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REPORT WRITING*

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It always takes much self-criticism and effort to make a technical report communicate effectively. There are five main points to remember:

1. Start at the end. First give your findings, then your methods.
2. Be prepared to make more than one draft.
3. Cut down on long words.
4. Be brief. Omit what the reader does not need.
5. Put yourself in your readers' shoes.

This essay concentrates on how these rules can be implemented.

1. START AT THE END

The structure of a report - the order of its sections - is the key to its success. Technical reports are not detective stories. Readers generally want to know your conclusions before reading how they were obtained.

Most reports get the order of their sections the wrong way round. A typical sequence might be:

Executive Summary
1. Objectives
2. Background
3. Methods
4. Results
5. Conclusions

This sequence is logical for you as author - that is how you did it. But it does not work like that for the reader. He usually has to start from the end, by first turning to your results and conclusions.

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A better sequence of topics is therefore:

Summary
Introduction
1. Main Results (with Conclusions and Recommendations)
2. Detailed Findings
3. Methods
4. Background
5. Evaluative Discussion

Not all reports or technical memoranda will follow this precise sequence of topics. But you should always give your findings (e.g. "The earth is flat") before your objectives and methods ("This report is about a recent study of the shape of the earth. We began by taking 3000 readings at 6 o'clock in the morning....").

Your reader can then see whether he wants to go on. He can also follow the rest of your report better if he knows what it is going to say. As author, you will not assume that your readers know all the detail in your later sections, and you will be able to cut much of that detail anyway. Giving all the main results early also makes the report easier to read for a second time, and is probably the only report format which works for a heterogeneous readership.

The different sections in your report should therefore be broadly as follows:

Summary: This will aim to be succinct but comprehensive.

If your report is on whether Product X should be packed in metal cans rather than glass bottles, the summary may read: "Metal cans will give a 12% saving in costs. Failure rates will be 2% down. Union, trade and consumer acceptance of the idea is good." This is too condensed to communicate fully. But it provides a first orientation and will also mean more after having studied the main text.

The Introduction: A report usually needs an introduction. This should quickly set the scene.

Rather than list dry objectives, say how some of the objectives have been met. Go on to mention briefly something of the background (e.g. "Previous studies of cans versus bottling having shown mixed results, but..."). Indicate just enough of the methods used to stop the reader asking himself 'How was it done?".

Use liberal sign-posting, here and later, to help your reader decide what not to read.

You may also need to guard against building up wrong expectations by telling the reader early on what the report will not do. The introduction does not need a formal title, nor does it have to be comprehensive.

Main Results and Conclusions: Give a full statement of the main results early. This helps the reader see the wood for the trees. The maxim is "Never hold back what matters." If there is anything that you were leading up to dramatically later, say it now.

The main results should lead on to your Conclusions and your Recommendations (if any). The reader can then stop.

Detailed Findings: Secondary or more detailed findings and arguments should come only after the main results and conclusions are already known to your reader. The details will the be much more meaningful to him.

As author you will find that much of the detail can now be relegated to an appendix or even just be stored in your filing cabinet. Why not simplify things by saying "Fuller information on so and so is available" and wait for the rush? You may be interested - but are your readers, once they know your main argument?

Methods: The introduction will have given the reader only the briefest hint of methods - just enough to stop him worrying about how it was done (e.g. by some experiments, a literature search, a statistical analysis, a sample survey or whatever).

The methods can now be described more fully. But as with detailed findings, you can decide better what to condense, or put in an appendix, or leave out, once you realise that the reader already knows your findings. He can also judge your methods better. For example, to be told that a result was obtained by ABC Consultants using a two-stage random sample of adults aged 25-60 becomes much more interesting if your reader knows that the result differs radically from last year. (Was last year's study also done by ABC Consultants Ltd, using a two-stage random sample, and the same age-range? And what was the response rate?). Suddenly dry methods begin to come to life.

History and Background: Your report can have two kinds of readers: those who already know all the background, and those who do not. Neither needs a detailed account before he learns what your report is about. ("Green in 1935 showed that ... . But Brown in 1936 argued that ... .").

Towards the end of your report it is different: even your knowledgeable reader may then want to see how your findings fit into the broader context. ("Brown was right in 1936 when he argued that..."). But it is now too late to impress the reader with your erudition; a reference to some earlier review may be enough.

Evaluative Discussion: Those readers who are still with you will now want to know what you yourself think. What would you do differently if you could do the study again? What might be done next? What objectives have you not managed to cover? What are the shortcomings of your report and what are its special strengths, in your opinion? If you do not say so, who will?

Do not be afraid to summarise again what you have already said. It may seem old hat to you, but presumably it was new to your reader. Remember how comfortable it is when you yourself read a report where the author tells you what he is going to say, says it, and then brings it all together for you again. Such a final summary is also a good discipline for you as author: What were your main points really, at the end of the day? Have you got them in the right order yet? What could you have left out?

2. MORE THAN ONE DRAFT

Revision and rethinking is an essential part of writing a good report. It can involve making several drafts and outlines, and using a friendly critic to help you judge what you have written.

Revision is nothing to be ashamed of. Even professional writers rarely use their first drafts - at the least they edit them. Yet many technical reports look as if their authors had never read them through, let alone thought about them after they wrote them. The question is how much effort you want to make yourself, and how much to leave to the reader. Even with a simple report you should try to take some time to edit and revise.

The first step in writing a report is usually an outline - i.e. listing, arranging and rearranging the main points as you see them at this stage, or at least writing out section-headings and sub-headings. Next comes the first draft. Unless you know the subject-matter backwards (i.e. can say what your main results and conclusions are before you start writing), you will need to write out a full draft - however rough - before your ideas begin to jell. Once they are on paper, unexpected connections and discrepancies will start to appear.

Having worked through an initial draft, a new outline will be needed. Now you know better what you actually want to say: there it is in the draft. You can start to list the main points in something like their right order for the reader. Having got it all out of your system, you can also begin to decide what to leave out. You can therefore prepare a new outline or two and a new draft accordingly. Depending on the difficulty of your subject-matter, this process may need to be repeated, perhaps often.

Getting a Fresh View

A major problem even for a good writer is that he is far too close to it all. With a technical report you will have done much of the work and feel compelled to tell everybody all about it. Distancing yourself from what you have written is difficult but very important.

There are several ways of getting a fresh view:

- Have your draft typed. Instead of seeing merely what you meant to say, you begin to see what you actually wrote.
- Leave it for a week or two (or longer). Then you will come to it afresh. (If you cannot wait that long, remember to start your next report a week or two earlier, at least with a rough outline!)
- Describe your draft or outline to someone else. You will find that you start saying things like "What I meant to say here was....". Write this down. It is what you meant to say, but didn't. Talking to someone else has begun to free you up. For example, why did you skip the section on methods? Should it be in your report? Should it be that long? Who will read it?

- Have someone read your draft who will not hesitate to write "Unclear" or "Too wordy" in the margins (and occasionally perhaps "Good"). A hint of criticism often helps us dramatically: We can see almost instantly how unclear we have been.
- If possible, have your friendly critic also go through the draft with you, to tell you briefly why he wrote "Unclear", etc. He is likely to say more than he wrote. (But do not argue with him except where it helps you to see his problems; when he cannot understand something it is always your fault. Also keep your critic motivated: "I'll work on that", "Yes", "Thanks").

From the resulting revision you will be getting your structure and contents clearer. That also gives you the chance to reduce your verbiage.

3. THE FOG-FACTOR

We are often told to use short words and write clearly. This is good advice, but practising it is difficult. A helpful device is the "fog-factor".

First you count the number of words of three or more syllables and the number of sentences on half a page or so of writing. (Personally I count the long words in my head and the sentences on my fingers.) Then you divide the number of long words by the number of sentences. This gives the fog-factor*.

An average of 2 or 3 long words per sentence in technical writing is easy to read, although good novelists cope with basics like life and death on a factor of less than 1. A factor of 4 or 5 becomes heavy. But 6 to 8 long words is typical of much academic and technical writing, which is why it is like it is.

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* The fog-factor is a simplification by my colleague T.P. Barwise of Gunning's Fog Index (R. Gunning, The Technique of Clear-Writing, McGraw-Hill, 1952).

In technical writing we often need long words like statistics, average or electronics. Indeed, jargon words provide a useful shorthand if they are used often enough to be worth learning. (It also helps to remind the reader once in a while what they mean.) But we can use the fog-factor to keep the number of long words within bounds, say an average of 2 or 3 per sentence.

The definition of the fog-factor is not watertight. For example, are there two syllables in "ratio" or three? Should a long word like "ourselves" really only count two? What about hyphenated words, dates, names, numbers, abbreviations? But the precise definition is unimportant - one is not playing games.

A low fog-factor does not guarantee good writing. But a factor of 5 or more provides a warning. It is tempting to make excuses ("My topic is very complex...."). But a high factor can always be reduced by omitting long words or replacing them by short ones, and by dividing long sentences.

To illustrate, a current report on "Broadcasting and Youth" opens:

> "In the UK and throughout the western world a rapidly growing proportion of young people appears to be faced with the almost certain prospect of periods of prolonged unemployment brought about by fundamental changes in the structure of industry and commerce. However, many young people currently in employment find that a lack of initial basic educational skills, together with the lack of access to training facilities at work, means that their ability to adapt to these changes is also very restricted."

There is nothing way-out about this, but it is heavy and dull. A fog-factor of $7\frac{1}{2}$. 15 words of three or more syllables in two sentences. And the report goes on like that for 100 pages.

Replacing some of the longer words and cutting the first sentence in half reduces the fog-factor to 1:

> "In the UK and the western world more and more young people appear to be faced with the almost certain prospect of being out of work for long periods. This is brought about by deep changes in the structure of industry and commerce. Even young people who have a job find they cannot adapt easily to these changes since they lack basic skills and have no access to training at work."

This is easier to read although still rather wordy. But the idea of 7 times as many 3-syllable words per sentence now seems horrendous. (Having too many long words makes it difficult to remember how a sentence started by the time you reach its end).

In cutting long words, Latin derivations can often be replaced by shorter Anglo-Saxon ones: e.g. fundamental by deep, currently by now, invariably by always. (Roget's Thesaurus is helpful in this). Active verbs can also replace long-winded constructions: instead of "their ability to adapt is very restricted" we can say "they cannot adapt easily".

Splitting a sentence into two will halve its fog-factor at a stroke. Short sentences are in any case good in their own right. The end of a sentence tells the reader that he can stop and think, and he may even want to read the sentence again. This is easier if the sentence is short and he can see readily where it started. (A short paragraph similarly allows the reader to go back and reread without losing his place.)

Not all sentences should be short. This would make for too abrupt a style. But a long sentence should have a reason, like giving a qualification or illustration before the reader is allowed to stop and think.

4. HOW TO BE BRIEF

Being brief is good for the reader, but costly for the writer - it can take much effort. Brevity can best be achieved by leaving things out. This works at different levels - sections, paragraphs, sentences, and verbiage.

Giving your main results early will often allow the remaining sections of the report to be cut drastically. This also applies to all the lesser points in your report. Instead of leading your reader carefully through each argument, simply give your conclusion first - e.g. that Product X should in future be packed in metal cans rather than in glass bottles. Follow this with your three main reasons: (1)..., (2)... and (3).... Q.E.D.

Much of the remaining discussion in your draft can now be left out. How thoroughly do you still need to discuss all the other factors which may have helped you in reaching your conclusions but in the

end did not matter much one way or the other? Perhaps a brief listing will do: "We also considered factors A, B and C, but they did not greatly affect the conclusions."

Drastic pruning also works at the level of individual paragraphs or sentences. Whenever you wonder how to put a point better, it can usually be left out:

"When in doubt, cut".

This works like a charm. It makes life simpler for the author. Nor does it harm the reader who will not miss what he does not see: He needs to be told the minimum that is necessary, not the maximum.

A harder piece of advice concerns items you actually like, as was noted by Dr. Johnson 200 years ago: "Read over your composition, and wherever you meet with a passage which you think is particularly fine, strike it out."

Pruning verbiage is another necessity. The earlier extract from "Broadcasting and Youth" will serve again as example:

> "In the UK and throughout the western world a rapidly growing proportion of young people appears to be faced with the almost certain prospect of periods of prolonged unemployment brought about by fundamental changes in the structure of industry and commerce. However, many young people currently in employment find that a lack of initial basic educational skills together with the lack of access to training facilities at work, means that their ability to adapt to these changes is also very restricted."

This can be written without major loss as:

> "More and more young people are likely to be out of work for long periods, due to deep changes in industry and commerce. Even those who have work may find they lack the skills or training facilities to adapt to these changes."

That is 40 words as compared with 80.

5. PUTTING YOURSELF IN YOUR READERS' SHOES

Putting yourself in your readers' shoes is difficult. His problems are different. To bridge the gap it helps to consider what your reader will do with your report.

In reporting on the likely effects of packing Product X in metal cans rather than glass bottles, you will have taken account of costs, finance, labour relations, re-tooling, spoilage, breakages, reclosure, storage, transport, trade and consumer reactions, the competition, trends in the economy - the lot. You now have four days in which to write your report. Your worries are: Can you get it done in time? What impression will it make? Will your assumptions be accepted? Will you be asked to give a visual presentation with charts? Should you offer to do so?

Your reader's worries are quite different. He is surprised to see your report since he forgot that he had asked for it. In any case, the meeting in question has been postponed for a week. He is Marketing Director and is currently working on a new product-launch in the South West, he has personal problems with the Northern Area Sales Manager and his wife, and he has to rush to a meeting with the advertising agency. He is not thinking about you or your 40-page report.

When he looks at it a week later, he wonders whether he can use any of it at the postponed meeting. He knows he has to prepare a memo about the overall future of Product X. Should he mention your conclusion about cans versus bottles? But his main worries are: Can he get his memo done in time? What impression will it make? Will he get his views accepted? Will he be asked to make a visual presentation to the Board? Should he offer to do so?

Your problems are not your reader's problems. As writer you are worrying what to put in your report. Your reader only wonders what he can get out of it.

Always ask yourself who the report is for. With technical reports, most of your readers already know something of the background - e.g. your boss or client who requested or sponsored the report. He knows the problem, and probably knows your answer: "Where is that report where you prove that cans are better than bottles". This helps you cut down on all the things which your audience already knows.

Next, what will the reader do with your report? He may need to pass on some kind of summary or extract to his own boss or to colleagues. Try to draft this yourself. (Your reader would probably concentrate on one or two of your findings and conclusions, add some reservations of his own, and possibly give just a hint of your methods: "These conclusions are based on a painstaking analysis of the different alternatives, carried out by our Mr. Z"). Now look at your own draft again from this vantage-point. How much of it was what your reader needs? How much is only what you wanted to say?

Also watch yourself reading or skimming other people's reports, articles or books. What do you actually get out of this? What strikes you as good and as bad (e.g. "Why doesn't he get on with it and say what its all about?"). What would be a better structure of the topics covered? It is much easier to criticise other people's writing than your own, and it is more fun. But you need to learn from it when you write your own reports.

6. DISCUSSION

Difficulties in writing a report centre on deciding what to say and how to say it.

The five precepts discussed in this essay aim to help with the "how to say it":

1. Giving the main results and conclusions early.
2. Being prepared to make several drafts.
3. Cutting down on long words.
4. Leaving out what the reader does not need.
5. Seeing your report as your readers would.

More basic still is the need to clarify the ideas and facts that you want to communicate, and the relationships between them. This is less

easy to legislate for directly. Nonetheless, following the five precepts for clear exposition also helps in organising your own thoughts. For example:

- Starting not just with a summary but with your main results in full forces you to commit yourself early on: "This is what it's all about".
- Revision, reactions of friendly critics, and thinking of your readers all help you to learn more about what you are trying to say.
- Too many long words and excess verbiage usually mean that your thinking is still muddled. Sentences starting with "Clearly..." never are clear and often are not even true.

Putting guidelines and precepts into practice is not easy, but the following checklist should help. Go through it before you start the first and last draft of any report you write.

First Draft:

(a) For whom am I writing this report? What do they already know? What will they do with the report?

(b) What do I have to tell them? Have I listed the main points?

(c) Are all these things really necessary? Have I thought about a different order? Have I worked at this enough?

(d) Have I written an outline of the report, or am I still only organising my first thoughts?

Final Draft

(a) Have I gone through the draft with someone who will really comment? Have I acted on all the comments? Do I still flinch at this idea? (If yes, do something about it now.)

(b) Have I re-organised the report so that the main results come early? Have I introduced each major section with a sentence or two telling what it is about?

(c) Have I checked on the number of words of 3 or more syllables? Have I looked for verbiage to prune? When pausing over any item, have I asked myself whether it could be left out?

(d) Have I reduced my account of the facts, methods and arguments to what the reader needs, rather than describing everything fully?

The precepts and guidelines in this essay do not make report writing easy. Preparing a good report will always be hard work for the author. But success should reduce the work for the reader.