

WRITING SHORT TECHNICAL REPORTS

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Requested by and Submitted to

**Client's Name Here
Client Department Name
Client Organization Name
City, State 99999**

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Report

The main Report should be restricted to two or three single spaced pages, supplemented by as many pages of appendix material as are necessary. The Report itself should include:

1. A very briefly statement of the problem. Do not include any background information well-known by the client or tell the client who he/she is. The purpose of this statement is merely to establish the scope of the study. The objectives of the study should be made clear right up front.
2. A summary of what was done---data collected, models built, scenarios considered, etc.
3. Identification of any important assumptions or restrictions that were imposed (e.g., the option of closing the current facility and moving elsewhere was not considered).
4. Specific recommendations, which may be conditional (e.g., if additional copper platers can be purchased for less than \$150K then adding capacity at this station is the preferred alternative for increasing throughput). Be careful not to make recommendations beyond the available data. Sometimes the recommendations will be in the form of suggesting further data collection and analysis. If you do this, however, be sure you are very precise on what must be collected, how it will be used, and what will come of it.

The goal of a short report is to communicate all key points of the study to busy managers who do not have time to scour detailed appendices to figure out what you did. To communicate efficiently, the following are often useful tips:

- Be flexible on format. An organization that is perfect for one study may be very awkward for another.
- Use bullets to call out key points. This saves space and highlights conclusions so that they don't get missed.
- Use graphs or tables to summarize numerical data. Try to present quantitative results graphically whenever possible, since a visual image is both stronger and faster than a numerical one.
- Make it look good. All reports should be neatly organized, typed, and stapled or bound. In this age of word processors and spell-checkers, there is no excuse for a sloppy or misspelled report.
- Be extremely careful about using ``folksy" language in a technical report. Saying that the plant is a ``disaster" or a ``real mess" may be more colorful than saying that it is ``extremely disordered," but can sound unprofessional. When in doubt, err on the side of formal, conservative language.
- Avoid long, complicated sentences. A technical report is not a work of literature. It is better to use short, clear statements to make your point, even it detracts from the flow of the writing. The reason is that people read technical material rapidly and will be confused by long sentences.
- Avoid using terms and acronyms that might cause confusion. However, make every effort to use the language of the client in the report. Using the term ``bill-of-materials" when the client uses ``schedule-of-materials" can make you look uninformed.
- Avoid nonstandard punctuation. Dashes and parenthetical comments should be used only sparingly.
- Footnotes should be used very sparingly, if at all.
- Use adequate spacing before and after mathematical expressions. This makes them much easier to read. This applies primarily to the Analysis appendix, since mathematics in the main Report should be minimal.
- Try to put tables and figures either on separate pages or at the top of a page with text.

References

This section is not always necessary, but should be included if you make use of results from books or journals. Although there are different styles for giving citations, one fairly standard approach is to give the name of the author and the year of the publication. The following are some examples.

Several approaches for applying stochastic processes methods to equipment replacement problems are described in Ross (1983). There are several excellent surveys of the literature on equipment replacement (see e.g., Pierskalla and Voelker 1976). The well-known control limit result for equipment replacement under Markovian deterioration (Derman 1963) is an early example of a structured policy in a dynamic programming problem.

Typically, cited references should be listed in alphabetical order, as follows.

Derman, C. (1963). "On Optimal Replacement Rules When Changes of State are Markovian," *in Mathematical Optimization Techniques*, R. Bellman (ed.), University of California Press, Berkeley, CA. 201-210.

Pierskalla, W., and J. Voelker (1976). "A Survey of Maintenance Models: The Control and Surveillance of Deteriorating Systems," *Naval Research Logistics Quarterly*, **23**, 353-388.

Ross, S. (1983). *Introduction to Stochastic Dynamic Programming*, Academic Press, New York.

Appendices

1. Analysis

If the analysis is complex, it may make sense to document it in some detail in an appendix, that includes:

1. A careful description of your model or technique,
2. Details about any modeling assumptions or constraints (Notice that assumptions may be listed both in the Report and in the Analysis appendix. The difference is that the Report should contain major assumptions, such as the fact that the analysis was restricted to a particular production line, while the Analysis appendix should contain *major* modeling assumptions, such as an assumption that machine failures are exponentially distributed.),
3. A description of the results of the analysis (It is particularly useful to use graphs, charts, and tables to summarize data and model results wherever possible. Try not to bury key results in a mass of text.),
4. A discussion of whatever verification and/or validation has been done for the model.
5. The discussion of the analysis should be detailed enough to enable the knowledgeable reader to duplicate the analysis.
6. Since in complex studies the Analysis appendix can get long, it can be useful to break it into appropriate subsections, such as Assumptions, Model Description, Data Collection, Scenario 1, Scenario 2, Model Validation, etc.

It is very important to be honest in your description of the analysis. You should always make your assumptions obvious, mention any significant limitations to your approach, and clarify as best you can the leap from your model to your recommendations. Furthermore, the discussion of the analysis should always be purposeful. Do not go into methodological details unless they are directly relevant to understanding your approach.

2. Data

If the analysis involved substantial raw data that is not summarized in the Report or Analysis, it can be included in an appendix.

3. Computer Code

If a computer model is involved, code can be attached. This is often unnecessary, however, when the analysis is distributed with a disk containing code.

4. Derivations

If the analysis involves standard results from the literature, the sources can simply be cited in the Analysis appendix. However, if extensions are non-trivial or if the audience for the report has need to know of the technical development of certain results, then they can be presented in separate appendices. For example, if basic cycle time calculations from factory physics are fundamental to the analysis, and you know that some readers who are unfamiliar with will want (need) background information, you can save them the trouble of tracking down Hopp and Spearman by developing the

key formulas in an appendix.

5. Numeric Computations

Sometimes it is useful to separate tedious numerical calculations from the Analysis. For example, in an Analysis that is making complicated use of various present values, we might simply say "the present value of Alternative 3 is \$352,000 (see Appendix X for details)." Then the interested reader can consult Appendix X for the gory details concerning tax and depreciation, etc.). The less devoted reader can still follow the analysis without pounding through the numbers.