Abstract
This Manual of Style details the stylistic and content guidelines to follow when writing a technical report or thesis. It is meant to help Software Engineering students prepare technical documents. It presents a set of consistent stylistic guidelines and conventions for the text, tables, figures, and other textual elements; when followed, these guidelines will produce a sharp and clean-looking document. It then presents directives on how to structure the material of the document and how to divide it neatly in sections, and how to structure each section internally. The Manual of Style itself is written following those guidelines, and thus also serves as a visual example of the application of those guidelines.
Acknowledgements

I would like to thank everyone who gave comments and feedback that helped improve this Manual of Style.
# Table of Contents

Abstract .................................................................................................................................................. ii
Acknowledgements ............................................................................................................................. iii
Table of Contents ................................................................................................................................... iv
List of Figures .......................................................................................................................................... vi
List of Tables ........................................................................................................................................ vii
List of Symbols ......................................................................................................................................... viii
List of Abbreviations .............................................................................................................................. ix

Chapter 1. Introduction .......................................................................................................................... 1
  1.1 Problem Background and Motivation ............................................................................................... 1
  1.2 Definitions ......................................................................................................................................... 1
  1.3 Objectives ......................................................................................................................................... 1
  1.4 Organization of the MoS .................................................................................................................... 2
  1.5 Conclusion ....................................................................................................................................... 2

Chapter 2. Stylistic Guidelines .................................................................................................................. 3
  2.1 Introduction ....................................................................................................................................... 3
  2.2 Text Style ......................................................................................................................................... 3
    2.2.1 Font Size, Spacing, and Attributes ............................................................................................ 3
    2.2.2 Paragraphs .................................................................................................................................. 3
    2.2.3 Title Style ................................................................................................................................... 4
  2.3 In-Text Objects ................................................................................................................................. 4
    2.3.1 Tables ......................................................................................................................................... 4
    2.3.2 Figures ......................................................................................................................................... 6
    2.3.3 Equations ..................................................................................................................................... 8
    2.3.4 Lists ............................................................................................................................................ 9
  2.4 Page Numbering ................................................................................................................................. 9
  2.5 Others .............................................................................................................................................. 10
    2.5.1 Footnotes ................................................................................................................................... 10
    2.5.2 Abbreviations ............................................................................................................................ 11
  2.6 Conclusion ....................................................................................................................................... 11

Chapter 3. Before the Text ....................................................................................................................... 12
  3.1 Introduction ....................................................................................................................................... 12
List of Figures

Figure 2-1: The Lakehead University coat of arms.................................................................6
Figure 2-2: A Cartesian graph.............................................................................................7
Figure 2-3: Code sample.......................................................................................................7
Figure 2-4: Faces. (a) A funny face. (b) A not funny face......................................................8
List of Tables

Table 2-1: Title styles. ................................................................................................................................................. 5
Table 2-2: A table with a caption so long that it takes several lines, and is consequently not centered
but left-aligned and indented. ....................................................................................................................................... 5
# List of Symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>$a$</td>
<td>Acceleration</td>
</tr>
<tr>
<td>$c$</td>
<td>Speed of light (299 792 458 m/s)</td>
</tr>
<tr>
<td>$E$</td>
<td>Energy</td>
</tr>
<tr>
<td>$F$</td>
<td>Force</td>
</tr>
<tr>
<td>$m$</td>
<td>Mass</td>
</tr>
</tbody>
</table>
# List of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>LWE</td>
<td>Long Words or Expressions</td>
</tr>
<tr>
<td>MoS</td>
<td>Manual of Style</td>
</tr>
<tr>
<td>ToC</td>
<td>Table of Contents</td>
</tr>
</tbody>
</table>
Chapter 1.
Introduction

1.1 Problem Background and Motivation

Technical writing is an important skill for engineers to have. Whether one is a professional engineer preparing a report for a client or a graduate student drafting a thesis, one’s ability to properly organize and present one’s thoughts is crucial. However, technical writing is not a skill taught in engineering classes. It is expected that engineering students will somehow pick it up as they go along. This Manual of Style (MoS) is meant to help them acquire that skill.

1.2 Definitions

A thesis is a document written at the end of a postgraduate-level research project. Such a project is undertaken at the Master’s or Doctorate level, lasts several years, and requires that the engineer makes some scientific contribution.

A technical report is a document written in the context of a practical project. The project could be to develop a new product, or to study an existing system and suggest fixes or improvements.

An engineer is a hoopy frood who really knows where his towel is.

1.3 Objectives

The objectives of this Manual of Style are:

A. To present stylistic guidelines for writing a technical report or thesis.

B. To give an outline of common sections found in these documents, their purpose and their contents.

C. To illustrate the guidelines presented for Objectives A and B.
1.4 Organization of the MoS

This Manual of Style needs to cover all the main stylistic aspects of a technical report or thesis, and we will present them in order. Accordingly, Section 2 will discuss fundamental notions such as font sizes and styles, as well as line spacing and page numbering. We will explain the parts of the document that precede the text in Section 3, then move on to the contents of the report’s text in Section 4. In Section 5, we will give an overview of the parts that come after the text is done, before finishing with some concluding remarks in Section 6.

1.5 Conclusion

The motivation for this Manual of Style is to help students with both the appearance and structure of their technical reports and theses. It aims to accomplish this by explaining as well as illustrating proper technical writing methods.
Chapter 2.

Stylistic Guidelines

2.1 Introduction

While there is no doubt that the content of a technical report is the single most important element, one should not underestimate the value of a good and clean style. It makes the report easier to read, and reflects well on the engineer who prepared it. Accordingly, we will present in this section a set of consistent stylistic guidelines and conventions that, when followed, will produce a good-looking document.

2.2 Text Style

2.2.1 Font Size, Spacing, and Attributes

The text should be written using a serif font, such as the standard Times New Roman. The text should be large enough to read easily, and line spacing should make the text airy without making it look spread out. Thus, text size and line spacing complement each other: a larger text size requires larger line spacing. A good combination is a 12 point font with 1.5 line spacing. The text alignment should be justified left and right.

The different style attributes have specific meanings. A word in italics is a new technical term that was just introduced, and will now be defined. Italics should not be used for emphasis; a term we need to emphasize should be underlined instead. One should make use of this emphasis carefully however, as abusing it diminishes its effect, in addition to making the text unappealing visually. Finally, bold should be reserved for titles and captions, and should not be used in the text.

2.2.2 Paragraphs

Normally, a subsection is composed of multiple paragraphs. They are separated by a slightly larger space than normal line spacing. This spacing should be consistent with the font size
and line spacing selected for the document. With our example of 12 point font and 1.5 line spacing, a 6 point spacing following each paragraph is adequate.

Indentation also helps separate paragraphs clearly. The first paragraph of a section does not need to have an indentation. However, the first line of every subsequent paragraph should have a small indentation, of less than 1 cm. For example, this Manual uses an indentation of 0.37 cm.

2.2.3 Title Style

Titles can be written in a different font from the text. Moreover, they can make use of a sans-serif font and the bold attribute. These differences make the titles appear clearly compared to the text, and makes it easy for a reader to scan over the document, for example when they are looking for specific information.

Microsoft Word defines nine levels of titles, from the most important level 1 to the very minor level 9. Normally, a document would make use of the first three titles, sometimes exceptionally of the fourth one; anything more might indicate a poor structure and division of the material.

In this manual of style, we will recommend the styles presented in Table 2-1. Numbering level 1 titles as “Section” is appropriate for a technical report; for a longer document such as a thesis, a better label would be “Chapter”. A level 1 title is always at the top of a new page. Titles of other levels do not necessarily need to appear at the top of the page; however, they can never be at the bottom of a page separated from their text in the following page.

2.3 In-Text Objects

2.3.1 Tables

In this Manual, we recommend using a simple but elegant table style. It simply uses double-lines at the top and bottom of the table, and a single line to separate the column title row from the content of the table. Other styles are of course possible, but whatever they are, they should clearly mark where the table begins and ends. The text inside the table can be of the
Table 2-1: Title styles.

<table>
<thead>
<tr>
<th>Level</th>
<th>Numbering</th>
<th>Font</th>
<th>Size</th>
<th>Alignment</th>
<th>Attributes</th>
<th>Spacing before</th>
<th>Spacing after</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Section 1</td>
<td>Arial</td>
<td>14 pt</td>
<td>Center</td>
<td>Bold</td>
<td>Top of page</td>
<td>12 pt</td>
</tr>
<tr>
<td>2</td>
<td>1.2</td>
<td>Arial</td>
<td>12 pt</td>
<td>Left</td>
<td>Bold</td>
<td>12 pt</td>
<td>6 pt</td>
</tr>
<tr>
<td>3</td>
<td>1.2.3</td>
<td>Arial</td>
<td>11 pt</td>
<td>Left</td>
<td>Bold</td>
<td>12 pt</td>
<td>3 pt</td>
</tr>
<tr>
<td>4</td>
<td>1.2.3.4</td>
<td>Arial</td>
<td>11 pt</td>
<td>Left</td>
<td>None</td>
<td>12 pt</td>
<td>3 pt</td>
</tr>
<tr>
<td>5</td>
<td>1.2.3.4.5</td>
<td>Arial</td>
<td>10 pt</td>
<td>Left</td>
<td>None</td>
<td>12 pt</td>
<td>3 pt</td>
</tr>
<tr>
<td>6</td>
<td>1.2.3.4.5.6</td>
<td>Arial</td>
<td>10 pt</td>
<td>Left</td>
<td>None</td>
<td>12 pt</td>
<td>3 pt</td>
</tr>
<tr>
<td>7</td>
<td>1.2.3.4.5.6.7</td>
<td>Arial</td>
<td>10 pt</td>
<td>Left</td>
<td>None</td>
<td>12 pt</td>
<td>3 pt</td>
</tr>
<tr>
<td>8</td>
<td>1.2.3.4.5.6.7.8</td>
<td>Arial</td>
<td>10 pt</td>
<td>Left</td>
<td>Italic</td>
<td>12 pt</td>
<td>3 pt</td>
</tr>
<tr>
<td>9</td>
<td>1.2.3.4.5.6.7.8.9</td>
<td>Arial</td>
<td>10 pt</td>
<td>Left</td>
<td>Bold Italic</td>
<td>12 pt</td>
<td>3 pt</td>
</tr>
</tbody>
</table>

same font and size as regular text. Typically, the first column is left-aligned, and the others are centered.

Tables must always be numbered and titled. The table number has two parts, first the section number, then the table number inside the section. The numbering in each section is independent; the first table of Section 3 will be Table 3-1, regardless of how many tables were in Section 2. The table’s caption can be one point size smaller and bold, and should be on top of the table. It can be centered if it is less than one line long; if it is longer, it should be left-aligned and have an indentation equal to the number, as illustrated in Table 2-2. The caption should never be separated from its table.

Table 2-2: A table with a caption so long that it takes several lines, and is consequently not centered but left-aligned and indented.

<table>
<thead>
<tr>
<th>Entry</th>
<th>Attribute 1</th>
<th>Attribute 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>55</td>
<td>94</td>
</tr>
<tr>
<td>B</td>
<td>70</td>
<td>12</td>
</tr>
<tr>
<td>C</td>
<td>42</td>
<td>47</td>
</tr>
</tbody>
</table>

Tables must always be referred to in the text before they appear. They should not be split over several pages, unless they actually are more than one page long. If a short table is split over two pages, it should be moved to the top of the second page.
2.3.2 Figures

Figures are useful to illustrate some notions explained in the text. When putting an image in the text, one should make sure that it will display correctly when printed. Avoid images with small details or light colours, as they will not appear clearly (or sometimes at all) in the hard copy. Likewise, make sure that the contrast in the image is sufficient to make out all the important details on the printed copy, especially when putting in a photograph. When resizing an image, care should be taken to avoid aliasing and to insure that text in the image is still legible.

Figures should be surrounded by a thin black frame if it is not clear where their boundaries are. Like tables, they should always be numbered and titled. The figure captions should have the same style as table captions, and they follow the same rules with the difference that they appear below the figure, are labelled “Figure”, and are numbered separately from tables. An example is given with Figure 2-1. Like for tables, figures must always be referred to in the text before they appear.

![Figure 2-1: The Lakehead University coat of arms.](image)
Cartesian graphs like Figure 2-2 do not need to be surrounded by a black frame, as their boundaries are normally clear. A reminder, while on the topic of Cartesian graphs: always label the axes and indicate the units used!

Code and pseudo-code samples are also figures. To embellish the document, they can be written in a special “code” font different from the rest of the document, to give them a unique appearance. This is the case for the code given in Figure 2-3, which was written using the Courrier New font.

![Figure 2-2: A Cartesian graph.](image)

**Figure 2-3: Code sample.**

```
10 Home
20 Sweet
30 Goto 10
```

The subfigures of multi-part figures have to be clearly labelled (a), (b), (c), and so on. The subfigures can be put side by side on the page with their labels under them if they are small enough, as we did with Figure 2-4. If the figures are too large to fit side by side, then they can be placed in column, with their labels to the right. In any case, there is only one caption for the entire figure which explains what each subpart shows, as we did in Figure 2-4. In the special simple case where there are only two subfigures, it is acceptable not to label them and to have the caption refer to the subfigures as (left) and (right) or (top) and (bottom).
2.3.3 Equations

Like figures and tables, equations are numbered with a section number and an equation number, and the numbering is independent of tables and figures. Equations are different, however, in that they do not have captions. They are simply centered on the page, with the number appearing in parenthesis on their right, as for Equation (2-1). It is always important to specify the meaning of new symbols used in the equation, either before or immediately after the equation. In Equation (2-1), $E$ is the energy, $m$ is the mass, and $c$ is a constant representing the speed of light in a vacuum.

\[ E = mc^2 \quad (2-1) \]

Equations also differ from tables and figures in that they can be part of the text. Take for example the equation

\[ F = ma \quad (2-2) \]

where $F$ is a force and $a$ is the acceleration, and which is part of a sentence. In that case, one should not forget to use proper punctuation after the equation. Finally, when writing a mathematical development, it is not necessary to number every equation. Only the final result needs to be numbered. For example, one can compute the speed of light as in Equation (2-3).
\[ E = mc^2 \]
\[ \sqrt{E} = \sqrt{mc^2} \]
\[ \sqrt{E} = \sqrt{mc} \]
\[ \sqrt{\frac{E}{m}} = c \] \hspace{1cm} (2-3)

2.3.4 Lists

Lists are useful to state a set of related elements in a clear and concise manner. This is somewhat similar to tables; however, while tables show elements and their attributes, lists state elements and their sub-elements in a hierarchical manner. Lists are part of the text; they are written in the same font and style as the rest of the text, and they do not have numbers, titles or captions.

The elements in the list should be marked, either with bullets, numbers, Roman numerals, or letters. However, the marks chosen should be used consistently throughout the document. Capitalization should also be used consistently: we can choose to capitalize the first word of each entry or to capitalize every word, provided it is done consistently.

2.4 Page Numbering

A technical report or thesis has two independent series of page numbers. The first series starts on the cover page and includes all the initial tables and lists. This series uses lowercase Roman numerals, beginning with \( i \). The second series of page numbers begins with the first page of the first section of the text, and continues until the end of the document. These pages are numbered with regular Indo-Arabic numbers, and the numbering begins anew at 1.

The authors are free to put their page numbers where they want, at the top or bottom of the page, left, centered or right. However, the position should remain the same throughout the document. There are only two exceptions to this consistency rule. First, the initial page of each section can have its page number at a different location than the others. For example, in this Manual of Style, page numbers are in the top-left corner, except for the first page of
sections where they are bottom-centered. The second exception is the cover page of the document, which is page \( i \) but does not have a number displayed on it at all.

2.5 Others

2.5.1 Footnotes

Footnotes\(^1\) can serve two purposes in a technical document or thesis. The first use of footnotes is to point the reader to an additional resource\(^2\) they could consult to learn more on a given topic. And second, they can be used to define a word or give some background information, if these notions cannot be included in the text. Words explained in this manner are usually out-of-domain technical terms, that is to say, technical terms that are not related to the topic of the document. For example, in a technical report on the network setup of a computer system for a hospital, medical terms would be out-of-domain technical terms that would unavoidably be included in the text. These words have to be explained to the reader, however including the explanations directly in the text would create an off-topic tangent that would break the flow of the document. Consequently, the explanations can be moved to footnotes.

Footnotes are indicated by superscript numbers. In a paper or a shorter report, they are numbered sequentially and continuously through the document. In a longer text such as a thesis or a book, we have the option of restarting the numbering from 1 at the beginning of each chapter. The text of a footnote is written in smaller characters of the same font as the text; we used 8-point characters in this MoS. A footnote in a short document should be written entirely at the bottom of the page where the word it is referencing appears, unless that word is on the last line of the page, in which case the footnote can be continued on the following page. In a longer text where the numbers are incremented sequentially from beginning to end, the footnotes could be either at the bottom of the page or in a special section at the end of the document before the references. In a longer text where the footnote

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\( ^1 \) Like this one.  
\( ^2 \) http://en.wikipedia.org/wiki/Footnote
number sequence restarts from 1 at the beginning of each chapter, the options are to write the footnotes at the bottom of the page or at the end of each chapter.

2.5.2 Abbreviations

It is common to abbreviate Long Words or Expressions (LWE) that are commonly used, to lighten the text. However, an abbreviation must always be introduced before it is used, by appearing in parenthesis next to the LWE it abbreviates, with all letters of the abbreviation written in uppercase in the complete LWE.

2.6 Conclusion

This section presented in detail some stylistic guidelines for writing a visually-appealing technical report or thesis. The aspects covered included the text itself, the titles, non-textual elements such as tables, figures, and equations, page numbering, and other notable elements of style. It is worth noting that the style proposed in this section is not the final word on technical writing, but rather a set of guidelines. These guidelines are internally consistent and will produce a crisp-looking thesis; however, stylistic conventions are always evolving, and the reader is free to update and personalize the style as needed.
Chapter 3.
Before the Text

3.1 Introduction

Before the text of a technical report or thesis even begins, a dozen pages of the document have already been written. The contents of the sections that appear at the beginning of a document are presented in this section, in page order. The sections described here all appear at the beginning of this Manual of Style.

Before we begin, we should recall the fact, mentioned in Section 2.4, that these pages are numbered using Roman numerals, starting on page i. Once the text begins, after these sections, the numbering will restart at 1 in regular Indo-Arabic numerals. We should also mention that, although it comes before the main text, this part of the document should nonetheless be written using the same style as the rest of the document, as defined in Section 2.2.

3.2 Cover Page

The cover page is the first, and sometimes the only, page of the report or thesis that people will see. As such, it is crucial that the important information be clear and easy to see.

By far, the most important information is the title and the names of the authors of the document. Consequently, the top half of the page is used to convey this information. The title comes first, and in a considerably larger font than anything else in the document. In this MoS for example, the title is 26 points in size, compared to 14 points for the next largest text (the level 1 titles), and 11 points for the rest of the text on the cover page. Under it is the list of authors, naming one author per line.

The second half of the cover page begins with a sentence stating what the document is and who it is for. The sentence is split to have one piece of information per line. For a thesis, the common statement is “A thesis presented to Lakehead University in fulfillment of the thesis requirement for the degree of Masters of Science/Doctor of Philosophy in Software
Engineering”. Notice that the sentence begins by saying what the document is (a thesis), who it is presented to (Lakehead University), and why (to fulfill degree requirements). For a technical report, there is no standard phrasing, so any variation that carries the necessary information is acceptable.

Finally, the bottom of the cover page states the place where the document was prepared, and the date.

The cover page is unique in that it is the only page that does not have a number displayed on it, although it is page i, and it is the only page that does not appear in the table of contents.

**3.3 Abstract**

After the title page, the abstract is usually the first part of a document that is read. It is the only page available through a library search engine, and the only part a curious reader will consider when deciding whether or not they are interested in reading the entire document. It is therefore crucial that the abstract gives an accurate representation of the document, lest an interested reader accidentally overlook it. The abstract should present clearly but concisely the main topics of the report or thesis, and what a person reading it from start to finish can expect to take from it, without false pretensions or exaggerated claims. The abstract should be no more than one page in length.

**3.4 Acknowledgements**

The acknowledgements are an optional section, often found in longer documents such as theses or books, but not in shorter technical reports. It is normally used by the authors to thank contributors to the work or loved ones who supported them. It has the unique advantage of being the only section of any document that is not critically reviewed, and is therefore a free page for the authors to write whatever they want. However, it should not exceed one page in length.
3.5 Table of Contents, List of Figures, List of Tables

The table of contents (ToC), list of figures and list of tables are three listings of elements found in the text. Each of these listings begins on its own page, and is written in the same style, with the elements’ names on the left and the corresponding page numbers on the right, connected by a dotted line. The ToC contains section and subsection numbers and names, including all those sections before the text except for the cover page, and all those after the text. The list of figures and the list of tables contain figure and table numbers and captions, respectively. The elements in the ToC and these two lists are sorted by page number.

3.6 List of Symbols, List of Abbreviations

The list of symbols and list of abbreviations are two optional sections that are typically found in longer documents, such as theses, which make heavy use of mathematical symbols or of abbreviations. It gives the reader an easy way to look up the meaning of a symbol or abbreviation that was introduced some time ago and that they have forgotten. These lists can be used independently; for example if a document has a lot of mathematical equations but few abbreviations, it is completely acceptable to put in a list of symbols but not a list of abbreviations.

These lists are very different from the list of figures and the list of tables. They are tables listing the abbreviation or symbol and its meaning in alphabetical order and without page numbers.

3.7 Conclusion

This section gave an overview of the contents of a technical report or thesis that appears before the beginning of the text. We discussed at length the cover page, then gave brief presentations of the abstract and the optional acknowledgements sections, and of the various tables and lists that summarize the contents of the text. With this done, we are ready to move on to the main text of the document.
Chapter 4.
The Text

4.1 Introduction
The bulk of a technical report or thesis, from the first page of the introduction to the last page of the conclusion, is what we refer to as the text. The content will naturally be very different from one technical document to the next; however there is a common basic structure to the text that should be followed. In this section, we present guidelines for this structure.

4.2 Structure

4.2.1 Parts and Chapters
The text is normally structured in discrete units with a clear purpose. These units can have different names: in a paper they are sections, in a legal document they are articles, and in a thesis they are chapters. This later name is the one that will be adopted here.

The text is divided into five parts, which typically correspond to five chapters, although it is not unusual for some of the parts to encompass several chapters if the need arises. The first part of the text is the introduction, which is only one chapter long, and presents the motivation and objectives of the thesis or report. Next is the background part, which gives a review of relevant topics. This part is also only composed of a single chapter. The next two parts of the text present the novel work of the document. One part presents the theoretical framework worked in, while the other presents the experimental results obtained. Each of these parts is in a separate chapter, and each can contain several chapters if needed. Finally, the conclusion chapter forms the last part of the text. That section gives some final highlights of the work.
4.2.2 Subsections

Presenting an entire chapter as a single lengthy text would be tedious to write and confusing to read, not to mention impossible to easily refer to in the future. For these reasons, chapters are divided into sections and subsections.

Most chapters in the text follow the same basic structure. They begin with an introduction section that describes the content of that section. Then they have a variable number of sections, as needed, to cover all the notions they should present. And finally, they end with a conclusion subsection which summarizes the content presented in the chapter. The structure of each chapter thus follows the simple guideline sometimes quoted as “tell them what you’re going to do, tell them what you’re doing, tell them what you’ve done”.

The introduction and conclusion chapters of the text are exceptions to this structure, and have more rigidly-defined sections that serve specific purposes. These will be presented later on.

4.3 Introduction Chapter

The aim of the introduction chapter of the text is to give the reader a clear idea of what the report or thesis is about and why it was written. After having read the introduction, the reader should know exactly what to expect from the rest of the document. In line with this objective, the introduction has three key subsections, the motivation, objectives, and structure, which address the why, what and how of the text, respectively.

The first section presents the motivation of the work. It explains what specific problem the work addresses, why existing solutions to that problem are insufficient, and why a new solution is needed. If this work is part of a larger project, then the complete project can be introduced here. This section should not be technical, and should be written in a language a layperson can understand.

An optional section for definitions sometimes follows. Indeed, some technical terms might be so basic that they cannot be introduced elsewhere, not even in a background section.
However, they are still technical terms, and we cannot assume that the reader will know what they mean. These words can be defined here.

The next major section is the objectives. These describe the intended contributions of the work. Clearly listing the objectives of the work allows the reader to know exactly what is being done and why. Moreover, it allows the author to easily refer to them later on, either in this document or in a follow-up report, to demonstrate point-by-point what has and has not been accomplished.

The last of the three major sections is the organization of the report. In this section, we give a brief overview of the content of each subsequent chapter of the document.

4.4 Background Chapter

The background chapter offers the reader an overview of topics relevant to the current work. In terms of technical depth, it needs to hit a middle-ground between superficial and overly deep. The reader of this section should learn about the existing literature with enough depth to understand key scientific and technical differences between the previous works done (and with the work that will be presented in the current document). However, the background chapter should not serve as stand-alone replacements for these works; in other words, a reader interested in completely understanding or reproducing one of the works described in the background section will still need to consult the original cited paper.

This background can take different forms, depending on the nature of the document. In a thesis, we have a review of the literature in fields relevant to the research, starting from seminal work in the field and going up to the state of the art. In the case that the work belongs to several different fields of study, there should be a background review of each field presented in an independent subsection of the background section. It is also good to use this background section to position the current work relative to the literature, by pointing out for example which project it follows up on or which it is at odds with.

In a technical report, the background will rather be a description of existing technologies related to the ones in the project. The idea of “related technologies” is vague – they may be
competing technologies from another company or within the same product line, or they may be complementing technologies the project has to interface with. The goal here is to give an overall perspective of the system being studied within its environment.

In many cases, it is useful to end this chapter with a summary table that lists the different works presented and the key points in which they diverge, and marks which point corresponds to which work. This serves as a quick and visual reference guide to the material presented.

Like all standard chapters, this one begins with an introduction where we highlight the topics that will be reviewed, and ends with a conclusion where we briefly sum up the state of the art and how we are connected to it.

4.5 Theoretical Framework

This set of chapters describes the theoretical aspects of the work. By “theoretical aspects”, we mean anything that was developed in the study but not part of the empirical tests. This can include, for example:

- brainstorming for various ideas and considering the pros and cons to pick one;
- proving mathematical theorems;
- developing a system “on paper”, for example by stating the technical and non-technical requirements, developing the system’s architecture and class diagrams, or preparing use-case scenarios of how the system should function;
- describing the implementation of a prototype and evaluating it from a theoretical standpoint, considering for instance its modularity or its portability or its algorithmic complexity.

It is also acceptable to review some fundamental notions that the study is directly based on. However, in doing that, we should be careful not to tread into background review territory, which should be contained in the previous part of the text.
Each chapter of the text should cover one and only one theoretical aspect of the work. While the exact division of the material in chapters will be unique to each project, we should be careful to group topics that are directly connected as sections of a single chapter, while moving unrelated topics in other chapters. For example, in a project where multiple small and isolated systems were developed, each system could be described in a chapter, with its requirements, design and implementation being sections of that chapter. As a counter-example, in a project where a single, large-scale system was designed and deployed, the requirements, design and implementation could be three separate chapters.

Like all standard chapters, these ones begin with an introduction where we highlight the work that will be done and connect it to the overall objectives of the thesis or report, and end with a conclusion where we briefly sum up the what was accomplished in the section and how it leads to the next section.

4.6 Experimental Results

This set of chapters cover the empirical tests done in the context of the work, and the results obtained. One of these chapters would typically begin by giving some context on the experiments, by presenting the test scenarios, the experimental setup, and/or the test conditions used, depending on the case. While the theoretical aspects of the work should have been discussed in a previous chapter, it is still acceptable to present here some new theory if it relates exclusively to the experiments. This would be the case for example of a brief background presentation of an application the tests are being run for, or of an equation used to interpret the results.

Next in the chapter come the experiments and the results generated. However, results by themselves are meaningless. Is a 65% accuracy good or bad? Is a 2 second response time fast or slow? In order to interpret and understand the results, the next section, the discussion, is absolutely critical. This is the section where the authors analyse their results, compare them to some reference point to determine whether they are good or bad, and explain why their system performed that way. The selection of a valid external reference point is thus important. A valid reference point can be a client’s requirements, benchmarks from the
industry or the literature, or results obtained with a previous version of the system. In all cases, it is up to the author to justify why that specific reference point was selected; it is not enough to simply browse the literature for results that are worse than those obtained!

As with the theoretical framework part, the experimental results part can be composed of multiple chapters, if there are multiple independent systems tested. However, all tests of a single system should be sections of a single chapter. And these chapters all begin with an introduction where we give an overview of the tests conducted and link them to the related theoretical chapter, and end with a conclusion where we briefly summarize the results obtained and the discussion conducted, and lead to the next chapter of the text.

4.7 Conclusion Chapter

The last chapter of the text is the conclusion. Like the introduction chapter, it has a more rigid structure and a specific goal to accomplish. The purpose of the conclusion is to tell the reader what has been done, and where we can go from here.

The conclusion normally begins with a section that summarizes highlights and notable accomplishments from every chapter in the report or thesis. This serves as a quick reminder to all that has been presented previously. No new information should be introduced in this section.

The next section is perhaps the most important one of the conclusion. It is the contributions section. This is the section where the central accomplishments of the work are presented. These accomplishments could be the scientific contributions of a thesis, the innovative aspects of a project, the central conclusions of a study, or even the recommendations that stem from a technical report. The authors can refer to the objectives section in the introduction to show, point by point, how they have successfully accomplished the work they set out to do. It is also an opportunity for the authors to draw general conclusions from the entire thesis or to offer final reflections on the work done.

The last section of the conclusion is the suggested future work. In this section, the authors try to foresee what will be the next step of the research stemming from their work. This could
include for example new applications of the system developed, the study of other ideas or problems that arose from or were hinted at in the research but were outside the scope of the project, or the application of the methodology to another problem or field of study. The future work section is important to demonstrate that the study was not a dead-end. Scientific research is an incremental process, with each individual project building on the previous ones and, in turn, being built on by the subsequent ones. The future work section thus positions the work inside a greater scientific context, much like the background review did.

One thing the conclusion section should not be is a dry retelling of the topic of each chapter. The aim of this section is to give a summary of your work and accomplishments, not of the table of contents of the document.

4.8 Conclusion

This section presented guidelines, both for the division of the text into chapters, and for the division of material inside each chapter. The introduction and conclusion chapters were more rigidly defined, and to further illustrate them the introduction and conclusion of this Manual of Style use the same structure. Meanwhile, the background, theoretical and experimental chapters were left deliberately vague, to allow each author to customize them to fit their own material.

The dozen or so pages that precede the text were covered in Section 3, and with this section we’ve completed the text itself. All that remains is the few pages that come after the text has concluded. These are the topic of the next chapter.
Chapter 5.
After the Text

5.1 Introduction

Once a technical report or thesis is written, only a handful of sections remain before it is complete. These sections do not introduce new material, but rather present long and tedious detailed information that does not fit in the main text.

5.2 Appendices

Appendices are used to present material that does not fit in the text. This material could be a long listing of technical information taking multiple pages, such as the contents of a log file, a long list of system parameters, or the complete code of an important algorithm. In some cases, it could even be material found in a background source which is crucial to the current work, and which is appended to the thesis or report for ease of reference for the reader.

Appendices are written in the same style as the rest of the text. The title of an appendix section is written in level 1 title like the section titles, but instead of having a section number they have a letter, starting at A.

5.3 References

The references section contains simply the list of all the works cited in the technical report or thesis. Authors have to cite a reference for any information that was obtained from another source. Using information taken from another source without referencing it is plagiarism.

References are only scientific sources, such as peer-reviewed journal papers, conference papers, textbooks, and technical reports. Non-scientific sources are never references, and should be included as footnotes in the text. Non-scientific sources include websites, dictionaries and encyclopaedias, and newspaper articles. There are however justifiable exceptions to this rule: for example, a project that manipulates web data will naturally need to cite the websites or online messages it uses as references.
Proper referencing is absolutely critical: quoting another author without a clear and explicit attribution is tantamount to plagiarism. Proper citation can be done in three ways. Firstly, one can restate the other author in one’s own words, and only include a reference note to the original work. Secondly, one can “repeat verbatim one line of an author, in brackets”, again including a reference note before or after this quote. Finally:

*An entire section of text can be repeated verbatim from the original author. This section will be included in italics in a separate paragraph, with different left and right margins, to make it visibly clear that this is cited text from another source, not one’s own work. As with the other two cases, a clear reference note must be included before or after the cited text.*

In a short document (approximately a dozen pages or less, such as a conference paper), the references are usually numbered in square brackets [2] when they appear in the text. The number refers to the relevant entry in the reference section. If there are multiple works cited, they are all listed in the brackets [1,4,5,6]. The reference section itself is organized by order of appearance in the text (that is, reference [5] is the fifth one cited in the document) and each reference is numbered. The section is written in a slightly smaller font than the text, and is left-aligned. Moreover, for references that are more than one line long, subsequent lines have to be indented to line up with the first word of the first line, past the reference number.

In a longer document such as a thesis, the references are cited by author last name and publication year in brackets (Alpha, 2015). The brackets can contain one or two author names; if the publication has more than two authors, only the first one is named and the others are mentioned by the Latin phrase *et al.*, short for *et alli* meaning “and others” (note that *al.* is an abbreviation, hence it takes a period) (Alpha & Beta, 2015). If several papers have the same authors and year, they are differentiated by adding a letter after the year (Alpha *et al.*, 2015a), (Alpha *et al.*, 2015b). In this case, the reference list is organized in alphabetical order of first author’s last name, not in order of appearance in the text. Once again, the section is written in a slightly smaller font than the text, and is left-aligned. The
first line of the reference is indented, while all subsequent lines (for references that are more than one line long) are not.

Different types of works are cited in different ways; the reference section at the end of this Manual of Style illustrates how to reference common types of documents.

The references section is the absolute last part of the thesis or technical report, since any other part of the text can list some references. For a short list of references, such as the one for a paper or a technical report, the section is called “references”. For a longer list of references, such as the one in a thesis or book, it is called a “bibliography”.

5.4 Conclusion

In this section we briefly discussed the last two types of sections that come at the end of a technical report or thesis. The first set of sections is the appendices, which allows authors to attach long sets of technical information to their work, for completeness and ease of future reference. Finally, the very last section of any technical work is the references, which lists the scientific sources on which the work is based.
Chapter 6.
Conclusion

6.1 Summary of the Manual

This Manual of Style was written for students at the Department of Software Engineering, to give them stylistic guidelines on technical writing. It covers both text style and section contents.

To begin, we presented stylistic guidelines for the content of the document in Section 2. These guidelines covered the text, graphics, tables, and other textual elements such as lists and footnotes. Following these guidelines will yield a clean, professional-looking document. As an illustrative example, this Manual of Style was written using the style advocated in Section 2.

After this presentation on the basics of text styles, the discussion moved to a higher-level perspective, and focused on the organisation of the thesis or technical report. To structure the presentation, we drew a distinction between the sections that come before the document’s text, the text itself, and the sections that come afterwards, and covered each of these parts in Section 3, Section 4 and Section 5, respectively.

In Section 3, we described the contents and style of the document starting from the cover page until the beginning of the introduction. While there are only a dozen pages in that part of the document, they are crucial to give the reader a complete and clear overview of the content and scope of the report. Again, to illustrate, this Manual of Style was organized using the recommended style. Section 4 picked up where Section 3 left off, at the beginning of the introduction, and described the structure and scope of each section in a standard technical report. While the introduction and conclusion sections are fairly strictly defined, the other sections are flexible and can be adapted to the needs of the specific report being written. This Manual of Style, for example, uses the standard introduction and conclusion structure we advised, but does not have a background survey, theoretical development, nor experimental results, as none of these sections would make sense here. Finally, Section 5 described the
contents of the last few sections that come after the end of the document, namely the appendices and the references. Once again, as a means of illustration, an appendix and reference section are included at the end of this Manual of Style.

6.2 Contributions

This Manual of Style makes three contributions to the teaching of technical writing. First and foremost, it introduces a set of consistent stylistic guidelines that can be used to prepare a professional-looking document. Second, it describes a proper division of sections and subsections, and gives an overview of the content that should be covered in each section. And finally, it serves as a visual example of the guidelines, thanks to the fact we wrote it following those very directives. These contributions are in line with the objectives we had set for our work in Section 1.3.

6.3 Future Work

Of course, writing a technical report or thesis is normally the last step of a project, after all the research, development, implementation, and testing has been done. However, it remains an important step. Effectively transmitting our results to our peers is as important as obtaining them.

Having a good and consistent style in the text is important, but so is proper writing. Always pay attention to spelling – nothing makes a report look less professional than typos and spelling errors. As importantly, be careful and consistent in the use of capitalization and punctuation. Many a report suffered from irregularly-capitalized titles, commas instead of periods at the end of sentences, or opened parenthesis that never closed.

Using a clear and simple, and most importantly correct, sentence syntax is very important in order to make the report or thesis easy to read and understand. Active sentences are usually easier to understand than passive sentences. As a rule, prefer shorter sentences that clearly convey a single point, and avoid long rambling sentences that go on for several lines. And never be afraid of handing in your work for review by a professional English editor. A
well-written report prepared with some help reflects much better on the author than a poorly-written report prepared alone. The Learning Assistance Center at Lakehead University offers five hours of free English tutoring to every student; make use of them!
# Appendix A

## Periodic Table of Elements

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<th>Element</th>
<th>Atomic Number</th>
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* Lanthanide series

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** Actinide series

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* *Lanthanide series*

** Actinide series
References


