Hints for report and paper writing

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There are many ways to write a report, but most technical and scientific reports and papers follow the same structure. Below I have collected some of my own thoughts. It is for English language reports but the same applies to reports in other languages.

- The main thing is to think about the reader!
  Who is the expected reader? What would you like to read if YOU were the one who should read it?

NTNU Universitetsbiblioteket har lenker til rapportskriving:

https://www.ntnu.edu/sekom/structuring-an-assignment

Language hints.

- It's important to have a good "float" in the report. The most important is to have a good structure as outlined in detail below.

- I generally recommend using short sentences. In many cases, you can delete words or parts of the sentence without losing meaning.

- Try to avoid abrupt changes in your thoughts. If you do this, insert words like "However, nevertheless" etc.

- Avoid issues that distracts the reader, for example, by moving material to the Discussion or Appendix.

- You should always use complete sentences, except in lists and Tables (and in power point presentations). However, note that in this document, I'm sometimes not following this rule, but this is not intended to be an academic document.

- Then there is the issue of active or passive language and the use of first-persons pronouns (we).
    - Active: “We see that..." or "The results show that"
    - Passive: "It is seen that...".

  I recommend using active language, and this is generally recommended by all English language experts

  I also recommend use of "we" because it's much easier to get a good float in the presentation. However, if you can get a good float without we (difficult) or with passive language (very difficult) then this is also fine.

  Comments on “we”:
    - The word "we" usually has the meaning of "The writer(s) of this report or paper" but in may also sometimes include the reader.
    - You may sometimes replace “we” by phrases like "the writer..." or "the reader..." or "the academic community...." or similar.
    - I have used the words "I" and "you" in this document, but these should generally be avoided in academic reports and papers. To avoid I and you, the simplest is to replace "I" by "we" and "you" by "one".

Report structure

To help the readers in finding their way, one should always follow the following basic structure of the report (denoted chapters for a large report and sections for a smaller report or journal paper):

(i) Abstract (always include this) (Sammendrag)

> This section is usually not numbered. It is sometimes called an executive summary.
>
> Write something that is understandable for a broad audience and give a hint of the main results.

(ii) Preface/Acknowledgement (if relevant)

> Mostly non-technical issues that you would like to say about how the work started, how it progressed and who helped you.

1. Introduction (almost always use this title)

> This section gives
>
> - the motivation for the work
> - the aim of the work
> - an overview of the most relevant background literature
> - and possibly an outline of the rest of the report.
>
> The introduction should focus on material that could have been written before you started the project.
>
> You should include the main basis and assumptions for the work (for example, if this is a report for a design project, then you should include a table that gives your "design basis"). As part of the introduction you may introduce the main notation (possibly as a Table)

2. Background material / Theory (usually with a different title, sometimes split into several sections).

> This is a summary of relevant existing material and results. By "relevant" is meant "relevant for the reader", that is, it should be helpful for reading the rest of the report.
>
> This section is often called "Theory", but preferably the title should be more precise, for example, it could be the name of the particular theory you are using.
>
> The title may also be quite different, for example, for a simulation study we may have one section named "process description" and another called "mathematical model".
>
> In some cases. one may include a section called "Literature review" if this was not covered in sufficient detail in the introduction.

3. Experimental / Methodology / Problem definition (in some cases this section is omitted)

This section should explain how you did the experiments, simulations or calculations which form the basis for the Results section.

In some cases, all or parts of this material may be moved to the Result section and/or to Appendix (if it's not really needed for reading the rest of the report).

4. Results / Main findings (sometimes with a different title; sometimes split into several sections)

The results should be presented in a clear manner. You may refer to cases or similar from the previous section.

To make the reading easier, I recommend that the most important interpretations (initial analysis and "discussion", e.g. telling the reader what is important and comparison with established theory) should be included in the result section.

If you choose to completely separate the results from the main interpretation/discussion of the results (which may be required in some reports), then it may make it difficult for the reader to follow the arguments and require a lot of looking around in the report.

In more theoretical reports the result section may be divided into a proposed method (new theory) part and Case study part (Examples)

Some hints about presenting the results:

- Hint about Figures. Figures are primarily meant to give a quick overview - NOT to read the exact results (use Tables for this; possibly in Appendix).
- If you have several related figures, all axes should be with the same scale!!!
- It is perfectly fine if one figure just varies over a small region, that would just show that not much is happening in this case.
- Hint about use of Appendix. A common mistake is that important material is put in the appendix (typically important results and figures), whereas more insignificant things are put in the main report (e.g. completely basic theory, which often is of little relevance for the specific work).
- If you have a lot of similar results, select a few (1-2) to include in the main report, and put the rest in Appendix.
- For process-related projects, a process flowsheet should always be included in the main report.
- Also, remember that one should be able to read main report independently, WITHOUT looking at appendixes. Appendixes are only extra information.

5. Discussion (often divided into several subsections with titles that explain what is being discussed)

Many students think that "Discussion" is the most important section. No, the Results is the main section, and as mentioned you should normally include your own main interpretations of the results in the Result section.

In the Discussion section, you can raise discussion issues that you think are of somewhat less importance, especially issues that would distract the reader if included in the Results section. This could include alternative interpretations of the results, and for experimental work a discussion of possible errors.

Also include suggestions for future work here (or it could be in a separate section)

6. Conclusion

This is mainly intended for someone who has already read the report. You can be more technical than in the abstract, and even refer to specific equations, Figures or Tables from the report.

7. References

It is important that you do a good job at referencing! Make sure the references are complete so it’s easy for the reader to find the source.

For material not found in basic text books, try to refer to the original source of the result or idea, so that the right people get the credit.

8. Appendix

The appendixes should give extra information which is not critical for reading the main report. All appendixes should be readable on their own.

Special case: Report for computational project (e.g. using Matlab, etc.)

Include an overview of the input and output data in the main report: for example, a printout of the Simulink block diagram can be useful.

Appendix: If you have done some programming yourself then include a printout of the your code in the Appendix (in addition all the files should be send electronically). In particular, it should make it possible for the reader to check more exactly how your code works, and what numerical values you use for the various parameters (I often find this very useful when I want to understand the presented simulation results).

Here are examples of two good reports

(Alexandre Leruth, project 2011):
http://www.nt.ntnu.no/users/skoge/diplom/prosjekt11/leruth/

(Carina Strand, Master 2012):
http://www.nt.ntnu.no/users/skoge/diplom/diplom12/strand/

BUT note: In a Diploma (Master) thesis you should in the introduction refer to your project report (if it was on a related subject) and provide a short summary of what you did.

Special case: Process Design project report.

(i) Abstract

(ii) Preface/Acknowledgement

Main report:

1. Introduction.

This should include ***the design basis*** (may give in separate table; order may vary):

- feed (composition, temperature, pressure)
- desired product and/or desired process route
- design capacity (product rate or feed rate)
- time for storage of feedstocks and products (for sizing of vessels)|
- location of plant (e.g. Norway)
- product specifications
- environmental specifications
- utilities (water, steam, electricity, oil, refrigerants, etc.) including steam levels and cooling water temperatures
- prices (feeds, products utilities)
- capital cost evaluation: method, expected accuracy, depreciation rate (%) and/or time (years)
- costs for cleaning/destruction of byproducts
- physical data and/or thermodynhamic methods used
- reactions with kinetics/equilibrium/conversions and ranges for temperature and pressure
- etc.

2. Process description.

Process chemistry overview (main reactions and side reactions) and alternative processes for making the desired product. Crude flowsheets. Given typical data for temperatures and pressure. Choice of process type (not the details)

3. Material and energy balances including process flowsheet.

Include main units and streams.

4. Equipment

Operating conditions and sizes for main equipment: Reactors, main separation units, important compressors, etc.. Include figures for illustration.

Give only an overview (table) of other equipment (table), like remaining tanks, heat exchangers. Details in Appendix

5. Investment costs

For main equipment.

6. Ecenomic analysis (including sensitivity to feed and product prices).

7. Discussion

(see comments above about discussion)

8. Conclusion

9. References

10. Appendix