

**THE WRITING OF A REPORT BY A STUDENT IN THE
STATISTICS DEPARTMENT OF THE
ATHENS UNIVERSITY OF ECONOMICS AND BUSINESS**

**(From the book “*The Teaching of Practical Statistics*”
by C.W.Anderson & R.M. Loynes (Wiley, 1987))**

A.1 INTRODUCTION

For most, possibly all, of the practical projects that you will carry out in your course you will be required to write a report, summarizing what you have done and what your conclusions are: the suggestions in this handout are intended to help you with that task. (This material is concerned particularly with the relatively short report appropriate to small projects, but most of the points apply much more widely-to theses for postgraduate degrees, for example, and to reports to be written within the context of ordinary commercial employment. There may well be a required or preferred form for these, which you should then study and follow, but this is likely to dictate only the structure, and the other aspects will then be similar to the present ones.)

There are several aspects, quite different in kind, of writing a report, and they will be discussed in turn:

- (a) structure;
- (b) content;
- (c) presentation;
- (d) style;
- (e) the preparation in detail.

Only general guidelines can be given, of course, which must then be interpreted and applied to the immediate task. The most important thing by far is to realize that a report is good if-and only if-it is effective, which means that it gets its message across: anything which diminishes its clarity or tends to irritate the reader will detract from that.

A.2 STRUCTURE

There are several possibilities, but the one suggested here has much to commend it; the general approach is similar to that of Ehrenberg (1982). The report will be made up of several components, listed below in the order *in which they should appear*. Some of them may well be better split up into sections, while some reports, perhaps because of their brevity, will not require as full a structure as that suggested here. Something that should certainly be avoided is the narrative approach, of the kind that says «first I did this and found that; next I did something else...», because this would make the report difficult to follow.

(a) Title

Every report needs a title, preferably on a separate title page, which should also include the author's address, department or other affiliation, and office (chairman, secretary, etc.) if he has one and if it is relevant, and the date.

(b) Summary

A brief summary-the shorter the better, and certainly no more than half a page - should follow, to tell the reader what the report is about, in general terms, and why it may be worth reading it. For example:

Some data relating Sheffield house prices to various geographical and physical characteristics, previously analysed by linear regression, are here analysed by generalized linear model (GLM) methods, and the results compared with those found earlier.

The summary should not, other than in exceptional circumstances, contain symbols, or numbers, and should contain technical terms only if they are widely understood.

(c) Introduction

This should describe the general context and background; including a (general) description of what data are available, and the aims of the investigation, together with some indication of the methods used. Overlap with the summary should not be a worry: the summary may in some circumstances be reproduced and used separately. It is

and what more might be done to carry things further. Reservations about the quality of the data, and so on, also belong here.

(g) References

The usual style in learned journals and books in statistics and mathematics is to refer to sources in the text by name and date - as was done above at the beginning of this main section - and then to collect them in an alphabetical list at the end: see an example at the end of this document. In other contexts a different convention may apply, and you should follow whatever is the custom.

(h) Appendix

Whatever does not fit naturally earlier should go into an appendix. In particular, computer program listings, which it will be appropriate to give if programs are individually written (and at all complicated), should be relegated to an appendix, possibly accompanied by a structure plan or flow chart, and *annotated*, so that the reader can follow them. Small, and small numbers of, tables can appear in the main report, but otherwise an appendix is likely to be the right place.

A.3 CONTENT

The decisions about the detailed contents are of course extremely important, but it is difficult to give much in the way of general guidelines; nevertheless a few things which are universally applicable may be said.

(a) A report must be self-contained-everything should either be stated explicitly, be justified by a reference to some other source, or be common ground (obvious, or common sense, or just well known for the intended readership). In particular, the source of any data should be clearly indicated.

(b) It is not usually sensible to describe everything that you did in detail. If you decide that one of your approaches to a question is wrong or inappropriate, then, unless you are convinced that most others would begin by supposing it acceptable, it should be omitted completely. If your initial approach is clearly included in a later

approach, no more than (at most) a passing reference to the former is necessary. For instance:

Regression on temperature showed some interesting features, but it became clear that both temperature and pressure should be brought into the model [and the results are as follows].

A.4 PRESENTATION

Reports should be attractive, and easy to find one's way through. It follows that they should be neat, clean, and tidy, and that they must be legible-so that if they are handwritten you should try to ensure that your handwriting is not a problem.

Pages, tables, diagrams, etc., should be numbered, as should sections, which should have headings; headings should stand out (by being underlined, or on a separate line, for example). In fact one can think of a report as needing signposts - partly to make it clear where one is (section headings, etc.), and partly to show where one is going (which will be done either by the wording or by dividing the report into subsections, each with a heading, or both). For example:

Thus, in the light of the analysis, it seemed worth investigating whether the variance of X was constant, and also attempting to model the relation between Y and Z.

6.1.1 The variance of X.

In much the same way, graphs need to be neatly drawn, carefully labelled and titled; scales should be chosen *sensibly* and the units indicated. A freehand graph, carefully drawn, may be appropriate; a sketch graph with various amendments, and axes carelessly drawn, will never be.

Tables, again, need titles, need to be boxed in, and figures in columns should be aligned correctly (usually so that the decimal points fall in the same line.) Rows and columns usually need labels (headings), and units must be stated in, or perhaps close to, the table.

Computer output needs some thought. For a student project report it may not be necessary to copy the results from the output so that they conform in appearance with the rest of the report (though it probably

difficult to generalize about length, but in the present context anything longer than about two sides would be surprising.

(d) Results, conclusions, and recommendations

Here it should be the *main* results and conclusions only that are given. Depending to some extent on their nature, subsidiary results and deductions may be gathered into a separate component, be combined with the description of methods, or be put into an appendix.

(e) Methods

These, which include any theory that is necessary, should now be described in reasonable detail. How much detail is always difficult to decide, but if one tries to write it as though for someone of comparable standing - a student in the same year, for example - who does not know anything about the subject of the report in detail, in such a way that he could repeat the study, this will be a good guide. Here again, do not be afraid of putting very detailed and long descriptions into one or more appendices.

What is quite likely is that this component will need to be split into a number of sections: a preliminary analysis, using graphical and simple descriptive methods, and then a full-scale analysis, for example. Note that what is being suggested here is that the techniques you need should be described in this section, whereas the results of using them will have been described in the previous one. This may at first sight seem an unnatural procedure, but you will find that it makes for efficient communication of what you found and how you found it, and that, after all, is a main aim of the report.

(f) General discussion

It may be appropriate to give some account of previous investigations of the same or related problems, or to relate the present conclusions to others in a connected area. It very likely is appropriate to discuss how far the original aim was successfully achieved, and if it was not, why not; to say what you would do differently if you had to begin again;

would be, at least for line printer output, for more serious purposes); but they will certainly need editing, to remove superfluous results, control commands, and so on, and it will probably be necessary to improve the labelling.

You may well find Chapman and Mahon (1986) helpful in these matters.

A.5 STYLE

(a) Earlier exhortations to be brief can stand repetition here. Closely connected with this is the advantage of using shorter rather than longer words when possible, and of avoiding jargon: if ‘educational establishments’ means only ‘schools and colleges’, then the latter is much to be preferred.

(b) Use of the personal style (‘I’), needs to be carefully done. (It is virtually never appropriate to use ‘you’). It is in principle reasonable—since it describes the case exactly—when judgement is involved: ‘I consider that the plot is sufficiently nearly a straight line that the data may be taken as normal.’ It sounds rather naive if used in a narrative context: ‘I carried out a regression analysis.’ In either case a reader can be irritated or distracted by it, since it is unusual, which will then detract from the impact of the report.

The indefinite pronoun ‘one’ can be used, but becomes tiresome very quickly, and the most usual solution is to make great use of impersonal verbs and of the passive voice. ‘A regression analysis was carried out.’ ‘It can be seen from the graph . . .’.

In mathematical-style arguments it is customary to use ‘we’: ‘We can now see . . .’. But the implication is that the reader and the author are doing this together, so that ‘We carried out a regression analysis’ is incorrect (unless there are two or more authors, to whom ‘we’ then refers).

(c) Some people would not agree, but there are many who care about spelling, and, in consequence, incorrect spellings may prove a distraction to your reader and a hindrance to efficient communication. If you know that your spelling is shaky, therefore, be prepared to look words up in the dictionary, and to remember corrections for the future. Many people cannot spell ‘separate’, and words like ‘recommend’, with some but not all letters doubled, need care.

(d) Be careful not to use words inappropriately: for example the similar sounding words ‘trend’ and ‘tendency’ are not interchangeable. Do not use the word ‘significant’ in a non-technical way in the middle of a statistical report.

(e) Grammar and punctuation are, again, areas which give trouble. Paragraphs divide the text into manageable pieces, usually with some unifying theme. One stage down from this is the sentence, ending with a full stop (or question mark). Sentences have to be complete in themselves, so that the following are not acceptable:

‘Which prove that it has no influence.’

‘A standard analysis is possible. By regression.’

(f) Style in a general sense is concerned as much with how the text flows - how it sounds-as with anything else, and if you read your report to yourself, pausing firmly at full stops, less so at commas, and so on, you may be able to detect grammatical errors connected with punctuation. You will also discover that using the same word time and time again, or starting two or three sentences in succession in the same way gives a monotonous effect; and you will also find that a succession of very short sentences breaks up the flow in an unpleasant manner.

Style is, in the end, something that you can develop only by practice, and by critically rereading what you have written. The famous maxim quoted by Dr Johnson:

Read over your composition, and where ever you meet with a passage which you think is particularly fine, strike it out.

Illustrates an appropriately self-critical attitude of mind, even if it exaggerates the action usually needed.

You may find *The Complete Plain Words* (Gowers, 1973) and *A Dictionary of Modern English Usage* (Fowler, 1983) (more idiosyncratic but more fun) useful as references on grammar, punctuation, and style.

A.6. THE PREPARATION IN DETAIL

There are really only two things to be said here: it is essential to plan the report before you start writing, and it is also essential to (be prepared to) revise it, possibly extensively, after you have written the first version. This handout, for example, was certainly revised noticeably.

Exactly what is worth doing depends on the scale, both of time and of the report - whether it is to be 5 pages or 50. If there is time, however, it is worth leaving a period between writing the first attempt and rereading it; if you can persuade someone else to read it and give you his reactions, so much the better, since he is going to be in a similar position to the final reader, whereas you will know what you meant to say, even if you did not actually say it.

If the report is to describe an activity which is extended in time, it is usually sensible to write the first draft piecemeal, as the information becomes available, to reduce what may be a formidable task if left entirely to the end. Also, you may find that the act of writing itself suggests new ideas and so may influence your plans for later parts of the analysis.

Note, finally, the rather obvious point that the various sections of a report need not be written in the order in which they will finally appear: it will often be easier to write the Introduction and Conclusions or Recommendations *after* making decisions about the contents of later sections and writing them.

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