

CHAPTER 24: REVISING FOR CLARITY, CONCISENESS, AND CORRECTNESS

Chapter outline

- Revising paragraphs for clarity and coherence
- Revising sentences for clarity
- Revising sentences for conciseness
- Editing for correctness

Engineers must at all costs avoid confusion and vagueness in their writing, because unclear writing can lead to costly, even disastrous, mistakes. Ultimately, writing clearly means paying attention to details like paragraphs and sentences. Paragraphs are the main organizational unit for writing, and readers tend to skim paragraphs to find main ideas. As a result, paragraphs need to be well structured so that main ideas appear early, in topic sentences, and all details in the paragraph support the key point. Similarly, sentences need to be well structured so that readers can easily find key points and act correctly on the information presented. In addition, engineers must write concisely, not only because readers are busy and want to get the information quickly, but because wordiness can obscure meaning and, as with vagueness, lead to mistakes. This kind of writing is like detailed design in the design process, getting down to a level of precision and accuracy that may not be present in earlier stages.

Revising for clarity and conciseness is a huge topic, so this book cannot offer comprehensive advice in these areas. In this chapter, however, we present important ideas about the professional writing style you should use in documents related to design, and techniques for revising and editing to achieve clarity, conciseness, and correctness.

24.1 REVISING PARAGRAPHS FOR CLARITY AND COHERENCE

Well-written paragraphs allow readers to identify main points easily, understand the reasons behind those points, and assimilate the information. In the

following sections, you will learn how to make sure that each paragraph has a strong topic sentence (usually the first sentence in the paragraph) and that sentences clearly relate to one another and to the topic sentence.

24.1.1 Topic sentences

The purpose of the topic sentence is to state the main point. It's the most important part of the paragraph because readers are likely to pay the most attention to it; in fact, they may merely skim the rest of the paragraph. Therefore, you should evaluate the opening sentence of each paragraph by asking: Does it state a single main point? Does it state the main point specifically and concisely? Does it capture the essence of the paragraph? With these questions in mind, you might do one or more of the following to improve the topic sentence:

- add a topic sentence to the paragraph
- revise the topic sentence to make it more specific
- make the topic sentence and body of the paragraph consistent with one another
- break a long paragraph into shorter paragraphs and add a topic sentence to each

Each type of revision is discussed below.

1. Adding a topic sentence. Sometimes you'll come across a paragraph you have written that lacks a topic sentence. You may have become so bogged down in details that you didn't figure out the main point, or you may have been thinking of a topic sentence but neglected to write it down.

Example 24.1: Rough draft of a paragraph with no topic sentence

User testing proved to be of less help than we had hoped in making the three design alternatives because there was a statistically insignificant spread among user preferences. After speaking with our client, we decided to focus on alternative one—the three-compartment storage—due to its versatility and ease of use. Our client strongly believes that of all the alternatives, the three-compartment design allows users to adapt the design most easily to their individual storage needs.

The first sentence doesn't state the main point of the paragraph—the decision to focus on alternative one—and so is not a topic sentence. Here is a revision:

Example 24.2: Revised paragraph with a topic sentence

We have decided to focus on alternative one—the three-compartment storage—for our final design direction on the basis

of client, rather than user, input. User testing proved to be of less help than we had hoped in deciding among the three design alternatives because there was a statistically insignificant spread among user preferences. After speaking with our client, we decided to focus on alternative one due to its versatility and ease of use. Our client strongly believes that of the three alternatives, the three-compartment design allows users to adapt the design most easily to their individual storage needs.

The topic sentence mentions client and user input, and nicely sums up the ideas in the paragraph.

2. Revising the topic sentence for clarity. You might find some paragraphs with vague topic sentences that fail to state the main point in specific enough terms. The topic sentence in the following rough draft suffers from that problem; it says that the team will continue its progress but not precisely how they will do so:

Example 24.3: Rough draft of a paragraph with a vague topic sentence

In the next two weeks we will continue our progress. We plan on brainstorming, setting criteria to evaluate our brainstormed ideas, and developing at least three design alternatives. We will then mock up these alternatives in foamcore and test them on users in our target group—children between the ages of 5 and 12.

Following is a revised topic sentence that replaces the vague phrase “continue our progress” by stating specifically what the team intends to do.

Example 24.4: revised paragraph with a specific topic sentence

In the next two weeks, we will generate alternatives and build mockups that we can test. We plan on brainstorming, setting criteria to evaluate our brainstormed ideas, and developing at least three design alternatives. We will then mock up these alternatives in foamcore and test them on users in our target group—children between the ages of 5 and 12.

3. Revising the topic sentence and the body of the paragraph. Occasionally you will need to revise both the topic sentence and the body of the paragraph to make them consistent with one another. Here is an example of a rough draft in which the topic sentence and the rest of the paragraph are inconsistent:

Example 24.5: Rough draft that requires editing of the topic sentence and the body of the paragraph

To keep costs down, we have chosen Velcro straps to secure the compartments. Velcro is easy to use and durable. Our user observations show that children can easily use Velcro straps to secure and open the compartments. In addition, there are a number of types of Velcro designed for the heavy use the compartments will receive.

The topic sentence mentions cost, but the body of the paragraph doesn't. Also, the body of the paragraph mentions usability, but the topic sentence does not. The ideas were connected in the writer's mind, but weren't expressed in the paragraph. Therefore, both elements of the paragraph need revision:

Example 24.6: Revision with consistent topic sentence and body of the paragraph

To keep costs down without sacrificing usability, we have chosen Velcro straps to secure the compartments. Our research revealed that Velcro would cost 75 percent to 90 percent less than our two alternative methods. Furthermore, Velcro is easy to use and durable: Our user observations show that children can easily use Velcro straps to secure and open the compartments. In addition, there are a number of types of Velcro designed for the heavy use the compartments will receive.

4. Breaking up long paragraphs that contain more than one point, and giving each one a topic sentence. Often, long paragraphs need to be broken up because they contain more than one main point. Here's a rough draft of a long paragraph:

Example 24.7: Rough draft of a long paragraph with more than one main point

The storage case will be made of a durable, weather-resistant, slightly flexible plastic called thermoplastic elastomer. It is the same material used to make the soles of athletic shoes and is meant to perform well under high-impact conditions. It has also proven to stand up well to rain, snow, and extremely high and low temperatures (see Appendix D). The plastic walls of the case will be 1 inch thick so the contents will not be damaged by impacts to the case. Because the material is flexible, it will not dent as metal will. The dimensions of the case are 12 inches wide, 10 inches high, and 7 inches deep. These dimensions allow the case to fit into the required space and to hold the kinds of objects specified by users. A lock makes the case theft-resistant. We have contacted a manufacturer of the thermoplastic elastomer and learned that the lock mechanism can easily be installed in a case made of this material (see Appendix E).

This topic sentence leads readers to believe that the paragraph is about the benefits of the plastic used for the case. But the body of the paragraph also makes important points about the dimensions and lock. The revision below divides the information into several paragraphs each with its own main point and topic sentence:

Example 24.8: Each paragraph has its own main point and topic sentence

The storage case will be made of a durable, weather-resistant, slightly flexible plastic called thermoplastic elastomer. It is the same material used to make the soles of athletic shoes and is meant to perform well under high-impact conditions. It has also proven to stand up well to rain, snow, and extremely high and low temperatures (see Appendix D). Finally, because the material is flexible, it will not dent as metal will.

The dimensions of the case will make it user friendly and durable. The case's measurements are 12 inches wide, 10 inches high, and 7 inches deep. These dimensions allow the case to fit into the required space and to hold the kinds of objects specified by users. The plastic walls will be 1 inch thick so the contents will not be damaged by impacts to the case.

A lock makes the case theft-resistant. We have contacted a manufacturer of the thermoplastic elastomer and learned that the lock mechanism can easily be installed in a case made of this material (see Appendix E).

The three shorter paragraphs are not only easier to read, and more visually appealing on the page, but they mesh more effectively with the way that people read and notice information: people notice and best remember information that appears at the beginning of something.

24.1.2 Flow of ideas within paragraphs

Technical documents often contain a lot of information in each paragraph, making it easy to lose your reader. The solution to this problem is to relate each sentence to the topic sentence or to the previous sentence. In doing so, you make your writing flow. For example, if you write a topic sentence that says the paragraph is about research results, you should clearly state results or make a point about results in each succeeding sentence. You should also use transitional words and phrases between sentences and paragraphs to highlight the logical connections. The following table lists some transitional words:

Table 24.1: Transition words and phrases

Transition categories	Transition words
Adding to	also, furthermore, in addition, moreover
Showing sequence	then, next, after, finally, first/second/third, one/two/three
Contrasting	however, nevertheless, in contrast, on the other hand
Showing cause and effect	therefore, as a result, consequently, thus, for this reason
Providing examples	for instance, for example
Showing similarity	similarly, likewise

As you edit paragraphs for logical flow of ideas, don't just add these transitional words indiscriminately. Instead, think first about how all the sentences in the paragraph relate to each other, and then edit to clarify these relationships.

In the rough draft paragraph below, it's difficult to determine the relationships among the facts:

Example 24.9: Rough draft of a paragraph that lacks a logical flow of ideas

After our research revealed the magnitude of this project, we took steps to determine whether it would still be within our client's budget. We consulted with a manufacturer and two retailers. We learned that the estimated price of materials and construction would range from \$6,000 to \$8,000. We were advised by our professors to meet with our client as soon as possible to determine where we should go with this project. We were informed that our client would not go forward with our current design approach.

There are two major problems with the flow of ideas in this paragraph. First, the topic sentence states that the team took steps, but some of the later sentences do not indicate the steps that were taken. For example, the team says they "were advised by professors" to do something, but that's a step that their professors, not they, took. Second, the sentences do not always relate to one another: In the last two sentences, did the professors tell the team that they should meet with the client and that the client would not want to go forward with the current approach? Or, after talking to their professors, did the team go to the client and learn from him that they should not go forward with their approach? Without transitions, the paragraph is unclear and choppy.

The following revision corrects these problems:

Example 24.10: Revised paragraph with a clear flow of ideas

After our research revealed the magnitude of this project, we took steps to determine whether it would still be within our client's budget. First, we consulted with a manufacturer and two retailers, and learned that the estimated price of materials and construction would range from \$6,000 to \$8,000. Then we solicited advice from our professors, who recommended that we meet with our client as soon as possible to determine where we should go with this project. Finally, we met with our client, who told us not to go forward with our current design approach.

In the rough draft below, the relationship of the sentences to one another also is unclear. The team's intention in this paragraph was to make a case for their design by citing three advantageous features. But because they didn't state that intention, or use transitional words, their point is unclear.

Example 24.11: Rough draft of a paragraph with unclear sentence flow

The swivel-grip design allows for a simple, intuitive clamping motion to attach the light to any support bar. The clamping motion requires very little hand movement, and can be completed quickly. Unlike the existing design, the swivel-grip adjusts easily to whatever diameter the support bar may be. In tests of the prototype, users were able to attach the swivel grip to bars of varying diameters in approximately one second. The shape of the swivel-grip makes its use intuitive. Users were able to attach the prototype without any instruction or prompting from us.

In the following revision, the team clarifies its point by stating the paragraph's purpose and using transitional words:

Example 24.12: Revision with clear transitions

The swivel-grip design allows for a simple, intuitive clamping motion to attach the light to any support bar. Three features account for the design's ease of use. First, because the clamping motion requires very little hand movement, it can be completed quickly. Second, unlike the existing design, the swivel-grip adjusts easily to whatever diameter the support bar may be. In tests of the prototype, users were able to attach the swivel grip to bars of varying diameters in approximately one second. Third, the shape of the swivel-grip makes its use intuitive. Users were able to attach the prototype without any instruction or prompting from us.

24.2 REVISING SENTENCES FOR CLARITY

Even if a paragraph is well structured, vague wording or overly long or complicated sentences can confuse readers and make them doubt your credibility. Consider the following rough draft paragraph from a final report intended for a client:

Example 24.13: Rough draft of a vague paragraph

The ramp will be reasonably safe. Sheeting with an extremely high coefficient of friction will cover it, making it rather difficult for a wheelchair to slip while ascending or descending the ramp. Although less expensive sheeting with a lower coefficient of friction could have been used, this seemed ideal to address the needs. In addition, our expert interviews appeared to support it strongly. We did tests under very wet conditions and it performed really well.

Not only is this paragraph worded vaguely, but it will make the client question the safety of the design. What does “reasonably safe” mean? How is it safe? What exactly is the coefficient of friction? What coefficient of friction is recommended for wheelchair ramps? What does “rather difficult to slip” mean—will wheelchairs slip under certain conditions? What is the difference in cost between the two types of sheeting? In the phrase “this seemed ideal to address the needs,” what is “this,” why does the sheeting only “seem” ideal, and whose needs will be addressed? Which experts were consulted? What were their credentials? How were the tests performed and what were the results?

The vague wording in the paragraph falls into the following categories. Note that the precise revisions often require more words, but that does not make them “wordy.” Wordiness refers to writing that is longer than necessary, not to extra words that clarify your meaning.

1. Vague modifiers: reasonably safe, extremely, rather, difficult, ideal, very, really, well. Eliminate vague modifiers or replace them with precise ones:

Example 24.14: Eliminating vague modifiers

Vague

Clear

The ramp will be reasonably safe.	The ramp will keep wheelchairs from slipping in rain or snow.
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2. Vague verbs: could have, seemed, appeared. Replace vague verbs with precise ones:

Example 24.15: Eliminating vague verbs

Vague	Clear
Our expert interviews appeared to support it strongly.	Our expert interviews supported it strongly.

3. Vague pronouns: this, it. Use specific words to avoid ambiguity:

Example 24.16: Eliminating vague pronouns

Vague	Clear
Our expert interviews supported it.	Our expert interviews confirmed that the sheeting would prevent wheelchairs from slipping on a wet ramp.

4. Vague references to research methodology. State who you interviewed, how you tested, etc.

Example 24.17: Eliminating vague references to methodology

Vague	Precise
Our expert interviews	We interviewed two professors in Northwestern University's Department of Materials Sciences (see References page).
We did tests under very wet conditions	We covered a mockup of the ramp with the sheeting and sprayed it with a hose for 15 minutes. Then a team member went up and down the ramp in a manual wheelchair.

5. Vague references to research results. As with research methodology, state the results precisely:

Example 24.18: Vague references to results

Vague	Precise
It performed really well	The team member ascended and descended the ramp three times without the wheelchair slipping at any point.

6. Unquantified measurements and values. Quantify information whenever you can to establish credibility:

Example 24.19: Adding clear quantities

Vague	Precise
less expensive sheeting	less expensive sheeting (\$2.50 per sq. ft. as opposed to \$4.50 per sq. ft.)

Here is a revision that eliminates vague language from the paragraph in example 24.13:

Example 24.20: Revised paragraph using precise wording and details

Covering the ramp in sheeting keeps wheelchairs from slipping in rain or snow. The sheeting we used is a 20 mesh minus crumb rubber with urethane binders (see Appendix F). The sheeting's high coefficient of friction (0.8) prevents wheelchairs from slipping while ascending or descending the ramp even in wet conditions. Although we could have used less expensive rubber (\$2.50 per sq. ft. as opposed to \$4.50 per sq. ft.) with a coefficient of friction of 0.6, we chose to use sheeting that conforms to the ADA recommended coefficient of 0.8. Interviews with two Northwestern University professors in the Department of Materials Science confirmed that this sheeting will ensure the safety of users. In addition, our own tests of the material demonstrated its non-slip qualities. We covered a mockup of the ramp with the sheeting and sprayed it with a hose for 15 minutes. Then a team member went up and down the ramp three times in a manual wheelchair. The wheelchair did not slip at any point.

The precise language and quantified detail in this paragraph make it clear and persuasive.

24.3 REVISING SENTENCES FOR CONCISENESS

Wordiness in engineering reports and memos also obscures meaning and slows down the reader. The following rough draft is wordy because it uses more words than necessary to communicate its information:

Example 24.21: Rough draft of a wordy paragraph

A total of four design alternatives have been generated by us, and now that the process of their being tested on users has begun in earnest, important and significant information is

being learned by our team about which features the users we are concerned with do favor and do not favor. Another piece of crucial information that has been revealed by the testing is the fact that there is great concern among users about the safety of the storage unit. This is interpreted by us to mean not that the current unit is unsafe for users but that the unit designed by us must be at least as safe and, what would be even more preferable, safer for those users. It is for this reason that we intend and plan to incorporate into the unit a feature that completely prevents the lid from collapsing at all when items are being retrieved by users from the interior of the storage unit.

The unnecessary verbiage forces readers to pore over the sentences to uncover their meaning. Here is an edited version:

Example 24.22: Revised paragraph that is concise and clear

We have generated four design alternatives and begun testing them on users. These tests have revealed which features users like and dislike. Testing also has revealed that users are concerned about the safety of the storage unit. We believe this means not that the current unit is unsafe, but that our design must be at least as safe if not safer. For this reason, we plan to incorporate a feature that prevents the lid from collapsing when users retrieve items from the storage unit.

The revision illustrates two principles for editing wordy sentences:

- choose active over passive verbs
- eliminate redundant and unnecessary words

Each principle is discussed below.

24.3.1 Choose active over passive verbs

Active verbs, as their name implies, state actions: *implement, purchase, gather, brainstorm, use, test*. In a sentence with an active verb, the subject performs the action stated by the verb: Our team (subject) built (verb) three mockups. In sentences with passive verbs, the subject receives the action stated by the verb: Three mockups were built by our team. A comparison of the two sentences illustrates why passive verbs lead to wordiness:

Three mockups **were built** by our team. Our team **built** three mockups.

The sentence with the active verb has five words; the sentence with the passive verb has seven. Sometimes writers in engineering and science avoid active verbs because they're trying to avoid personal pronouns; they may

believe they've said "we" or "our team" too often. However, many things other than people can do an action in a sentence. For example, "data" can indicate, "testing" can show, an analysis "can demonstrate."

Use "Grammar Check" on your word processing software to find passive verbs and decide whether you can replace them with active verbs that clarify who or what is performing an important action. Similarly, use your software to search for forms of the verb "to be" (is, are, am, be, was, were, being, been), followed by a past tense verb or forms of "to be" that appear in "stretcher phrases" like "it is," "there are," "there were," and "there will be." The following examples show how to change these wordy constructions into concise active ones:

Example 24.23: Avoiding "it is" and "there is"

Wordy	Concise and active
It was apparent to us why users did not like that feature.	We realized why users did not like that feature.
There is a crucial flaw in the design.	The design has a crucial flaw.

This chart shows how to replace wordy, passive and weak verbs with concise, active verbs:

Example 24.24: Eliminating passive or weak verbs

Passive	Active
A total of four design alternatives have been generated by us.	We have generated four design alternatives.
The process of their being tested on users has begun.	We have begun testing them on users.
Significant information is being learned by our team.	Our team is learning significant information.
Another piece of crucial information that has been revealed by the testing is...	The testing has revealed another crucial piece of information.
There is concern among users about the safety of the storage unit.	Users expressed concern about the safety of the storage unit.
This is interpreted by us to mean...	We interpret this to mean...
It is for this reason that we intend...	For this reason, we intend...
When items are being retrieved by users...	When users retrieve items...

We don't mean to suggest you should never use passive verbs. In the following circumstances, passive verbs are effective because they help to place the emphasis in the right place or they promote coherence and clarity:

- To emphasize an action or result rather than who performed it: “A force of 100 pounds per square inch was applied to the mockup.”
- To start the sentence with the most important element: “The lid is securely attached with four bolts.”
- To connect a sentence to the previous sentence by continuing to focus on the topic you’ve just mentioned: “We used four different brands of paper towels to wipe up the liquid. Since the liquid was absorbed at an equal rate by three of the brands, we assumed that any of these would work for our experiment.” in this case it’s acceptable to use passive voice because you’re using it to connect the beginning of a new sentence to the end of the previous sentence.

24.3.2 Eliminate redundant or unnecessary words

Another way to eliminate wordiness is to make yourself aware of the most common wordy constructions and get rid of them.

1. Redundant modifiers. In each of the following cases, the modifier can be cut without changing the meaning of the sentence. Thus, the modifier is unnecessary or redundant.

Example 24.25: Eliminating redundant modifiers

Wordy	Concise
A total of four design alternatives	Four design alternatives
has begun in earnest	has begun
completely prevents	prevents
makes total sense	makes sense

2. A series of two or more words that have the same meaning. If you use two or more nouns, adjectives, verbs, or adverbs in a row, be sure they have significantly different meanings. If they don’t, choose the one that best conveys your meaning and omit the others:

Example 24.26: Eliminating words from a series

Wordy	Concise
important and significant information	important information [or significant information]
we intend and plan	we plan [or intend]

3. Repeated words. Instead of looking for a synonym to a repeated word, omit it:

Example 24.27: Omitting repeated words

Wordy	Concise
do favor and do not favor	do and do not favor
we plan to incorporate into the unit a feature that prevents the lid from collapsing when users retrieve items from the storage unit	we plan to incorporate a feature that prevents the lid from collapsing when users retrieve items from the storage unit

4. Unnecessarily long phrases. These may be harder to spot than other kinds of wordiness:

Example 24.28: Eliminating long phrases

Wordy	Concise
we have begun the process of testing them on users	we have begun testing them on users
must be at least as safe and, what would be even more preferable, safer	must be at least as safe if not safer

Revising for clarity and conciseness can be difficult because the original versions may not seem wordy to you. You wrote the sentences and know exactly what they are supposed to mean. Using the techniques suggested above can help you identify vague and wordy sentences. You should also have teammates look at your draft and offer editing advice.

24.4 EDITING FOR CORRECTNESS

Revising and editing are two different procedures. Once you're satisfied with your written text—and you've revised it for clarity and conciseness—you still need to edit it to give it a professional finish. This means proofreading to find errors in grammar, spelling, and punctuation. It also means checking headings and font styles for consistency, and section and appendix numbers for accuracy.

While a spell-checker is immensely helpful for final editing, you cannot rely on it completely because it cannot differentiate between similar words that are spelled correctly but have different meanings. Are you designing an exercise apparatus to strengthen users' "mussels" or "muscles"? When you've written "it's," do you really mean "it is," or did you mistakenly add an apostrophe when referring to "its dimensions"? Mistakes like these, while minor in many ways, can undermine your credibility. Readers are likely to think that if you were careless about final editing in your report or your presentation slides, you may have been equally careless in your design calculations. They will be

especially frustrated if they try to check one of your references only to find that the information didn't come from the website in your reference list, or if they refer to one of your appendices looking for specific information only to find that your appendices are misnumbered.

Proofreading for grammar and punctuation are equally important. In design reports, the most common grammatical problems involve pronouns that lack antecedents and faulty parallelism in lists. As you proofread, make sure that every "it" or "which" or "this" refers to a specific noun that precedes it. Similarly, check items in every list for parallel structure so that the list won't be confusing. See Chapter 20 (section 20.1.4) for a discussion of parallelism in lists. The most common punctuation problem is the "comma splice"—using a comma instead of a period, to connect two complete sentences. As you proofread, pay special attention to commas. Make sure that all sentences are complete, but no sentences are overly long. If punctuation is difficult for you, try proofreading out loud. Or read with a pencil in your hand to encourage you to focus on each word.

Final editing is a tedious task, but one that represents your whole team's work. For this reason, it should be divided among team members who, ideally, proofread and correct sections of the report that they have not written. Moreover, final editing should be done by someone proficient in English, especially if the team has members for whom English is not their first language. It is not cheating to get help with final editing—such as using Northwestern's Writing Place or asking your instructors for help. Try to finish your writing in time to get this extra help, and be especially scrupulous about prominent parts of your report, like the title page and executive summary, or work that will be on display, like your poster for the EDC project fair.

