The Institution of Engineering and Technology

A Guide to Technical Report Writing

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Contents

Foreword

A Guide to Technical Report Writing was originally written by Joan van Emden and the late Jennifer Easteal, and revised for the IET by Alex Kerr.

Introduction

A good report is easy to recognise. Its title is precise and informative, its layout and format are well organised, and the binding is easy to handle and opens flat to reveal both text and diagrams.

Reading a well written report is pleasurable: the style is accurate, fluent and concise, with headings to indicate the content of each section. The diagrams, which in this Guide will be taken to include non-verbal material such as tables and graphs, are well presented and clearly labelled.

There are no absolute rules about the details of report production, because every report must be totally adapted to the needs of its reader. This Guide suggests laws of good report writing, but only because in the field of communication, laws should be generally applied but broken if necessary. For example, the second law concerns brevity. If clients have spent thousands of pounds to gain access to expert knowledge, it may be inappropriate to reveal it in five pages. They will feel cheated if they receive so little, even if it represents value for money. A longer report will be politically more expedient.

Nevertheless, laws can be broken only on the basis of knowledge, and the Guide will therefore discuss in turn each of the report writing laws, which are as follows:

1. The reader is the most important person.
2. Keep the report as short as possible.
3. Organise for the convenience of the report user.
4. All references should be correct in all details.
5. The writing should be accurate, concise and unobtrusive.
6. The right diagram with the right labels should be in the right place for the reader.
7. Summaries give the whole picture, in miniature.
8. Reports should be checked for technical errors, typing errors and inconsistency.
9. The report should look as good as it is.
10. The reader is the most important person.

The first law is repeated because it is the only law which should never be broken. Flexibility and adaptation may be useful, but only to make the report more accessible to the reader. All other considerations, even saving time and money, are in the end counter-productive if readers find reading the report a burden they would prefer not to undertake.

1. Objectives

The objectives of a report identify exactly what information it covers, for whom it is written and why it should be produced; these objectives should be clear to the writer long before the process of writing starts.

It is helpful to put down in note form the precise details of the objectives and to check these details regularly until the last stages of production. The report may assess the validity of a new process, the possible heating and lighting needs of a new factory, the technical possibilities of developing a new kind of antenna: whatever the subject of the report, its exact specification must be identified and adhered to.

Closely allied to this is the 'why should it be produced at all?' question. Is the report intended to inform about recent developments, show the potentialities of a product (and if so, for whom - the senior scientific officer, the manufacturing subsidiary, the user?), or to persuade superiors that more money, time or facilities are needed?

Surprisingly, perhaps, this stage of report production can present problems. A report which was meant to cover 'the UK' and in fact dealt with England and Wales resulted in lost opportunities for development and sales in Scotland and Northern Ireland; a report which tried to be both a specification of a machine and a report on the results of using the machine ended up as confusion, neither precise specification nor reasoned conclusion. If time is needed to discuss the objectives and clarify them, it will be time saved in unravelling complications at a later stage.

Knowing the reader involves questions which will be discussed in Section 2.1, but identifying the level of technical knowledge, and the precise nature of that expertise, is part of the analysis of objectives. Seven questions should be asked:

- What does the reader already know about the material of this report?
- How wide is the reader's knowledge of the subject?
- Why should the particular reader need this particular report?
- What is it necessary to tell the reader?
- What will be the reader's expected response?
- What, from the writer's point of view, is the desired response?
- How can the writer bridge the gap between what the reader knows already and what the writer wants the reader to know, in order to produce the desired response?

Six out of the seven questions concentrate upon the reader, and therefore are related to the first law of good report writing.

Law 1: The reader is the most important person

At the same time, some reports have to be written for a varied readership, for instance technical managers and financial managers. Writing two separate reports would be time-consuming and 'politically' dangerous (directors, for example, might feel offended if they did not receive both versions!). Strategic use of appendices (see Section 2.2) and summaries (see Section 5.1) can produce a partial answer to this problem. It must, however, be identified as a possible area of difficulty before the writing starts.

The identity of the reader will determine not only the approach but also the technical level and the style of the writing. A short, emailed report to a colleague will be less formal than a report to the managing director of another company, and considerations of tact in what can be safely included, and of presentation and layout, will of course be less important. A balance must be maintained between the informality of friendly writing and the formality due to any business communication; diagrammatic material must be clearly produced even if the drawing is informal in style.

The objectives of a report, then, are found in matching the reader's need, the information involved, and the appropriate tone, within the clearly defined limits of the report specification. When the objectives are identified and clarified in this way, the actual writing of the report will become much easier.

2. The format of the report

When the objectives of the report are firmly established, the material must be collected; indeed, some of it will probably be already available. Decisions about organising the information can begin now, even if they are only provisional. Report writers often worry that nothing can be done until everything is assembled, and are then appalled at the amount of organisation needed, usually with a strict time limit.

As material arrives, it should be put into one of three categories:

1. obviously important information which must go into the report because it is completely relevant to the objectives;
2. borderline information which might be useful to some readers, or which might amplify or substantiate other more important material;
3. information which is interesting (or not) to the writer, but which is not relevant to the objectives of the report.

At this stage, it is obviously dangerous to jettison category 3, but it should be set aside to be checked through later. Material in categories 1 and 2 must be kept available, but thought of as probable 'main text' (category 1) and appendix material (category 2). There must be flexibility between these two sections, and details may move about for some time before finding an eventual resting place. Nevertheless, information which is 'main text' is now being identified and can be examined to see what logical order might be appropriate.

2.1 Beginning and end

It seems obvious that every report has a beginning and an end, but the choice of these limits should be a conscious decision rather than mere accident. The beginning of a report is not usually the beginning of the work: there will have been meetings, letters, conversations, laboratory work, and possibly some previous reports. This report is built on foundations which may have been laid weeks or months, even years, earlier. The choice of starting point will be decided largely by the objectives, and so ultimately, once more, by the reader. Questions will have to be answered, such as:

- What does the reader already know about this work?
- How much background (to this project or whatever) will the reader need in order to understand the argument of the report?
- Has the reader been closely involved with this, or similar, work before?

Obviously, if the answer to the third question is 'yes', then less background detail will be needed, and the scene can be set briefly and easily. If the answer to the first question is 'not much', then more background will be needed and the 'appendix material' file will probably grow. If the answer is, as often happens, 'some readers will know a great deal and others very little', then drastic reorganisation may be needed to put more information into appendices, and to give more detail in the text. However, it is always worth remembering that reports are often passed on from one reader to another, and so should not be written so specifically for a particular reader that others cannot use the information.

2.2 Appendices

It may seem strange to talk about the use of appendices so near the beginning of this Guide, but they can be one of the writer's most useful tools, and some of their value has already been suggested. Essentially, an appendix or appendices should be used to remove from the main text all information which is not needed by the majority of the users of the report.

Law 2: Keep the report as short as possible

Human nature being what it is, and report users being as busy as they are, the shortest report usually wins in attracting attention and also in being read as opposed to being glanced at and forgotten. If the main text is uncluttered by detailed statistics, maps, explanations of technical terms, or experimental data, it will be kept as short, and therefore as readable, as the material allows.

An appendix, then, is a good place for background information which most readers will take for granted but which a few need to be told. It is excellent for supporting statistics, and diagrammatic material which is not needed as the report is read. (See Section 4 for a further discussion of this point.) Lists of symbols, technical terms and abbreviations which are familiar to some but not all readers may be included in the appendices. It is, however, common practice nowadays to place them near the beginning of the report as part of the preliminaries.

As in many aspects of report presentation, tone (getting it right for the reader) is all-important. Readers may feel patronised if too much is explained and bewildered if too much is taken for granted. Putting helpful back-up material into an appendix can satisfy all parties.

This is particularly important when the readers have varied expertise. The engineer may not want complex technical material to be interwoven with details of costing, but both technical and financial readers will be happy to find the latter in an appendix. The research scientist may be fascinated by the experimental details and will be happy to find them in an appendix, while the report is primarily used by the marketing people who want results, not laboratory tests.

Appendices are the report writer's friends, but while they are developing, so is the main text of the report.

2.3 Sections and sub-sections

Report writers can usually produce outline section headings for their material with comparative ease. 'Background', 'Results of field tests', 'Future developments' are obvious choices, and very useful while the information is still being collated. They are rarely sufficient for the final report. 'Site details' or 'Other considerations' are not helpful to the reader. The sections originally considered will almost certainly need sub-division, and headings must be as specific as possible.

The dividing of material in this way serves several purposes. From a purely visual point of view, space on the page helps the reader, and there should be clear and adequate spacing between sections; major sections, at least in long reports, should start on new pages. Readers can identify and isolate particular sections which are relevant to their interests; in this Guide, reference has been made to 'report users' as well as to 'report readers', and this was no accident.

Law 3: Organise for the convenience of the report user

While a few people may read a report as a bedside novel, from beginning to end, most will 'use' it, certainly if it is more than ten pages or so in length. The observed pattern is that report users look at the beginning, then at the end, and then at any section in the middle which particularly interests them.

This creates problems for the report writer, who cannot assume that a reader who arrives at a particular point in the report has necessarily read all that went before. Indeed, there are far more users of long reports than readers, and the writer would be wise to assume that the user has not read everything in the logical order in which it has been presented. So in the case of symbols and abbreviations previously mentioned, a glossary at the beginning or at the end is much more useful than the normal practice of writing out a technical name in full, putting the abbreviation in brackets immediately afterwards, and thereafter using the abbreviation only.

Each section must be clearly identifiable. As users often want to know the content of one or two sections only, they must see where each section begins and ends, and which sub-section is connected to which. In other words, headings must be linked in form and layout to a notation system which is itself logical and easy to use.

2.4 Headings and decimal notation

Reports vary in content and informality and also, of course, may have to follow the outline which is standardised in company templates. Nevertheless, there are widely accepted sections, all of which would appear in a long and very formal report: they must be adapted or amalgamated as the writer thinks appropriate for the reader's needs.

2.4.1 Format

The full format of a long report can be as follows:

- Title page
- Acknowledgements
- Summary
- Table of Contents
- Introduction/Terms of Reference/Scope
- Procedure
- Findings (the evidence)
- Conclusions
- Recommendations
- References/Bibliography
- Appendices

Most technical reports will not need such a detailed breakdown, but is it often helpful for writers to keep the scheme in mind in arranging the information, even if they know they will not use the headings in full.

These sections form the framework of the report, but in preparing the material, the writer will normally start with the Findings, because that is where most material is quickly identified. It is, of course, perfectly reasonable for the writer

to start the actual writing of the report within this section; there is no special virtue in beginning at the beginning, and it may be much easier to start with purely factual material in the middle. Certainly the summary (see Section 5) will be written last.

2.4.2 Notation

Headings within the organisation of the report must, as has been said, be as specific as possible in order to be useful. The logical linking of headings is shown by notation, most commonly decimal notation.

This system is easy to produce and easy to follow, and the very fact that it is widespread means that readers are probably familiar with it. As far as possible, headings should match numbering in importance, so that the visual impact of major headings is correlated with the major notation. Lower down the 'hierarchy', this correlation may break down, but it should certainly be followed for first and second level headings.

The pattern is this:

1. MAIN HEADING

1.1 Lesser Heading

1.1.1 Small Heading

and this will be maintained throughout the report:

8. MAIN HEADING

8.4 Lesser Heading

8.4.6 Small Heading

As far as possible, the heading numbered 1.1.1 should be equal in importance to heading 8.4.6. It is usually sufficient to have four figures (for example, 8.4.6.2), as more sub-divisions are difficult to follow. Information should if necessary be adjusted to fit four levels of heading, and indeed more are rarely needed.

A variant to the decimal system is that in which each paragraph is numbered within a major section:

1. MAIN HEADING

1.1 - 1.56

2. MAIN HEADING

2.1 - 2.91

This can be useful for quick reference if there is likely to be an exchange of telephone calls or emails in response to a report, but it does not produce a logically structured form, and is not generally recommended.

Appendices should be distinguished from the main text by letter, and if necessary decimal notation after the letter. Appendix B2.4 is therefore the fourth sub-section of the second major section of the second Appendix, and if referencing is correct it should be easy to locate and identify.

2.5 References

References, once gone, are difficult to recall. It is sensible to note full bibliographical details of all sources as soon as possible. In the text, references may be shown by a number in square brackets, [1]; they should then be listed in that order at the end of the report. The numbers identify the reference, and full details should be given in one of the approved forms. Examples of a possible layout are given below, firstly for a book and secondly for a journal.

> van Emden, Joan: *Writing for Engineers* (Palgrave Macmillan, Basingstoke, 3rd edn, 2005)
>
> Hawley, Robert: 'Leadership challenges in an engineering environment', *Engineering Management Journal*, 6(5), October 1996, pp. 217-231

Nowadays, the Harvard system of referencing is often used. In the text, the author's name, date of publication and page number are given in brackets, as (Hawley, 1996, 220-221), and at the end of the document the details are given in full, beginning with the author and date to match what is in the text:

> van Emden, Joan, (2005) *Writing for Engineers*, Palgrave Macmillan, Basingstoke,3rd edn.
>
> Hawley, Robert, (1996) 'Leadership challenges in an engineering environment', *Engineering Management Journal*, 6(5), pp 217-231

It has become conventional to cite online material in the same style as other bibliographical references but giving the URL or DOI in angle brackets and showing the date at which the resource was consulted in square brackets.

Any method which gives full information is acceptable, but consistency in the form chosen is very important

Law 4: All references should be correct in all details

The report is now taking shape, although little or no formal writing has been produced. The format has been chosen, the material organised, the logical progression clarified and the sections prepared.

The writing of the report can now begin.

3. The writing of the report

It is probably true to say that most engineers do not enjoy writing, and put it off for as long as possible. It is equally true that if preparation has been thorough, the writing will be less of a burden because some important questions will already have been answered.

If the objectives of the report have been clarified, the writer will know the appropriate level of technical language and the correct tone for the readership. The style will be formal because reports are formal documents, but the exact degree of formality will have been decided with the writer/reader relationship in mind.

Certainly material which goes outside the writer's own company must always conform to a high standard of stylistic propriety.

Law 5: The writing should be accurate, concise and unobtrusive

3.1 Accuracy

The accuracy of a document is the responsibility of its writer. Most engineers produce their own reports, but as they are not usually trained typists, careful checking is essential. It is always particularly difficult for writers to check what they have typed only a few minutes earlier; some guidelines are given below, and further help is available in the section on checking (see Section 5.4).

3.1.1 Spelling

When the engineer has completed a section of the report, it should be checked for spelling and typing errors. Most of these will be picked up by the computer dictionary, but there are some problem areas.

Creating the wrong word

If a mistake creates a word which was not intended, the computer will accept it. 'Not' and 'now', for instance, are easily confused, and they may give the opposite information, as in:

- The car is now in a safe condition to be driven.
- The car is not in a safe condition to be driven.

Only an alert human being will be aware of the mistake if the wrong word is typed.

Technical words

Engineers sometimes avoid the spell-check because it highlights too many technical words which are not in the computer's dictionary. Such words should be added if they are likely to be used frequently - and a second person should check what is added; it is all too easy to add an incorrectly spelt word. Rarer words should be checked individually as they occur, the spellcheck being used for all the other words which might be mis-typed.

New words

New technical or semi-technical words often consist of two 'old' words put together without a hyphen (such as online, workstation). This is probably the wisest way to write such words in the absence of other evidence. The best guide to words which have not yet appeared in a dictionary (published or on the computer) is the technical press; follow the usage in, for example, the IET journals.

3.1.2 Punctuation

Punctuation matters because it aids accurate reading and also because it may affect the meaning. In the sentence:

> 'The engines, which were in perfect running order, had been tested previously.'

all the engines were in perfect running order and all had been tested. However, if the sentence were to read:

> 'The engines which were in perfect running order had been tested previously.'

the implication would be that only the engines which were in perfect running order had been tested. Others had not. The sentence could, of course, be rewritten in order to emphasise the intended meaning.

Similarly, 'a cross-section of staff' should be clearly distinguished from 'a cross section of staff'. Hyphens should be used, as in this instance, where they affect the sense; they are also helpful in lists of adjectives, to show which belong together.

The rules of punctuation, unlike those of spelling, are easy to learn, and the bibliography at the end of the Guide suggests helpful books.

3.1.3 Choice of words

The correct choice of word is not simply a matter of the right word as opposed to the wrong word. The effect on the reader is again important, and words have both meanings and overtones. 'Substantial' and 'excessive' might mean the same thing from different points of view. Overworked words such as 'basically' should be avoided unless they mean precisely what they say, and 'empty' words and phrases which give an impression of vagueness (rather, quite, fairly, in due course) should be avoided.

3.1.4 Sentences

Sentences, like paragraphs, should be kept under control. Good style involves variety in sentence length as well as in paragraph length, and many technical writers are led into grammatical confusion because their sentences are so long that by the end both writer and reader have lost sight of the beginning. The most important part of a sentence or paragraph can be lost because it is hidden in a mass of words. The reader's attention will be immediately caught by 'The maintenance costs can be reduced.' A long technical explanation, which mentions somewhere in the middle that money can be saved, risks this important point being overlooked. Short sentences produce a clear, easily read style for factual material. Information which needs to be considered and held in tension with other information is better given in longer sentences which slow the reader down. No reader wants to be brought to a standstill by a sentence which is eight lines long.

3.1.5 Paragraphs

Paragraphs should have unity of content, but they also have a psychological effect on the reader. Several paragraphs on a page, with the resulting spaces, encourage reading, while one long block of print is disheartening. A balance between content and ease of reading often has to be kept, but a page which is filled by only one paragraph is best avoided.

Above all, writers must say what they mean. The wrong impression can be given by an injudicious choice of words, and ambiguity in technical affairs is highly dangerous. Readers should not be left in doubt about the meaning of, for instance, an abbreviation, or about the writer's intention, or about the information presented. If they cannot understand what is going on, the report will probably end up in the wastepaper basket.

3.2 Brevity

Some reports are long because they contain a great deal of important information. Others are too long because the writer has explained the same point more than once, not being sure that the meaning was clear at the first attempt. Sometimes the writer takes a long time to come to the point, a habit which can be intensely irritating to a busy reader.

Clichés and jargon phrases tend to be wordy. 'At this present moment in time' is longer and less pleasant than either 'now' or 'at present'. 'Presently' should be used with care until the Anglo- American difference of meaning has been resolved.

Writing in an impersonal style can also be cumbersome. 'It was immediately apparent to the writers that ...' is longer than 'We at once saw that ...', and if company policy permits, the active voice ('I recommend' or 'We recommend') is preferable to the passive voice ('It is recommended that ...'). However, tact will sometimes dictate otherwise.

3.3 Unobtrusive writing

Reports are, as has been said, formal. Report writers frequently feel, therefore, that the language used has to be not merely formal, but grandiose. Formal writing simply means writing in full (it is, not it's), avoiding slang or colloquialisms, and using words correctly. It does not mean that simple words are unacceptable. 'Dispatch' is not intrinsically better than 'send', and 'finish' is not inferior to 'draw to a conclusion'. The reader's attention may be so caught by the constant use of grandiloquent (pompous) language that the substance is forgotten. Formal writing is more ordered and stately than speech, but it does not have to be 'literary'.

The reader can also be unobtrusively guided in the right direction by 'leading' words and phrases. Introducing sentences or paragraphs with 'At the same time', 'On the other hand', or 'Bearing this in mind', makes the writing flow easily, and the reader's attention is drawn to the supplementary or conflicting information which follows. In the Conclusions of a report, when the reader is assessing the argument, these pointers can be especially helpful.

3.4 Worked example

One example of writing, by a qualified and experienced (but anonymous) engineer can perhaps usefully conclude this section. It is part of a 'real-life' report, and permission to use it is gratefully acknowledged. It is reproduced as it was written, and the problems and mistakes are then listed below, together with a suggested version. The readers of this

Guide might like to use this example as a small test of their own writing skills:

> At present on the XYZ sub-station board we have
> no facility to supply 1200 amps required for the new plant from the existing spare O.C.B.'s, this will require the removal of some of the old existing oil circuit breaker and replacing with new vacuum circuit breakers (VCB) since we cannot obtain oruprate
> the existing VWX equipment which are of
> 1937 vintage, the proposal for this would be as follows:
>
> (The costing follows)

1. 'At present' would be better later in the sentence; the name of the sub-station is then emphasised.
2. 'We have no facility' = we cannot (or are unable to).
3. 'the' is omitted before '1200 amps' (presumably per phase).
4. 'amps' is not a recognised abbreviation for 'ampères'.
5. O.C.B.'s are explained later as oil circuit breakers; the full version should come first. The apostrophe is unnecessary, as are the full stops.
6. 'This' should start a new sentence, but it is not clear what 'this' refers to.
7. 'breaker' should read 'breakers'.
8. Instead of 'removal… and replacing', it would be better to write 'removing and replacing'. However, 'removing' seems unnecessary.
9. (VCB) is acceptable as an abbreviation of what has gone before but it is inconsistent with O.C.B. - and should be plural.
10. 'orup-rate' is an oddity caused by the lack of space between 'or' and 'uprate', and the unfortunate line-break in the latter.
11. Equipment is singular.
12. The cost proposal should be a new section, preferably with a heading.

Suggested version

> On the XYZ sub-station board, we are unable at present to meet the demand (1200 ampères per phase) required to operate the new plant using the existing Oil Circuit Breakers (OCBs). Spares are not available, and the old equipment cannot be uprated.
>
> We therefore suggest replacement of some of the existing switchgear with new Vacuum Circuit Breakers (VCBs). This proposal is costed below.

Good style should be unobtrusive. The reader will be aware only that the report seemed easy to read and interesting: the skill of the writing will have its reward in reader goodwill. The best way to develop such skill is to read a great deal, write often, to be self-critical and to be willing to ask for constructive comment from others.

4. Illustrating the report

In this Guide, the word 'diagrams' is used to include tables, graphs, charts, photographs scanned in, and line drawings, or any other non-verbal illustrative material.

Diagrams are an essential part of many technical reports, in some circumstances giving a great deal of information more easily than continuous prose could do. Clarification of the general situation or of complex details is often most readily accepted by the reader if it is presented in a way which is both visually attractive and easy to use.

Law 6: The right diagram with the right labels should be in the right place for the reader

4.1 Positioning

Most people do not like to have their reading interrupted while they search for the next item. As prose is usually written in a logically ordered format, so diagrams must be presented when and where the user needs them. Readers are unlikely to stop reading, turn the page or pages, scrutinise a diagram and return to their place in the text. Instead, they will mentally register the reference, continue reading and study the diagram, if at all, only when its information has become essential. It is therefore very important that diagrams are positioned in the right place, that is, where they are needed.

There is an unfortunate tendency for all diagrammatic material to be put into an appendix or appendices at the end of the report. It is reasonable to do this if the diagrams are supplementary only, having no immediate bearing on the main text. It is not reasonable to make readers hunt for information which is essential to their understanding and, as has been suggested above, they may well not bother to waste time on the search, but simply pass on to the next section.
As always, it is the convenience of the reader which matters.

The report user is helped also if labels on diagrams are presented horizontally, so that the report does not have to be angled to enable them to be read. An amusing result of angled headings is often seen when a graph has been presented at a right angle to the report and the label on the vertical side has been written along the axis. When the report is bound, the writing is upsidedown, which is entertaining on the first occasion and infuriating thereafter.

4.2 Conventions

In the same way that convention must be followed when writing prose (conventions of English usage, for example), conventions for diagrams exist and should also be followed. The hands of a clock move - usually - in a clockwise direction, and it is surprising if for some reason they do not. Readers will accept what they are used to, and shock tactics rarely have a place in report writing.

The format chosen for a diagram should be appropriate to the information which it presents, for instance, a great many detailed figures should be given in tabular form. Comparisons of aspects of one item or of two different items are best seen in bar chart form, while for both general trends and accurate scientific results, graphs are used.

Diagrams may be produced and therefore bound into the report in one of two ways, either as an upright A4 sheet ('portrait' position) or turned through an angle of 90° for greater width ('landscape' position). The landscape format is useful and easily accepted by the eye, provided that the page is turned clockwise through 90°. Having to turn a document first one way and then the other to see the diagrams can be irritating. If it is certain that the reader will read the report on screen rather than in hard copy the difficulty is avoided, since the change from portrait to landscape format will not require changing the orientation of the page.

4.3 Clarity

Great care is usually taken with the text of a report, but the diagrams may be unclear and difficult to use; it should be remembered that distinctions depending entirely on colour will be lost if a document is photocopied in black and white. Graphics packages are useful, but it is still the responsibility of the writer to ensure that the information is presented in a helpful and unambiguous way and that the resolution of any image imported electronically is good enough. Blurred numbers on a diagram can cause serious errors.

4.4 Tables and graphs

4.4.1 Tables

These are the most common form of diagram in technical reports. Tables can give a great deal of accurate information if they are effectively presented. Vertical and horizontal rulings can be untidy and confusing: the use of space is a much more successful alternative.

To give more vertical space in a table, units and powers of ten should if possible be put into the column heading. Headings should be matched at the left hand side, for ease of reading and also of typing. Horizontal space is obtained by grouping similar items, with a space after, at most, seven items. For example, an annual financial breakdown could have the months grouped in quarters (January to March, etc) and no horizontal lines would be necessary. It is, however, possible to give too much space, so that the reader loses track across the paper. Colleagues are useful people on whom to test the ease with which a table can be used!

It is, as always, the need of the reader which is all-important. The report writer might have data available which are of far greater detail than the reader could possibly need. In this case, figures should be rounded to the appropriate accuracy, and perhaps some might be omitted altogether.

4.4.2 Graphs

Graphs are used either to show trends or to give accurate technical information. All graphs must be clearly labelled, and scales identified. If graphs are to be compared, the same scale must be used for each; as before, the detail needed by the reader must be included, and not necessarily all that is available to the writer.

4.4.3 Space

Sometimes diagrams outgrow their pages, and this is dangerous. Margins must be sufficient on all sides to allow for clarity, and to carry as appropriate the page number, figure number and title, and to allow for the binding of the document.

4.4.4 Diagram references

Diagrams of all types must be numbered and clearly referenced in the text. Probably the most useful method of numbering is to use first the number of the report section in which the diagram appears, and then, after a decimal point, the sequential number. So Figure 3.7 is the seventh diagram in section three of the report.

The references in the main text should identify the individual diagram and also, if necessary, give its position, for instance in an appendix. Titles for diagrams should be appropriate but brief, and always positioned in the same place relative to the diagram.

When a diagram is completed, the report writer should sit back and look at it, asking the following questions.

- Does it give the required information?
- Does it reproduce faithfully the information intended?
- Is it easy to use?
- Does it look attractive?

If the answer in each case is yes, the effect of the report is enhanced by its diagrams.

5. Finishing the report

The report has been planned, its structure set out in the most logical way and, section by section, it has been composed on the computer. The writing has not necessarily taken place in the order set out in the contents; the easiest sections have probably been completed first and the more complex information has then been added. Care should of course be taken to ensure that the final version is numbered and presented in the right order. The most difficult section to write still remains: the summary.

5.1 Summaries

Summaries and abstracts are different from one another, and used in different ways, although they are often confused. The summary is the last part of the text to be written, and it is perhaps the most difficult.

The use of summaries is widespread, and they serve several purposes. A summary gives a general picture of the report for those who want to be reminded of what they have already read, and also for those who will never see - or want to see - the total report. Many companies have long circulation lists for summaries, but supply the full report only to those whose status demands it or who ask for it (which most summary readers are happy not to do). In this way, summaries save much time and money and are therefore admirable.

Perhaps the most important use of the summary is by the most senior reader - often the decision maker - who has neither time for nor interest in the detail; this reader wants the report's 'answer', its conclusions and/or recommendations, to be immediately available.

However, the writer has the unenviable task of trying to reproduce the balance of the original report in a small space, while at the same time emphasising the most important conclusions or recommendations which everyone needs to know.

Law 7: Summaries give the whole picture, in miniature

The 'small space' mentioned is usually no more than 250 words, for a report of up to fifty pages.

Summaries have, therefore, to show the essential elements of the whole report, giving sufficient background to make sense to the reader, commenting on the major findings and giving stress to conclusions which are of general importance. The writer needs to sit back from the report and take an overall view, which can be difficult if he or she has been deeply involved with a particular aspect. The headings can be useful in pointing the balance of the whole, and of course the actual writing has to be as concise as possible. It may be helpful to know that the best summaries usually start by being too long by about one third, and that many words can be lost by careful pruning of the writing style, 'in the first instance' becoming 'firstly', and so on.

The summary is influential, and therefore should generally be in continuous prose, with an appropriate emphasis. Diagrams and lists are rare in summaries; good clear writing makes its own impact on the reader.

5.2 Abstracts

Abstracts are intended to bring together the report and prospective readers, and to guide readers who might not necessarily consider that a particular report is relevant to their needs. As summaries are usually best written by the report writer, abstracts are usually best written by somebody else, perhaps a librarian with specialist knowledge and training in abstracting.

The abstract selects the areas of interest covered by the report, and this may be done by a list of key words, which can be stored on a database. Readers who are hunting for material will find the report when they produce a key word which is common to their interest and the report itself; summary reading for further information will often follow. Sometimes at this stage hopeful readers learn that the report is confidential and that they cannot see it anyway, but at least they know that it exists!

5.3 Contents lists

It is rarely useful to index a report, but users will need to be guided to the sections which particularly interest them. An analytical contents list is the best answer. Each chapter or section is listed with its constituent headings, section and sub-section numbers being given as well as page numbers. The reader can therefore select a particular sub-section and locate it easily, at the same time seeing its connection to what precedes and follows it.

Page numbering, incidentally, is important. If the pages are not numbered, they may be put together inaccurately or even incompletely if the report is issued in hard copy - resulting in an immediate loss of reader goodwill. An indication such as 'page 15 of 18' in a running footer is helpful in alerting the reader if part of the report is missing.

5.4 Checking

The computer spell-check provides the first level of checking; it will identify spelling and typing errors that do not produce a different word (see Section 3.1.1). It is not a substitute for human checking, however, as there are some mistakes which only a reader will notice.

Law 8: Reports should be checked for technical errors, typing errors and inconsistency

Ideally, at least two people should check a report: a technical expert who can assess the amount of explanation given, the validity of the data and the logical flow of information, and a nonexpert who is patient and meticulous in checking the typing. In a world which is not ideal, writers must often check their own work.

Immediate checking is almost useless; leaving the report for 48 hours will improve the checking greatly. A week is better still. Covering the rest of the page with a blank sheet and checking line by line is helpful, and numbers must always be checked digit by digit. Consistency is important for the impact of the report: using different abbreviations for the same thing gives an impression of carelessness which worries the reader. There is some advantage in being consistently wrong rather than sometimes right!

Above all, the checking stage must not be rushed. It is annoyingly time-consuming, but it affects the reader's attitude to the report as a whole. This is also true of the appearance of the report.

5.5 Appearance

The reader is attracted or repelled initially by the look of the report. Overcrowded pages, small margins, information disappearing into the binding, too small a typeface, headings which merge with the text - all these put readers off and may even prevent their becoming readers. Good print and layout are attractive, and the reader is encouraged to tackle even the dullest subject if the pages can be dealt with quickly because they contain a good ration of blank space.

For the occasional very important and expensive report, it is worth considering employing a graphic designer or typographer to make the best of the material.

5.5.1 Title pages

The title page is the first page of the report proper which the reader will see. It should contain the title and author's name, the report reference number and date, its classification ('confidential', etc) if appropriate, the company's name and logo if desired, a statement of copyright if appropriate, and no more. Distribution lists look untidy and are better on a separate sheet, and the habit of putting the summary on the title page should be avoided. Most companies have well-designed title pages available as a template. These have the advantage of producing a company image which is itself good publicity for the writer's organisation.

Law 9: The report should look as good as it is

6. Conclusion

The report is checked, its appearance is pleasing, it is easy to handle, 'interesting' and 'readable', to quote the criteria suggested at the beginning of this Guide. If the technical content is as good as the organisation, writing, illustration and finishing, then the report should delight the reader. Which is just as it should be, for the tenth law of good report writing is exactly the same as the first:

Law 10: The reader is the most important person

Appendix A - Bibliography

A good dictionary, such as the Concise Oxford Dictionary

Cutts, Martin: Oxford Guide to Plain English (Oxford University Press, Oxford, 4th edn, 2013)

van Emden J: *Writing for Engineers* (Palgrave Macmillan, Basingstoke, 3rd edn, 2005)

Appendix B - A Guide to the laws of good report writing

1. The reader is the most important person. (Section 1)
2. Keep the report as short as possible. (Section 2.2)
3. Organise for the convenience of the report user. (Section 2.3)
4. All references should be correct in all details. (Section 2.5)
5. The writing should be accurate, concise and unobtrusive. (Section 3)
6. The right diagram with the right labels should be in the right place for the reader. (Section 4)
7. Summaries give the whole picture, in miniature. (Section 5.1)
8. Reports should be checked for technical errors, typing errors and inconsistency. (Section 5.4)
9. The report should look as good as it is. (Section 5.5)
10. The reader is the most important person. (Section 6)

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