, or the slides if they have been provided) and break it up into sections or "stages of thought." Briefly summarize each section and indicate how it relates to the main idea. Again, paraphrase using your own words. Except for the occasional key word or phrase, avoid quoting directly.*

Keep your purpose and intended audience in mind when you design your summary; remember, your intended reader has not read the article. Why are you summarizing it? Why is your audience reading your summary?

Writing Stage

Now you are ready to begin writing your summary. Follow these steps:

Provide the author's name and title of the text being summarized*. If you are are summarizing a*

speaker's presentation, give the presenter's name, the title or topic of the presentation. If context is important to your summary, give some details about the intended audience, etc. Add in in-text citation.

- *In "Can Ethics be Technologized?" Peter Dombrowski [1] critiques the idea that …*

***Paraphrase** (write in your own words) the author's **thesis** or main idea:*

- *… critiques the idea that ethics can be reduced to an objective formula or algorithm that can implemented in any given situation.*

***Describe, in a neutral and objective manner**, how the author supports and develops the main idea. Do not editorialize (evaluate, critique, analyze, etc); simply describe. Keep the following in mind:*

- *Summarize the key points used to develop the main idea*
- *Leave out minor details and examples that are not critical to the main idea*
- *Do not quote from the article; or limit quotations to a single key word or important phrase. Padding your summary with quotations does not effectively condense and summarize, so will make your summary less effective.*

***Use signal phrases,** such as "Dombrowski explains" and "Dombrowski asserts" to show that the ideas are not yours, but that they come from the article you are summarizing. **Do not accidentally plagiarize**. Do not inadvertently present the author's ideas as your own. Where there is no signal phrase and no citation, the author may assume you have shifted to presenting your own ideas).*

***Pay attention to verb tense**: summaries of ideas are generally given in the present tense, while results and findings are often given in the past tense.*

- *Dombrowski explains … (present tense)*
- *Hollander's study found that … (past tense)*

Cite and document your source. Include a Reference that provides full bibliographical information for the source you have summarized, in case the reader wants to find and read it for themselves.

NOTE: *Summaries of presentations are generally given in the past tense, since the presentation happened only once in the past, while a text can be read and reread several times, making it more "present." However, a video presentation, such as a TED Talk, would likely be summarized in present tense, much like an article, because it can be reviewed over and over again. Which verb tense you should use is not subject to absolute rules; you will have to use some judgment to determine what sounds best (and avoid what sounds awkward).*

Example Reference:

[1] P.M. Dombrowski. "Can ethics be technologized? Lessons from Challenger, philosophy, and rhetoric." In *IEEE Transactions of Professional Communication*, vol. 38.3, Sept. 1995, pp. 146-50 . DOI: 10.1109/47.406727

Rewriting Stage

Review and revise your draft using the following steps:

Revise content and organization: *Is it complete? Should you add any important details? Is it well organized? Does it follow the order of the original text? Can you get rid of any unnecessary content? Have you used your own words and phrasing? Have you used signal verbs to indicate what ideas belong to the summarized source and describe the author's rhetorical intention?*

Edit for flow: *Do ideas flow smoothly together creating a logical sequence of ideas? Are sentences clear, concise, correct and coherent? Or do they require effort to decode? Do transitions effectively indicate the relationships between ideas? Have you effectively introduced, developed and concluded?*

Proofread*: Look for mechanical errors (typos, spelling, punctuation), and for grammar and usage errors that may have crept in during revision and editing.*

Signal Phrases

Signal phrases allow you to clearly indicate when words, phrases and ideas you include in your writing come from someone else. These include verbs that introduce summaries, paraphrases, and quotations. In general, it is best to avoid bland, generic verbs like

- *says (too vague)*
- *writes (too vague)*
- *talks about (too informal)*

Instead, use a verb that more precisely and accurately describes the author's rhetorical intention — describe the rhetorical move the author is making in this quotation, or what rhetorical purpose the author is trying to achieve.

The list of signal verbs below offers suggestions for introducing quoted, paraphrased, and summarized material that convey more information about the author's rhetorical intent than verbs like "says" or "writes" or "discusses."

The author makes a claim	**The author recommends**	**The author disagrees or questions**	**The author agrees**	**The author shows**
argues *asserts* *believes* *claims* *emphasizes* *insists* *suggests* *hypothesizes* *maintains*	*advocates for* *proposes* *calls for* *demands* *encourages* *implores* *pleads* *recommends* *urges* *warns*	*challenges* *complicates* *criticizes* *qualifies* *counters* *contradicts* *refutes* *rejects* *denies* *questions*	*admires* *endorses* *supports* *affirms* *corroborates* *verifies* *reaffirms*	*illustrates* *conveys* *reveals* *demonstrates* *points out* *exemplifies* *indicates*

"I Can't See the Forest for the Trees"

A summary should move from a statement of the ***general purpose*** *to the* ***specific ideas*** *used to develop that purpose; it should be neither too vague nor too specific. There is an expression: "I can't see the forest for the trees." It means you get too focused on the details so you miss the "big picture." You don't want to be too general or too detailed. You want to give an accurate description of the forest as a whole, and quickly go over the main characteristics of the types of trees that comprise it (the key examples used to illustrate the main idea). Don't let your summary get bogged down in the minor details, specific examples, and precise data (the species of fungus on the leaves of the trees).*

Appendix C: Writing Comparisons

University classes often ask you to write comparative analyses in which you compare 2 or more items in a way that offers some insights and meaningful conclusions. You can compare almost anything – even porcupine and mushrooms – as long as you have a clear reason for your comparison (a thesis) and logical criteria for comparing the items. For example, although porcupines and mushrooms seem to have very little in common (different life forms) you might compare how both porcupines and mushrooms have developed similar self-preservation methods to avoid predators. In order to compare two items, they must have obvious differences, but interesting similarities – or, conversely, obvious similarities, but interesting differences. Your reason for comparing can often be expressed by clearly articulating these interesting similarities and differences.

Writing an effective comparison relies on clear comparative grammatical and organizational structures.

1. Comparative Grammar

We frequently engage in making comparisons in every day life. This leads to a sort of "short hand" in the way we express comparisons. This shorthand might be understood in a conversational way with the aid of gesture and tone, but formal writing should adhere to certain grammatical standards. A *correct comparative sentence should do the following:*

Clearly identify the things being compared

Ensure the compared items are equivalent and comparable

State the specific criteria for comparison.

These rules might seem obvious, but we often break them in our informal conversational comparisons. For example, the following sentence is intended to compare the difficulty levels of dealing with the peels of apples and oranges, but grammatically compares "apples" to "my lab group," which are not equivalently comparable.

Compared with the apples, my lab group found orange peels more difficult to deal with.

While we would likely understand this in colloquial conversation, in formatl writing this can be very confusing to the reader. How would you fix this sentence to correctly express the comparison of apple peels to orange peels?

They say you can't compare apples and oranges, but you actually can as long as you have established their equivalence, have stated a purpose, and defined clear criteria for comparison. For example, you CAN compare apples to oranges, but you cannot compare apples to fruit. You can compare fruit to vegetables, but you cannot compare fruit to carrots. These are non-equivalent. Non-equivalent comparisons are often a result of faulty sentence structure.

Here is an example of effective comparative topic sentence:

> *There are significant differences between apples and oranges, in terms of their culinary uses, nutritional content, and growing needs.*

Comparative sentences can fail for several reasons:

They are incomplete *(do not clearly identify the two items being compared)*

- *Apples grow better in northern climates. (than what?)*
- *Oranges have twice the vitamin C content. (than what?)*
- *Apples are considered more effective "comfort food."*
- *This design is better.*

They are too vague *(they don't provide enough specific or meaningful information about the items)*

- *There are some differences in the characteristics of apples and oranges.*
- *There were some similarities in the teamwork between the two lab.*
- *Lab 2 was better than lab 1.*

The comparisons are faulty *(often missing information, a sentence structure error, or idiom error)*

- *This process of juicing oranges is different than apples.*
- *Compared with the first lab exercise, my team and I have a more professional approach toward our common goal.*
- *Cooking apples is easier* ***as opposed to*** *oranges.*
- *This lab helped us understand the value of teamwork* ***as against*** *individual work.*

Exercise C-1

Try writing 2 or 3 comparative sentences, making sure you follow all three rules, and watching out for incorrect vernacular phrasing. For example:

> Compare how effectively your team performed in two different lab exercises.
>
> Compare the quality of your draft to the quality of the final peer-reviewed and revised version.
>
> You might even try rewriting Shakespeare's Sonnet 18 ("Shall I compare thee to a summer's day" in prose form, making sure to create correct comparative sentences.

2. Comparative Structures

Just as there are rules at the sentence level, there are also guidelines for comparative paragraph and essay or report structure. ***Alternating*** *(also called Point-by-point) and* ***Block*** *(also called Whole-to-whole) structures are common ways of organizing a comparative analysis, and the structure you use will depend on what, how, and why you are comparing. Let's say you are writing a comparative analysis of how two different articles make use of the rhetorical appeals. Your overall purpose might be to analyze how (or evaluate how well) each article uses rhetorical appeals to effectively convince its specific target audience.*

> ***Alternating Style*** *arranges the structure based on the criteria for comparison (the 3 appeals). Your first section will focus on one of the rhetorical appeals (logos), and compare how both articles use the appeal to logic to convince their respective audiences. The second section will focus on a second rhetorical appeal (pathos), and again, compare how both articles employ the appeal to emotion differently to appeal to their different audiences. In each case, the topic sentence focuses on the criteria for comparison and compares both items according to that criteria.*
>
> ***Block Style*** *arranges the structure based on the items being compared (the articles). Each paragraph will focus on one of the articles, and may discuss more than one criteria for comparison. For example, the first section might focus on one article in detail, and might discuss how it uses both appeals to logic and credibility. The next section would focus on the other article, perhaps discussing its reliance on appeals to emotion.*

Often, ***Alternating*** *structures work well for this kind of comparison, as you can structure your analysis based on a discussion of each rhetorical appeal in turn. You might choose to organize your*

analysis in a ***Block*** *style, if the articles are quite different and you are focusing on different criteria for comparison in each article. Table C-1 shows simplified outlines for each structure*

Table C-1 Simple Outlines of Block and Point-by-Point Structures

Block Style	**Alternating Style**
Introduction: *Introduce items being compared, state the purpose of your comparison (thesis), and indicate the criteria for comparison.* ***Item 1 (Article A)*** • *In-depth analysis of item 1, focusing on several criteria (may need more than 1 paragraph)* ***Item 2 (Article B)*** • *all the things you want to say about item 2* ***Direct Comparison*** *You will need an extra paragraph here for direct comparative analysis based on the discussions in the previous sections.* ***Conclusion***	***Introduction***: *Introduce items being compared, state the purpose of your comparison (thesis), and describe the criteria for comparison.* ***Criteria 1 (appeal to logic)*** • *Article A directly compared to Article B in terms of criteria 1* ***Criteria 2 (appeal to credibility)*** • *Article A directly compared to Article B in terms of criteria 2* ***Criteria 3 (appeal to emotion)*** • *Article A directly compared to Article B in terms of criteria 3* ***Conclusion***
PROs and CONs *If your items are different enough that you aren't using the exact same criteria for comparison, use Block style. But this can end up being a bit repetitive in that you have to remind your reader of your analysis when you get to the direct comparison part at the end.*	***PROs and CONs*** *If you have the same criteria for each item, this is the most economical way to organize your essay. But it can sound a bit "ping-pong" like if you are not careful with transitional words and phrases.*

Sample Essay using Alternating Structure

See the attached essay that uses the alternating structure to compare how and why academic authors might choose different rhetorical strategies than authors writing in a popular context: Choosing Rhetorical Appeals for your Audience

Block and Point-by-point structures are helpful principles for organizing your ideas, but keep in mind that you do not have to rigidly follow these outlines. You can mix these up a bit and use hybrid methods. Examine the excerpt below, from Douglas Rushkoff's book Program or Be Programmed: Ten Commands for a Digital Age.[1] *Identify where the author has used block style, point-by-point style, and a mixture of the two. Also note the use of comparative* ***transitional words and phrases*** *(highlighted for emphasis).*

Sample Comparative Passage – by Douglas Rushkoff

The difference between an analog record and a digital CD is really quite simple. The record is the artifact of a real event that happened in a particular time and place. A musician plays an instrument while, nearby, a needle cuts a groove in a wax disk.... The sound vibrates the needle, leaving a physical record of the noise that can be turned into a mold and copied. When someone else passes a needle over the jagged groove over one of the copies, the original sound emerges. No one has to really know anything about the sound for this to work. It's just a physical event — an impression left in matter.

A CD, **on the other hand**, is not a physical artifact but a symbolic representation. It's more like a text than it is like a sound. A computer is programmed to measure various parameters of the sound coming from a musician's instrument. The computer assigns numerical values, many times a second to the sound in an effort to represent it mathematically. Once the numerical – or "digital – equivalent of the recording is quantified, it can be transferred to another computer, which then synthesizes the music from scratch based on those numbers.

The analog recording is a physical impression, **while** the digital recording is a series of choices. **The former** is as smooth and continuous as real time; **the latter** is a series of numerical snapshots. **The record has as much fidelity** as the materials will allow. The **CD has as much fidelity** as the people programming its creation thought to allow. The [configuration of] numbers used to represent the song – the digital file – is perfect, at least on its own terms. It can be copied exactly, and infinitely.

In the digital recording, however, only the dimensions of the sound that can be measured and represented in numbers are taken into account. Any dimensions that the recording engineers haven't taken into consideration are lost. They are simply not measured, written down, stored, and reproduced. It's not as if they can be rediscovered later on some upgraded playback device. They are gone.

Given how convincingly real a digital recording can seem — especially **in comparison** with a scratchy record – this loss may seem trivial. After all, if we can't hear it, how important could it be? Most of us have decided it's not so important at all. But early tests of analog recording **compared to** digital ones revealed that music played back on a CD format had **much less of** a positive impact on depressed patients **than** the same recording played back on a record. Other tests showed that digitally recorded sound moved the air in a room **significantly differently than** analog recordings played through the same speakers. The bodies in that room would, presumably, also experience that difference – even if we humans can't immediately put a name or metric on exactly what that difference is.

1. Rushkoff, *Program or Be Programmed: Ten Commands for a Digital Age*. Soft Skull Press, 2011, pp. 52-54

Notes

1. *D. Rushkoff, Program or Be Programmed: Ten Commands for a Digital Age. Soft Skull Press, 2011. pp. 52-54.*

Appendix D: Transitional Words and Phrases for University Writing

In previous English classes, you may have learned the basic transitional words or phrases in ***Table D.1****. These can be effective when writing simple information in a structure where you simply add one idea after another, or want to show the order of events.*

TABLE D.1 Basic beginner-level transitions

first	*firstly*	*first of all*
second	*secondly*	*next*
third	*thirdly*	*then*
last	*last but not least,*	*finally*
moreover	*furthermore*	*besides*

However, more complex university-level writing requires more sophisticated transitions. It requires you to connect ideas in ways that show the logic of ***why*** *one idea comes after another in a complex argument or analysis. For example, you might be*

- *comparing/contrasting ideas*
- *showing a cause and effect relationship*
- *providing detailed examples to illustrate an idea*
- *presenting a conclusion to an argument.*

When expressing these complex ideas, the simple transitions above will not always be effective – indeed, they may even confuse the reader.

Consider the transitions in ***Table D.2,*** *and how they are categorized. While this is not an exhaustive list, it will gives you a sense of the many transitional words and phrases that you can choose from, and help you choose the one that most effectively conveys your meaning.*

TABLE D.2 Sophisticated university-level transitions

Addition	**Comparison**	**Contrast**	**Cause and Effect**
also	*along the same lines*	*although*	*accordingly*
and	*in the same way*	*but*	*as a result*
in addition	*similarly*	*in contrast*	*consequently*
in fact	*likewise*	*conversely*	*hence*
indeed	*like*	*despite*	*it follows, then*
so too		*even though*	*since*
as well as		*however*	*so*
furthermore		*nevertheless*	*then*
moreover		*whereas*	*therefore*
		yet	*thus*
		while	
		on the other hand	
Conclusion	**Example**	**Concession**	**Elaboration**
as a result	*as an illustration*	*admittedly*	*by extension*
consequently	*consider*	*granted*	*in short*
hence	*for example*	*of course*	*that is to say*
in conclusion	*for instance*	*naturally*	*in other words*
in short	*specifically*	*to be sure*	*to put it another way*
in sum	*a case in point*	*conceding that*	*to put it bluntly*
it follow, then		*although it is true that…*	*to put it succinctly*
so			*ultimately*
therefore			
thus			

Transitional words and phrases *show the connection between ideas, and show how one idea relates to and builds upon another. They help create* ***coherence****. When transitions are missing or inappropriate, the reader has a hard time following the logic and development of ideas. The most effective transitions are sometimes invisible; they rely on the vocabulary and logic of your sentence to allow the reader to "connect the dots" and see the logical flow of your discussion.*

Common Transitional Strategies to Link Ideas

- Repeat a word or phrase from the previous sentence (or use a synonym, related word, or antonym) to show that the same idea is still being discussed, but is being developed further
- Use the pronoun "this + noun" to show continued discussion of the idea
- Use one of the above transitional words or phrases to show ***how*** you are developing your idea. Are you showing contrast? Are you using an example to develop your idea? Are you explaining a cause and effect relationship? Are you concluding? Are you conceding a point?

Exercise D-1: *Place the transitional words below the paragraph into the blanks where they work most logically into the paragraphs.*

Exercise 1

A vegan can be defined as someone who does not eat meat, fish, or other animal products, such as eggs or cheese; _____, he or she eats vegetables, fruits, grains, and seeds. _____ this diet consists of non-meat food sources, a vegan typically consumes less fat and cholesterol than an individual who consumes meat. _____, raising animals for food uses valuable land, water, and energy. _____, adopting a vegetarian diet helps conserve the valuable resources that our future depends on.

- Consequently
- Because
- Furthermore
- Instead
- For example

Exercise 2

_____ many educators and parents have praised the *Harry Potter* series, some Christian parents have called for a ban on the books in their schools and libraries. Some churches have even gone as far as burning the books, citing biblical injunctions against witchcraft, _____ those in *Exodus* and *Leviticus*. _____, some Christians believe the books are compatible with Christianity, _____, that they embody basic Christian beliefs.

- However
- Although
- In addition
- Such as

- Indeed

Appendix E: Sentence Structure

When building anything, it is important to be familiar with the tools you are using. Grammatical elements are the main "tools" you use when when building sentences, paragraphs, and longer written works. Thus, it is critical to have some understanding of grammatical terminology in order to construct effective sentences. If you would like to a review some basic parts of speech (nouns, pronouns, articles, adjectives, adverbs, verbs, conjunctions, prepositions, etc), see the ***Parts of Speech Overview*** *at the OWL.*

The two essential parts of a sentence are the ***subject*** *and the* ***predicate*** *(verb portion). The subject refers to the topic being discussed while the verb conveys the action or state of being expressed in the sentence. All clauses must contain both a subject and a verb; phrases, on the other hand, lack one or both a subject and a verb, so they need to relate to or modify other parts of the sentence. Main clauses, also called* ***independent*** *clauses, can stand on their own and convey an idea.* ***Dependent*** *clauses, also called* ***subordinate*** *clauses, rely on another part of the sentence for meaning and can't stand on their own.*

Consider the following examples:

Independent Clause	**Phrases**
1. The **engineers** stood around the table	looking at the schematics for the machine.
(subject) (verb) (phrase)	(phrase) (phrase)

Sentence 1 *is a simple sentence. It has one clause, with one* ***subject*** *(The engineers) and one verb (stood). These are followed by 3 modifying phrases ("around the table" "looking at the schematics" and "for the machine").*

Dependent Clause	**Independent Clause**
2. After **they** discussed different options,	**they** decided to re-design the components.
Sub. Conj. **(subject)** (verb) (object)	**(subject)** (verb) (phrase)

Sentence 2 *is a complex sentence, with one dependent and one independent clause, each with its own* ***subject****-verb combination ("****they*** *discussed" and "****they*** *decided"). The two clauses are joined by the subordinate conjunction, "after," which makes the first clause subordinate to (or dependent upon) the second one.*

Being able to identify the critical parts of the sentence will help you design sentences that have a clear and effective subject-verb relationship. Knowing the components will also help you improve your punctuation. If you would like a more detailed review of sentence structure, visit Purdue's OWL (Online Writing Lab) Mechanics page.

Sentence Structures

There are four main types of sentence structures: simple, compound, complex, and compound-complex. In the examples above, Sentence 1 is a simple sentence, while Sentence 2 is complex.

SIMPLE SENTENCES *have one main clause (one subject + one verb) and any number of phrases. The following are all simple sentences:*

- A simple sentence can be very effective.
- It makes one direct point.
- It is good for creating emphasis and clarity.
- Too many in a row can sound repetitive and choppy.
- Varied sentence structure sounds more natural.

COMPOUND SENTENCES *have two or more main clauses joined by one of the* ***coordinating conjunctions*** *(CC): and, but, for, yet, nor, or, so (FANBOYS). You can also connect them using punctuation such as a semi-colon or a colon. By* ***coordinating*** *the ideas, you are giving them roughly equal rhetorical weight and importance.*

Subject + verb, CC Subject + verb

The following sentences are all compound:

- A compound sentence coordinates two ideas**, and** each idea is given roughly equal rhetorical weight.
- The two ideas are closely related**, so** you don't want to separate them with a period.
- The two clauses make up part of the same idea**; thus**, they should be part of the same sentence.

- The two clauses may express a parallel idea; they might also have a parallel structure.
- You must remember to include the coordinate conjunction, **or** you may commit a comma splice.

COMPLEX SENTENCES *express complex and usually unequal relationships between ideas. One idea is "**subordinated**" to the main idea by using a "**subordinate conjunction**" (like "while" or "although"); one idea is "dependent" upon the other one for logic and completeness.* **Complex sentences** *include one main clause and at least one dependent clause. Often, it is stylistically effective to begin your sentence with the dependent clause, and place the main clause at the end for emphasis.*

Subord. Conjunction + subject + verb (*this is the dependent clause*), Subject + verb (*this is the main clause*)

The following are all examples of complex sentences:

- **When** you make a complex sentence, you subordinate one idea to another.
- **If** you place the subordinate clause first, you give added emphasis to the main clause at the end.
- Subordinate clauses cannot stand on their own. Despite the fact that many students try to use them that way. x (*fragment* – replace the period with a comma to fix this error)

COMPOUND-COMPLEX SENTENCES *have at least two main clauses and at least one dependent clause. Because a compound-complex sentence is usually quite long, you must be careful that it makes sense; it is easy for the reader to get lost in a long sentence.*

KEY TAKEAWAY

Using a variety of sentence types as well as using these types strategically to convey your ideas will strengthen your style. Keep the following in mind:

- **Simple sentences** are great for emphasizing a key point.
- **Compound sentences** balance ideas; they are great for conveying the equal importance of related ideas.

- **Complex sentences**, when you use them effectively, show complicated relationships between ideas by subordinating one idea to another.

EXERCISE *Combining sentences*

Combine the following pairs of sentences to make one idea subordinate to the other. Notice the impression you convey by how you subordinate one idea to another. If your combined sentence was a topic sentence for a paragraph, what idea would the reader expect that paragraph to emphasize?

Pair 1.

- Energy drinks enhance awareness and energy level.
- Energy drinks have negative health impacts.

Pair 2.

- Smith's study found that energy drinks can increase athletic endurance.
- The study also found that energy drinks can cause negative side effects such as headaches and "energy crashes", and can possibly lead to caffeine addiction.

Pair 3.

- The rates of adolescent male violence has dropped by 20% over the last decade.
- The rates of female adolescent violence has increased by 50% over the last decade.

Pair 4.

- Nuclear power plants can pose significant dangers.
- Nuclear energy is a clean and efficient way to generate power and reduce reliance on fossil fuels.

Appendix F: Punctuation Matters

> *"Punctuation marks are the road signs placed along the highway of our communication, to control speeds, provide directions and prevent head-on collisions."*
>
> *Pico Iyer, "In praise of the humble comma"*[1]

Punctuation *Really* Matters!

Consider how punctuation can change the meaning of the following run-on sentence:

I have two hours to kill someone come see me.

The main function of punctuation is to separate phrases and clauses into meaningful units of information to avoid confusino. Therefore, it is necessary to understand the basic structure of sentences—phrases and clauses—to understand the proper uses of punctuation. When punctuation is missing or incorrectly used, the reader may get a completely different message than the one intended. This can not only confuse readers and waste time, but can have disastrous results in cases where the writing has legal, economic, or safety implications.

2

An example of how a punctuation error can have real world costs and consequences is reported in "Comma Quirk Irks Rogers": one comma error in a 10-page contract cost Rogers $2 million.[3] *If you need further evidence, read about the case of the $10 million serial comma that went all the way to the supreme court!*[4]

There are several helpful rules that will help you determine where and how to use punctuation, but first, it might be helpful to understand the origins. Punctuation was initially developed to help people who were giving speeches or reading aloud. Various kinds of punctuation indicated when and for how long the reader should pause between phrases, clauses, and sentences:

Comma = 1 second pause

Semicolon = 2 second pause

Colon = 3 second pause

Period = 4 second pause

These "pause rules" can still offer some guidance, but they are not foolproof, as there are many reasons that someone might pause while speaking, including that they simply ran out of breath, got distracted, or need time to think of a word. Below are some more consistent rules that you should follow to properly punctuate your sentences. These are presented in a numerical order to help you remember the rules more easily.

COMMA RULE 1 – *Set off an introductory element before the subject*

If the subject is not the **first** word/phrase in the sentence, place a comma before it to separate it clearly from the introductory element and indicate clearly what the subject of the sentence is.

As we have discussed before, ***sentences*** *are most often strongest when the subject is the first element of the sentence:* S → V → O

Occasionally, however, ***we*** *might want to place a word or phrase before the subject. In cases where you want to do this,* **it** *can be helpful, and often necessary, to place a comma after that word or phrase to clearly indicate the subject of the sentence. (Notice the bolded subjects in the previous sentences all have an introductory element before them). In the following sentence, see if you can determine what the subject is without a comma to help you:*

Based on that initial design concepts will be generated.

The subject—and therefore the meaning of the sentence—depends on where you place the comma. If the initial phrase is "Based on that," and "that" refers to some previously stated idea, then the sentence

*indicates that the subject is "**initial design concepts**," and the verb is "will be generated." However, if the initial phrase is "Based on that initial design," then we already have an initial design to work from and do not have to generate one. We are now focusing on creating more advanced "**concepts**," that will be "based on that initial design."*

*So if the subject is not the #1 word in your sentence, place a comma before it to clearly show what the subject is (hence "comma rule #1"). In each of the following examples, the subject of the main clause is **bolded**.*

After an introductory word	*Finally, **the design** must consider all constraints.*
After an introductory phrase	*In the initial phase, **the design** must meet early objectives.* *Meeting all the client's needs, **this design** has the potential to be very successful.* *Unlike Mei, **Karla** loves mechatronics.*
After a subordinate clause	*If the design meets all the objectives, **we** will get a get a raise.* *Although we are slightly over budget, **the design** will be cost effective overall.* *While he interviews the client, **she** will do a site survey.*

COMMA RULE 2 – *Interrupt the subject and verb*

Never place a single comma between the subject and verb of the sentence; you need either two commas (like brackets) or no commas between the subject and verb.

*When you place an interrupting word, phrase, or clause between the subject and verb, if that phrase is a non-essential element, you must enclose that phrase in commas (use the "bracket test": if you could enclose it in brackets, then you can use commas). If the phrase is essential to the meaning, omit the commas. The words interrupting the subject and verb are **bolded** in the examples below.*

Interrupting word	*Communication errors,* ***unfortunately****, can lead to disastrous design flaws.* *The rules,* ***however****, are quite easy to learn.*
Interrupting Non-Essential Phrase or Relative Clause *(****these*** *could be bracketed, and even omitted, without changing the meaning of the sentence)*	*The Johnson street bridge,* ***commonly known as the "Blue Bridge,"*** *had to be replaced.* *The new bridge,* ***completed last year,*** *is a rolling bascule design.* *The new bridge,* ***which is a rolling bascule design****, was completed last year.*
Interrupting Essential phrases or clauses *do not use commas;* ***these*** *are essential to the meaning of the sentence*	*The objective* ***that is most critical to our success*** *is the first one.* *That bridge* ***that needed replacing*** *was the Blue Bridge.* *The man* ***with the yellow hat*** *belongs to Curious George.* *The student* ***who has the best design*** *will get an innovator's award.*

If you would like more information on Essential vs Non-Essential elements, and when to use "that" vs "which," check out this ***Grammar Girl*** *link:* Which versus That

Beware the "Pause Rule"*—many comma rule 2 errors occur when a sentence has a long subject phrase followed by the verb "is." People have the tendency to want to place a comma here, even though it is incorrect, simply because they would normally pause here when speaking:*

> *The main thing that you must be sure to remember about the magnificent Chinese pandas of the southwest, x is that they can be dangerous.*

COMMA RULE 3 – *The serial comma*

When listing a series of 3 or more items, separate the items with commas.

Whether you are listing 3 or more nouns, verb, adjectives, phrases, or even clauses, use commas to separate them. In general, do ***not*** *place a comma before the first item or after the last item. If you are only listing two items, do not separate them with commas. Note what happens when you forget to put commas in the following sentence:*

"I love cooking my family and my pets."

The author may have intended to list three things that she loves, but without punctuation, she ends up listing two things she loves to cook.

Only use the commas if there are three or more elements being listed. Make sure to list the elements in a consistent grammatical form (all nouns, or all verbs, or all using parallel phrasing).

2 listed elements *(no commas needed)*	*All initial designs must incorporate mechanical structures and electrical systems. (2 nouns)* *Squirrels eat acorns and sleep in trees. (1 subject + compound verb (2 actions)*
3 listed elements	*The final design must incorporate mechanical, electrical, and software subsystems. (3 adjectives describing different subsystems)* *Squirrels eat acorns, sleep in trees, and dig holes in the garden. (3 actions)* *The proposed designs must not go over budget, use more than the allotted equipment, or take longer than 1 week to construct. (3 verbs: go, use, and take)*
faulty parallel phrasing *(one of these things is not like the others…)*	*Proposed design concepts must adhere to all constraints, meet all objectives, and the components x must be on the approved list. (2 verbs and a 1 noun)* *The new bridge is aesthetically pleasing, structurally sound, and has x a pedestrian walkway. (2 adjectives and 1 verb)*

There is some debate about whether to place a comma before the "and" used before the final listed item. This comma, referred to as the Oxford Comma as it is required by Oxford University Press, is optional in many situations. For an optional piece of punctuation, has stirred up a surprising amount of controversy! As with most grammatical rules, they can be broken when it is prudent and effective to do so; use your judgment, and choose the option that achieves the most clarity for your reader.

EXERCISE F-1 *Review Comma Rules 1-3*

Punctuate my imaginary award acceptance speech below, indicating where you would put commas and which rules you are following:

For their guidance and inspiration throughout my life I with all humility would like to thank my parents Lady Gaga and Ghandi.

COMMA RULE 4 – *Joining clauses*

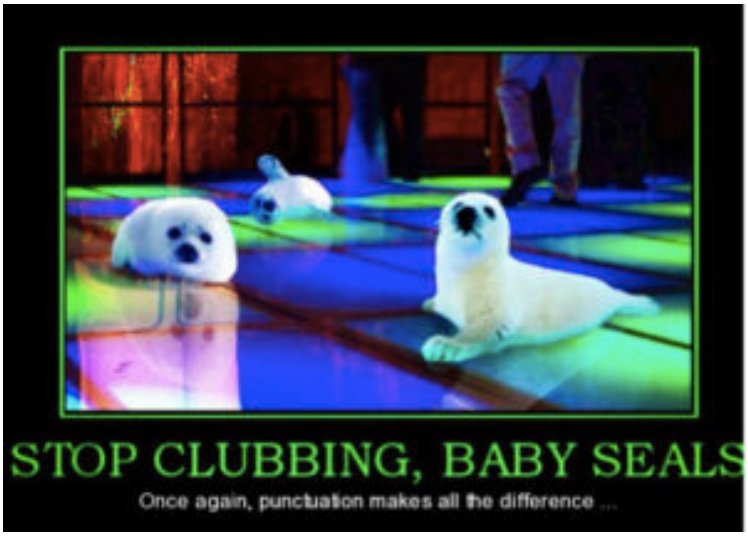
Separate independent clauses by placing a comma before the coordinating conjunction.
Use a comma to join a dependent clause to an independent clause.

While you might occasionally omit commas if the two clauses you want to join are very short ("She drove and he navigated."), it is a good habit to separate them with a comma for the sake of clarity. The mnemonic device for remembering the coordinating conjunctions that can link two independent clauses together is FANBOYS (*for, and, nor, but, or, yet, so*). *When you have two complete sentences, but you want to join them together to make one larger idea, use a comma before the coordinating conjunction.*

FANBOYS	***Two clauses joined by a comma and coordinating conjunction***
, for	*Thanks goodness next week is reading break,* ***for*** *we all need rest.*
, and	*Vampires drink blood,* ***and*** *zombies eat brains.*
, nor	*You should not play with vampires, nor should you hang around with zombies.*
, but	*The undead are not acceptable playmates,* ***but*** *werewolves are ok most of the time.*
, or	*You can simply avoid werewolves during the full moon,* ***or*** *you can lock them in the basement.*
, yet	*Some rules of etiquette suggest it is rude to lock someone in the basement,* ***yet*** *safety is of paramount concern.*
, so	*I think you understand my concerns,* ***so*** *I will leave it at that.*

COMMA RULE 5

Use commas to indicate that a non-essential sentence element (a word, phrase, or clause) follows the comma, or to signal an abrupt shift in thought.



5

Learning comma rules takes practice, of course.

Practice makes perfect, in the long run.

Vampires make everyone nervous, even the bravest slayers.

I told you I need it by Wednesday, not Thursday.

Consider the difference between "It's raining cats and dogs" and "It's raining, cats and dogs."

SEMICOLON RULES

Use semicolons to link ideas when something stronger than a comma is needed.

A semicolon has three main functions:

1. Join closely related independent sentences into one sentence:

> *Raj was impatient to get married; Devon wanted to wait until they were financially secure.*

(Subject are strongly related — indeed, in this case, they are engaged!)

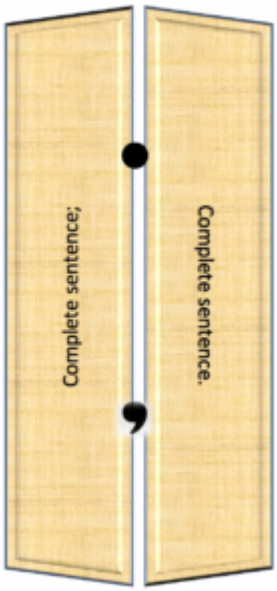
2. ***Link two sentences joined by a transitional phrase/conjunctive adverb*** *(however, therefore, finally, moreover, etc.):*

   Leah found Canadian History to be a rather dull class; however, it is a requirement for the elementary education program.

3. ***Separate items in a complex list where one or more of the items have internal punctuation:***

   The role of the vice-president will be to enhance the university's external relations; strengthen its relationship with alumni, donors, and community leaders; and implement fundraising programs.

In the first two cases, a semicolon works the same way a period does; if you could put a period there, then you can put a semicolon there. The semicolon simply connects the ideas more closely as part of one key idea, and makes the pause between them a little shorter.



The main rule you must remember is that if you use a semicolon in this way, the clauses on either side of the semicolon must be complete sentences. You cannot use a semicolon to introduce a phrase or fragment.

Complete sentence; complete sentence.

Think of the semicolon as working like a hinge in a bi-fold door; it joins two complete door panels that each have their own frame together as one.

Also remember that you cannot simply use a comma instead of a semicolon to link the two clauses; that would result in a comma splice error.

The 3rd case–using semicolons to separate long, complex list items that contain commas within them–can result in complicated sentences that are difficult to read. You might consider using a bullet list instead of an in-sentence list in these cases.

How would you punctuate the following to clearly show how many courses Makiko is taking?

Makiko is taking Classics, a course on the drama of Sophocles, Seneca, Euripides, Fine Arts, a course on Impressionism, Expressionism, Modernism, Literature, a course on Satire, Pastiche, Burlesque, and Science, a new course for Arts students.

EXERCISE F-2 : *Add commas and/or semicolons as needed in the following sentences*

1. Many companies make sugar-free soft drinks that are flavoured by synthetic chemicals the drinks usually contain only one or two calories per serving.
2. The crab grass was flourishing but the rest of the lawn unfortunately was dying.
3. The hill was covered with wildflowers it was a beautiful sight.
4. The artist preferred to paint in oils he did not like watercolours.
5. The house was clean the table set and the porch light on everything was ready for the guests' arrival.
6. The computer could perform millions of operations in a split second however it could not think spontaneously.
7. The snowstorm dumped twelve inches of snow on the interstate subsequently the RCMP closed the road.
8. We invited a number of senior managers including Ann Kung senior vice-president Lionel Tiger director of information technology and Marty Sells manager of marketing.

COLON RULES

Use a colon to introduce amplification in the form of an example, explanation, quotation, summary, or list.

Keep in mind that when correctly used, colons are only placed where the sentence could come to a complete stop (i.e: you could put a period there instead).

Amplification	*The hurricane lashed the coastal community: within two hours, every tree on the waterfront had been blown down.*
Example	*The tour guide quoted Gerald Durrell's opinion of pandas: "They are vile beasts who eat far too many leaves."*
List	*Today we examined two geographical areas: the Nile and the Amazon.*

Remember that when introducing a list, example, or quotation with a colon, whatever comes before the colon should be a complete sentence. You should not write something like this:

Today we examined: x

Three important objectives we must consider are: x

If these cannot end in a period, they should not end in a colon. Whatever comes after the colon can be a fragment or list; it does not have to be a complete sentence.

EXERCISE F-3 *Additional practice*

1. Download the attached Punctuation Exercise (.docx) document and compete the exercises with a classmate.
2. Choose a paragraph from the Pico Iyer's *Time Magazine* article, "In praise of the humble comma," and examine how he has used punctuation to demonstrate his point in that paragraph. In particular, note how he not only *explains* the importance of punctuation, but also *shows* its use in action.

Notes

1. P. Iyer, "In praise of the humble comma," Time, 24 June, 2001 [Online]. Available: https://time.com/archive/6712509/essay-in-praise-of-the-humble-comma/
2. [Grandma image]. [Online]. Available: https://91rules.wordpress.com/2011/10/14/who-knew-commas-could-be-so-important/. CC-BY 2.0.
3. G. Robertson, "Comma quirk irks Rogers," The Globe and Mail, Aug. 6, 2006 [Online]. Available: https://www.proofreadnow.com/hubfs/docs/2.1Mcomma.pdf
4. M. Norris, " A few words about that ten-million-dollar serial comma," The New Yorker, March 17, 2017 [Online]. Available: https://www.newyorker.com/culture/culture-desk/a-few-words-about-that-ten-million-dollar-serial-comma
5. [Baby seals image]. [Online]. Available: https://www.flickr.com/photos/venditti_min_min-venditti/30088824650. CC-BY 2.0.