

UNIVERSITY OF LIMERICK

Department of Electronic & Computer Engineering



Technical Report Writing

(with focus on FYP reports)

Hussain Mahdi

Department of Electronic and Computer Engineering

University of Limerick

Limerick, Ireland

Email: Hussain.Mahdi@ul.ie

Presentation Overview

- Introduction & Aims of Seminar
- Different types of technical reports
- Essence of good planning & preparation
- Structure & layout of a technical report
- Report Style Guidelines & Tips

Report Structures

- In general, reports contain a **Main Body** supported by some mandatory and other optional content
- The **Main Body** varies depending on type of report
- Reports should consist of the following parts in sequence given:
 - a) Title page
 - b) Summary/Abstract
 - c) Table of Contents
 - d) Introduction
 - e) Main body
- These may, where appropriate, be followed by:
 - f) References
 - g) Acknowledgements
 - h) Appendices

FYP Report Structure

- Guidelines are given in Appendix 3 of the 'Project Guidelines' document accessible from the <http://www.ecestudents.ul.ie/> web page
- **Your FYP report** must contain the following sections:

(i) Front sheet	(vi) Discussion of Results
(ii) A title page	(vii) Conclusions
(iii) An abstract	(viii) References
(iv) A table of contents	(ix) Acknowledgements
(v) The Main body of the report	(x) Appendices

Remember, you need to discuss your report structure, layout and contents with your supervisor !!

FYP Report Structure & Format

- The final document should be approximately 15,000 words, roughly 50 pages of main text
- A badly-written, or poorly-structured, report could seriously undermine what may otherwise be an excellent project
- The report format should be consistent. The following are some guidelines:
 - A4 page size
 - 1.5 or double line spacing, single sided
 - Top, Bottom, Left and right margins set to 1 inch
 - All pages numbered (Appendices listed Appendix A, Appendix B, etc.)
 - Equal justification
- There is a particular writing style applied to the document, it should be:
 - Formal and impersonal
 - Professional
 - Of interest to a technically-aware reader

Structure of FYP Report

- **Front sheet / cover page**

- Should contain the following: Name, I.D. Number, Supervisor's Name, Course Followed, Year, Department, Title of Project
- [Sample Cover](#)

- **Title page**

- Title of your project, name of author (your name & ID)
- [Sample title page](#)

Abstract

- An **Abstract** is a brief, yet comprehensive summary of a project
- It should be precise, factual and consistent across the sub-sections of your report and discuss:
 - **Purpose**: what is the topic and why did you do it?
 - **Methods**: what did you do, and how?
 - **Results/Findings**: what did you find?
 - **Conclusions**
 - **Relevance**: How do your findings relate to the practice of your field?
- Approximately 200 words
- Usually written last

Table of Contents

- Essential component of any report
- **Table of Contents** should list section/chapter headings, sub-sections, references and appendices etc., all complete with page numbers
- There should be a logical structure to the contents, and indentation should be applied to subsections
- 'Table of Contents' [sample page](#)

Main Body of the Report

- Each report will vary in structure and have different emphasis on various sections
- A logical approach is strongly advised to ensure all aspects of the project are balanced appropriately
- Maintain a consistent writing style and cohesion. Sample breakdown:

Development	Research
Introduction	Introduction
Similar Systems & Technology	Research & Rationale
Analysis & Design	Subject analysis
Implementation/Construction	Experimental Implementation/Construction
Testing	Evaluation
Discussion of Results & Conclusions	Conclusions & Recommendations

Introduction Section

- A good introduction should inform the reader what the project is about without assuming an in-depth technical knowledge
- It should provide a good overview of the system and include the following components:
 - Rationale: situation that brought about the need for the project
 - Aim of the project
 - Scope of the project/Project specification/Outline of system
 - Project plan
 - Assumptions on which work is based
 - Scope/organisation of the report

Similar Systems

- This section should provide a review with relevant background theory of technology, products or services currently in the marketplace that resemble the scope of your project
- Components to include:
 - Overview of at least 3 current systems
 - Outline the functionality of each system
 - Conclusion, briefly discussing the functionality of the intended system (improving or supporting current systems)

Research & Rationale

- Projects predominately based on research should provide the reader with:
 - Research and requirements defined
 - An overview of current research in the field
 - Proposal of how the project builds on previous work
 - Research methodology

Technology

- This section should describe the various software/hardware available in order to implement the aspects of your project
- It should briefly describe the architecture of your system and available technology
- A conclusion should justify chosen technologies given constraints that affected the decision (time, knowledge, cost, licenses etc.)

System Analysis & Design

- For a **hardware-related project**, this section should focus on the following points:
 - Describe in detail the technical analysis & design used during development
 - Document system development stages
 - Where possible have schematic snippets for your circuitry
 - Projects should be broken down into basic block/sections where possible
 - The design of a system will change during development. Please consult your supervisor on describing intermediate states of the project

System Analysis & Design

- For a **software-related project**, this section should focus on the following points:
 - Describe in detail the technical analysis & design used during development (follow a standard s/w development cycle)
 - There are many different design techniques available, the most familiar one is:
 - UML
 - Documentation outlining system development usually includes all stages of the system lifecycle. This will vary depending on the design technique employed
 - The design of a system will change during development. Please consult your supervisor on describing intermediate states of the project

UML approach for software project

SECTION	DESCRIPTION
User Requirements	<ul style="list-style-type: none">• Use case diagram• Narrative description of the system requirements
Physical Design	<ul style="list-style-type: none">• Class diagram• State diagram (for complex system functionality)• Sequence diagram (for complex system functionality)• A data dictionary• A normalised ERD if using a relational database• HCI section
Testing	<ul style="list-style-type: none">• Unit testing• Integration testing• System testing

Subject Analysis

- Research Analysis
 - Define research problem
 - Develop and implement sampling plan
 - Develop a design structure
- Descriptive Analysis
 - Used to describe the basic features of a project
- Inferential Analysis
 - Investigate questions, models and hypotheses

System Implementation/Construction

- Describes system in finer detail
- Do NOT include large pieces of code or full system schematics
- Divide the implementation section relative to the architecture of your system:
 - Critical circuit design/code to system operation
 - Hardware/software integration
 - Documentation architecture
 - Integration or communication of different technologies
 - Illustrate a non-standard or innovative way of implementing an algorithm, electronic circuit, etc.

Testing/Evaluation

TESTING

- Important section of report
- Verifies specifications
- Evaluates performance of system
- Proves/disproves any conclusions

Testing/Evaluation

EVALUATION

- Extremely important section of report
- Technical overview
- At a minimum should include:
 - Performance analysis
 - Evaluation protocols
 - How to test the system
 - Select data
 - Measure performance
- Technology evaluation
- Scenario and operational evaluation

Conclusions & Recommendations

Conclusions

- Conclusions are results arrived at during the project & discussion of these results
- Document conclusions in short paragraphs stating the main conclusion first, followed by others in a decreasing order of importance

Recommendations

- Must follow logically from conclusions
- Should address significant aspects of project and recommendations for further development

References

- A reference list should appear at the end of the report, before the appendices
- The heading 'References' should appear as an item in the 'Table of Contents'
- A reference list is a list of all of the sources of information such as books, journals/conference papers, web sites, standards, etc. that are referred to in the text of the report
- All entries in the reference list must be recorded in a standard format
- This is explained in more detail in Section 4.3: 'References & Citation' – we will come to this later...

Acknowledgements & Appendices

- **Acknowledgements**

- Any acknowledgement of assistance that has been given by outside bodies or individuals to the authors should be included in this section

- **Appendices**

- An appendix can consist of any matter that is not essential to contain within main text, or is likely to break the natural continuity of the text
- Examples of these can include:
 - mathematical derivations adopted from specific source
 - circuit schematics, PCB designs
 - complete listings of computer codes,
 - important datasheets/user manuals/technical manuals, etc.
- Appendices should be listed with a letter immediately after the word 'Appendix', i.e. Appendix A, Appendix B, etc.
- There should be appropriate references to these appendices and what they contain at relevant sections of the main text of the report

Figures & Tables

- **Figures** should be a maximum A4 size to avoid any folding in
 - They will usually be pasted into the body of the report adjacent to the text referring to them
 - The figure number and caption should be typed beneath the appropriate figure (See Section 4.4.2: 'Figures')
- **Tables** should generally be included in the body of the text
 - Tables should be numbered in the order in which they are referred to in the text
 - Each table should have an appropriate title, which should be given above the table and following the table number. (See Section 4.4.2: 'Tables')

Optional Components/Sections

- In addition to sections described, and depending on the type of your report, you may consider adding the following sections:
 - Declaration page
 - Dedication page
 - List of symbols (nomenclature)/list of acronyms
 - List of figures (figure numbers and captions)
 - List of tables
- The above sections are traditionally placed after the report's Abstract/Summary
- It is a good practice to add above

Referencing



Citations, References and Bibliography:

Citations

Identifies in the main text of the report/paper that the information presented comes from another source

References

List of the details of the source of information that was cited in the main text of the report/paper. This may be presented at the end of a chapter/ section, or at the end of the main body of text (prior to any appendices). The references are normally presented in the sequence that they were cited in

Bibliography

A complete list of information used in the preparation of the report/paper. This may include sources of text that were not explicitly cited in the report/paper. This is usually presented in alphabetical order (author)

Referencing Support Material

IEEE

<http://www.ieee.org/web/publications/procieee/authinfo.html>

Harvard

This is well explained on internet sites (keyword search: Harvard Referencing System)

University of Limerick

“Cite It Right” – based on the Harvard System

<http://www.ul.ie/~library/pdf/citeitright.pdf>

Citations -- IEEE

- In the main body of text, each citation is given a unique number enclosed in a square bracket
- A space is placed between the citation and the word that precedes it

- Examples:

Single reference: [1].

Multiple references (out of sequence): [2, 3, 6, 9].

Multiple references (in sequence): [10–14] or [10]–[14].

- The citation might also contain a page number (e.g. [10, p20])

Format of the 'References' List

- The following refer to the **IEEE referencing system**
- In the **References** section, the citations are normally listed in numerical order starting at [1]
- The format of the References depends on the source of the work
- Type of work:
 - Books
 - Journals
 - Conferences, workshops and symposiums
 - Internet
 - IEEE Standards

Format of the References - Books

- Books are referenced as:

Initials and surname of the author(s) followed by the *Title of the Publication (in italics)*, the edition of the publication (for books with more than one edition), place of publication, publisher, year of publication, any specific pages

- For example;

I. Grout, *Integrated Circuit Test Engineering Modern Techniques*, London, Springer, 2006

Format of the References - Journal Papers

- Journal papers are referenced as:

Initials and surname of the author(s) followed by the “Title of the Paper” (in double quotes), *Name of the journal* (in italics), volume number of the journal, page numbers for the paper within the journal, date of publication.

- For example;

I. Grout and J. Walsh, “Microelectronic circuit test engineering laboratories with programmable logic”, *International Journal of Electrical Engineering Education*, No. 41/4, pp.313–327, October 2004

Format of the References – Conference Papers & Internet Sources

- Presented papers are referenced as:

Initials and surname of the author(s) followed by the “Title of the Paper” (in double quotes), *Name of the conference* (in italics), volume of conference proceedings (if applicable), page numbers for the paper within the proceedings, date of publication.

- Internet sources (websites) are referenced as:

Author (person or organisation). (Year, month created or updated). Title of the page. [Online]. Viewing date – year, month, day. Available: website location

- For example;

UK Patent Office. (undated). [Online]. Viewed 19th March 2006.
Available: <http://www.patent.gov.uk>

Support Tools for Referencing

Tips for referencing:

- Keep detailed documentation on the sources of reference material and the nature of the reference material
- Keep a separate document or library detailing the references. This may be then used in the final report/paper
- Use an available referencing tool:

EndNote

EndNote is a software tool for developing and maintaining bibliographies

<http://www.endnote.com/>

Plagiarism

- Using ideas & writings of others and representing them as your own
- The purpose of an FYP is to demonstrate independent research
- The work undertaken must be documented and described in your own words, supported by reference material

Plagiarism is a serious violation of academic standards and deemed a major disciplinary offence under the University code of conduct

Avoid Plagiarism !!

- It is important to cite:
 - Factual information or data you found in a source
 - When quoting verbatim
 - When summarising, paraphrasing, or using ideas, opinions, interpretations or conclusions arrived at by another person
 - When using a source's distinctive structure, organising strategy or method
 - When mentioning in passing some aspect of another person's work

An appropriate approach is to acknowledge researched work and thus gain credit for having read around the subject area

Style

- Use an objective, impersonal style

“The style of writing should be formal and impersonal, but attempting to interest a technically-aware reader”.

- The third person is traditionally used to show an unbiased presentation of the facts

1st person

You will find that

I recommend

We encountered difficulties

3rd Person

It will be found that

It is recommended

Difficulties were encountered

Active or Passive?

- Use passive voice for the main focus

“ Penicillin was discovered by Sir Alexander Fleming ”

- Use active voice to emphasise the doer

“ Sir Alexander Fleming discovered penicillin ”

- Active is more direct and clear
- Passive uses more words – more room for grammatical error
- Overuse of passive voice makes for heavy reading

Express Ideas Clearly

- Keep the sentence structure simple
- Avoid over-long sentences
- Vary the sentence length – a short sentence after a string of longer ones can have greater impact
- Choose word order for emphasis

“The machine worked at full capacity after it was overhauled”

is better than

“The machine was overhauled, after which it worked at full capacity”

Grammar and Language

- Ensure your grammar is correct
- Use plain English
- Use clear, precise language
- Avoid abstract words and phrases
- Avoid overusing imprecise words such as:

“Appreciable, certain, consideration, practically, relatively, situation, tendency”

- Avoid clichés

“a window of opportunity, as a matter of fact, the bottom line”

Use of Graphical illustrations

Graphics should:

- Be appropriate to the information
- Add something to the text
- Be simple, uncluttered and easy to read
- Be to a sensible scale so information can be easily extracted
- Have a title, number and clear labelling
- Be sensibly placed on the page
 - as close to the relevant text as possible
- Be consistent with other graphics

Punctuation

- The apostrophe is used for two reasons
 - The possessive (e.g. the computer's hard drive)
 - Contractions (e.g. it's, who's, isn't)

(Note : do not confuse its and it's or who's and whose)
- Commas are generally used
 - After each item in a series
 - To delimit a sub-clause from the main clause
 - After an introductory phrase or sub-clause
 - To delimit material that is not essential to the meaning of the sentence

Punctuation

- Semicolons are typically used:
 - Between two closely related independent clauses
 - Between items in a list when the items are punctuated by commas
- Colons are used to introduce a list or series:
 - Before bullet points
 - When it is all strung together, a colon precedes the listed points and semicolons separate them

Words

- Use spell check (but re-read to ensure that the corrected words are the words which you intended to use)
- Plurals
 - Add “s” (or “es” to words ending in “o” or “sh”)
 - The plurals of abbreviations don’t have apostrophes
 - Irregular plurals (e.g. datum -> data, appendix -> appendices)
 - Plurals are **not** made by adding ‘s

Words

- Commonly confused words
 - Affect / effect
 - Compliment / complement
 - It is composed of / it comprises
 - Lead / led
 - Passed / past
 - Principal / principle
 - Their / they're / there

Fill in the blanks

1. Because of overuse, the land has lost _____ nutrients. (its/it's)
2. Mr Smith, _____ responsibility is the monitoring of (who's/whose)
3. Mr Smith, _____ responsible for monitoring (who's/whose)
4. The pollution will _____ the dissolved oxygen concentration. (affect/effect)
5. The pollution will have an _____ on the dissolved oxygen concentration. (affect/effect)
6. This _____ to the pollution of the stream. (lead/led)
7. The study was made up of five _____ sections. (principal/principle)
8. The _____ of the investigation was (principal/principle)

Questions

