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Writing a Structurally Coherent Report

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1. Introduction

When a reader begins reading a document, he or she does not know what to expect. A well written introduction can entice the reader to continue, but a reader does not, in general, desire the format of a murder mystery. To help the reader, documents and reports will have tables of contents; lists of figures, tables and equations; and indices; however, the body of the document must assist in guiding and presenting the reader with the structure and flow of the document.

The structure of a document and any sub-component of a document will always be similar: an introduction, body, and possibly a conclusion. The introduction not only introduces the purpose of the component, but also explains to the reader an overview of the flow of the body of the component. The body then conveys the information that is necessary to support the purpose of the component. Finally, the conclusion reiterates the purpose and summarizes the supporting information that was presented. The body of any paragraph, essay, section or document will always be made up of a list of supporting information. It is necessary to make clear to the reader this structure so as to assist the reader in navigating the document. Specifically, we will look at how we can use

1. lists of phrases or sentences within a paragraph structure,
2. lists of paragraphs in essays or sections, and
3. numbered sections and sub-sections within documents.

Additionally, it is possible in many cases to more clearly summarize such lists in a tabular format in any subsequent concluding remarks. The balance of this document will look at how each of the preceding four concepts can be put into practical use when authoring documents.

2. Paragraph Structure: Lists of Phrases or Sentences

The first sentence or two of a paragraph should convey to the reader the purpose of a paragraph. When any list of supporting information is presented in a paragraph, it may take one of two forms: a list of comma-separated phrases or sentences. We will look at how such lists can be separated from the surrounding paragraph text, how to deal with lists within lists, consider a question of balance, the use of ordinal numbers, and conclude with observations that will be relevant to the balance of this document.

2.1. Separating Lists from Surrounding Text

When a list of supporting information should, in the view of the author, be of significant interest to the reader, it is reasonable to separate the list from the paragraph. For example, to separate a list of three comma-separated phrases,

1. the information appears in the same order,
2. removing the numbers should convert the itemized list back into a comma-separated list, and
3. if appropriate, the last item should be ended with a full stop.

When the phrases themselves contain commas, the phrases can be separated using semicolons; for example,

1. lorem ipsum dolor sit amet, consectetur adipiscing elit;
2. nullam quis diam at enim eleifend fermentum a ac dui;
3. sed consequat tempor est, ac luctus arcu lobortis vel; et
4. integer tincidunt neque eu enim viverra laoreet [1].

To separate a sequence of supporting sentences from a paragraph, the structure will be similar:

1. As before, the sentences appear in the same order.
2. Again, removing the numbers should convert the itemized list back into a correctly structured paragraph.
3. In this case, each item should end in a full stop.

In either case, the supporting information is separated from the paragraph structure for easier identification and reference by the reader.

2.2. Lists within Lists

With lists of more complex supporting information, it is possible that the list contains further lists. For example,

1. **S**ed tempor ligula ut dui dignissim rutrum**;**
2. **M**orbi ornare ante et erat ullamcorper ornare proin**,** commodo**, et** etiam viverra facilisis**; et**
3. **P**roin et ligula eget lectus molestie molestie ac nec erat**.**

In these cases, if it is helpful or necessary to separate out the list within the list, one may use a format as is demonstrated by,

1. **S**ed tempor ligula ut dui dignissim rutrum**.**
2. **M**orbi ornare ante et erat ullamcorper ornare
   a. proin blandit**,**
   b. rutrum commodo**, et**
   c. etiam viverra facilisis**.**
3. **P**roin et ligula eget lectus molestie molestie ac nec erat**.**

Alternatively, one may try something like

1. **s**ed tempor ligula ut dui dignissim rutrum**;**
2. **m**orbi ornare ante et erat ullamcorper ornare
   a. proin blandit**,**
   b. rutrum commodo**, et**
   c. etiam viverra facilisis**; et**
3. **p**roin et ligula eget lectus molestie molestie ac nec erat**.**

This second example has more connectivity and flow between the items as compared to a list of sentences. One significant benefit of separating such lists within lists is that there is no ambiguity: one may be able to use grammatically correct structures to ensure that the list of items parse correctly, but this can still often confuse the reader. While further indentation is possible (producing lists within lists within lists), you may, however, wish to ask yourself what is it you are actually attempting to convey to the reader.

2.3. The Relative Weight of Items

One observation that may have been observed concerning the previous examples is that each of the points in the lists has approximately the same *weight*. In general, if the items of supporting information are such that a minority are either significantly shorter or longer than the others, you must be able to justify this. Recall that in attempting to impress a list of supporting information on the mind of a reader, if one is significantly longer, either the reader will miss the point of that one item and focus on the balance, or the

reader will place more significant focus on that particular item and not see the relevance of the rest. Thus, a structure such as the following is undesirable:

... The evidence for supporting this particular decision includes:

1. Morbi ac ligula diam, quis blandit odio. Phasellus adipiscing aliquam mauris, et gravida lacus iaculis id. Praesent ac ante sed elit adipiscing tincidunt vitae sit amet magna. Mauris tempus suscipit nisl, sit amet gravida nisi vehicula vel. Etiam malesuada dui id sapien condimentum bibendum. Quisque non nibh ullamcorper justo faucibus interdum.
2. Sed pharetra lectus vel dui accumsan eget tristique sapien tristique.
3. Proin eget eros massa, quis imperdiet lorem.
4. Nullam hendrerit lectus lobortis leo luctus malesuada.
5. Maecenas commodo ipsum eget ligula congue consectetur.

Consequently, it is recommended that ...

Two possible reasons for this are:

1. There is supplementary—but not critical—information in the first item, in which case we have one of two choices; there is either
   a. background information that should have been presented earlier (in a section on background), or
   b. supporting information that could be relegated to an appendix.
2. Alternatively, the first idea is the critical support and the others are supplementary.

In the second case, the paragraph should be rewritten as follows:

... The primary evidence for supporting this particular decision is that morbi ac ligula diam, quis blandit odio. Phasellus adipiscing aliquam mauris, et gravida lacus iaculis id. Praesent ac ante sed elit adipiscing tincidunt vitae sit amet magna. Mauris tempus suscipit nisl, sit amet gravida nisi vehicula vel. Etiam malesuada dui id sapien condimentum bibendum. Quisque non nibh ullamcorper justo faucibus interdum. **In addition to this, four other items of support include:**

1. Sed pharetra lectus vel dui accumsan eget tristique sapien tristique,
2. Proin eget eros massa, quis imperdiet lorem,
3. Nullam hendrerit lectus lobortis leo luctus malesuada, and
4. Maecenas commodo ipsum eget ligula congue consectetur.

Consequently, it is recommended that ...

This emphasizes the difference in weight in the mind of the reader. Similarly, a minor point could be covered within the paragraph as, perhaps, an afterthought.

2.4. The Use of Ordinal Numbers

In presenting a list, authors often attempt to include ordinal numbering: first, second, ..., n^{th} or finally. As soon as a list is separated from the surrounding paragraph structure, as demonstrated above, ordinal numbering is no longer required—it does not convey any further information to the reader. Even if a list of supporting sentences should, instead, be introduced by indicating the number of supporting points. In this case, the last sentence in the list could be prefixed by "Finally, ..." The use of ordinal numbers, however, would only be useful if each item in the list of supporting sentences a collection of sentences. Thus, this example shows an inappropriate use of ordinal numbering:

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec pellentesque enim in nunc consequat fermentum. Praesent risus dui, iaculis eu ultrices eget, ultrices nec ligula. Morbi ultricies, ipsum venenatis cursus feugiat, magna magna imperdiet est, et tristique ante lacus ut felis. Sed vel risus sem. **Three possible mechanisms can be used: First, the Rudolph system** aliquam sagittis nunc ac nulla dignissim sit amet blandit libero euismod. **Second, the Donner device** nullam lobortis scelerisque quam, vel suscipit felis convallis ut. **Third, the Blitzen instrument** curabitur erat sem, malesuada sed tristique nec, accumsan ac ante. **Of these three,** in hac habitasse platea dictumst. Vestibulum lobortis purus et enim lacinia a varius est hendrerit.

Instead, the following is equally clear:

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec pellentesque enim in nunc consequat fermentum. Praesent risus dui, iaculis eu ultrices eget, ultrices nec ligula. Morbi ultricies, ipsum venenatis cursus feugiat, magna magna imperdiet est, et tristique ante lacus ut felis. Sed vel risus sem. **Three possible mechanisms can be used: The Rudolph system** aliquam sagittis nunc ac nulla dignissim sit amet blandit libero euismod. **The Donner device** nullam lobortis scelerisque quam, vel suscipit felis convallis ut. **Finally, the Blitzen instrument** curabitur erat sem, malesuada sed tristique nec, accumsan ac ante. **Of these three,** in hac habitasse platea dictumst. Vestibulum lobortis purus et enim lacinia a varius est hendrerit.

Only if each of the supporting items has numerous sentences is it useful to use ordinal numbers to separate them:

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec pellentesque enim in nunc consequat fermentum. Praesent risus dui, iaculis eu ultrices eget, ultrices nec ligula. Morbi ultricies, ipsum venenatis cursus feugiat, magna magna imperdiet est, et tristique ante lacus ut felis. Sed vel risus sem. **Three possible mechanisms can be used: First, the Rudolph system** aliquam sagittis nunc ac nulla dignissim sit amet blandit libero euismod. Fusce pellentesque enim id massa consequat consectetur. **Second, the Donner device** nullam lobortis scelerisque quam, vel suscipit felis convallis ut. Morbi at turpis sed ante pulvinar iaculis sit amet vitae tortor. Nunc venenatis nibh sed odio volutpat accumsan. **Third, the Blitzen instrument** curabitur erat sem, malesuada sed tristique nec, accumsan ac ante. Cras imperdiet ultrices magna, non elementum magna volutpat nec. **Of these three,** in hac habitasse platea dictumst. Vestibulum lobortis purus et enim lacinia a varius est hendrerit.

This more complex case could, however, be more clearly presented by separating the list from the paragraph structure:

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec pellentesque enim in nunc consequat fermentum. Praesent risus dui, iaculis eu ultrices eget, ultrices nec ligula. Morbi ultricies, ipsum venenatis cursus feugiat, magna magna imperdiet est, et tristique ante lacus ut felis. Sed vel risus sem. **Three possible mechanisms can be used:**

1. **The Rudolph system** aliquam sagittis nunc ac nulla dignissim sit amet blandit libero euismod. Fusce pellentesque enim id massa consequat consectetur.
2. **The Donner device** nullam lobortis scelerisque quam, vel suscipit felis convallis ut. Morbi at turpis sed ante pulvinar iaculis sit amet vitae tortor. Nunc venenatis nibh sed odio volutpat accumsan.

3. **The Blitzen instrument** curabitur erat sem, malesuada sed tristique nec, accumsan ac ante. Cras imperdiet ultrices magna, non elementum magna volutpat nec.

Of these three, in hac habitasse platea dictumst. Vestibulum lobortis purus et enim lacinia a varius est hendrerit.

Thus, ordinal numbering if listed items is often not as useful as one may suspect—if it does not help separate the items within the paragraph, it provides additional and unnecessary information; consequently, doing a disservice to the reader.

2.5. Page Breaks

When a list is separated from a paragraph, a few rules must apply to the location of page breaks:

1. They cannot occur between the paragraph introducing a list and the first item in the list.
2. They cannot leave the last item at the top of a page.
3. An item should not be split unless at least two lines appear on both pages.

Consequently, a line break should not appear anywhere between the two lines indicated in this example:

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec pellentesque enim in nunc consequat fermentum. Praesent risus dui, iaculis eu ultrices eget, ultrices nec ligula. Morbi ultricies, ipsum venenatis cursus feugiat, magna magna imperdiet est, et tristique ante lacus ut felis. Sed vel risus sem. **Three possible mechanisms can be used:**

1. **The Rudolph system** aliquam sagittis nunc ac nulla dignissim sit amet blandit libero euismod. Fusce pellentesque enim id massa consequat consectetur.
2. The Donner device nullam lobortis scelerisque quam, vel suscipit felis convallis ut. Morbi at turpis sed ante pulvinar iaculis sit amet vitae tortor. Nunc venenatis nibh sed odio volutpat accumsan.
3. The Blitzen instrument curabitur erat sem, malesuada sed tristique nec, accumsan ac ante. Cras imperdiet ultrices magna, non elementum magna volutpat nec.

Of these three, in hac habitasse platea dictumst. Vestibulum lobortis purus et enim lacinia a varius est hendrerit.

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec pellentesque enim in nunc consequat fermentum. Praesent risus dui, iaculis eu ultrices eget, ultrices nec ligula. Morbi ultricies, ipsum venenatis cursus feugiat, magna magna imperdiet est, et tristique ante lacus ut felis. Sed vel risus sem. **Three possible mechanisms can be used:**

1. **The Rudolph system** aliquam sagittis nunc ac nulla dignissim sit amet blandit libero euismod. Fusce pellentesque enim id massa consequat consectetur.
2. The Donner device nullam lobortis scelerisque quam, vel suscipit felis convallis ut. Morbi at turpis sed ante pulvinar iaculis sit amet vitae tortor. Nunc venenatis nibh sed odio volutpat accumsan.
3. The Blitzen instrument curabitur erat sem, malesuada sed tristique nec, accumsan ac ante. Cras imperdiet ultrices magna, non elementum magna volutpat nec.

Of these three, in hac habitasse platea dictumst. Vestibulum lobortis purus et enim lacinia a varius est hendrerit.

If the first item consisted of four lines, a page break could appear between them; however, it is always most important to consider readability.

2.6. Summary

You will note that, in all examples shown above, the lists are always preceded by information that describes the purpose of the list and they are followed by concluding ideas—no paragraph ends in the last item of a list. The ideas presented above demonstrate will, in the subsequent sections, be used to show how one can organize the structure of essays and section within documents.

3. Essay or Section Structure: Lists of Paragraphs

In an essay or a section within a document that requires more supporting information than can be presented in a single list of phrases or sentences, the next approach would be to have a sequence of supporting paragraphs. An essay is, as you have learned in school, an introductory paragraph, a body of

supporting paragraphs, and a concluding paragraph. We will look at introducing a list of paragraphs, the possible need for numbering, and a description of an all-too-common error.

3.1. Introducing a List of Paragraphs

In general, an essay or a section within a document attempts to convey more support for an idea than can be presented in a simple list; for example, each item may require its own background or justification.

> Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec pellentesque enim in nunc consequat fermentum. Praesent risus dui, iaculis eu ultrices eget, ultrices nec ligula. Morbi ultricies, ipsum venenatis cursus feugiat, magna magna imperdiet est, et tristique ante lacus ut felis. Sed vel risus sem. **Three possible mechanisms can be used:**
>
> 1. **The Rudolph system,**
> 2. **The Donner device, and**
> 3. **The Blitzen instrument.**
>
> **These will be discussed in the following three paragraphs.**
>
> **The Rudolph system** aliquam sagittis nunc ac nulla dignissim sit amet blandit libero euismod. Nullam lobortis scelerisque quam, vel suscipit felis convallis ut. Curabitur erat sem, malesuada sed tristique nec, accumsan ac ante. In hac habitasse platea dictumst. Vestibulum lobortis purus et enim lacinia a varius est hendrerit.
>
> **The Donner device** ut quis dui eget urna congue aliquam. Maecenas vel tortor nec nunc aliquet laoreet ac quis nulla. Quisque cursus rutrum nunc in auctor. Fusce in velit quis lorem feugiat tincidunt. Mauris adipiscing ultricies imperdiet. Maecenas tempor molestie orci, vitae dapibus turpis ultricies et. Mauris euismod ultrices lacus, fermentum consequat est lobortis id. Mauris dapibus vestibulum auctor.
>
> **The Blizen instrument** sed sed urna in nisi pretium scelerisque. Fusce euismod fermentum dignissim. Curabitur fringilla ante ac nisi pharetra gravida. Ut sem nisi, fringilla quis tempus eget, euismod sit amet velit. Maecenas volutpat, felis id varius dignissim, eros eros gravida est, eget posuere nibh metus quis sapien. Donec laoreet sagittis arcu, eget tristique massa porta sit amet.
>
> **Consequently,** pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Proin quis purus et orci viverra tincidunt.

The introduction clearly specifies the topics to be covered and a reader who is only skimming the report will see those items separated from the text; consequently, they will stand out in the mind of the reader. If it is not that critical for the reader to identify the list being discussed, the first paragraph in the previous example could be replaced with:

It is much more preferable that the introductory paragraph appears as follows:

> Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec pellentesque enim in nunc consequat fermentum. Praesent risus dui, iaculis eu ultrices eget, ultrices nec ligula. Morbi ultricies, ipsum venenatis cursus feugiat, magna magna imperdiet est, et tristique ante lacus ut felis. Sed vel risus sem. **Three possible mechanisms can be used: the Rudolph system, the Donner device and the Blizen instrument. These are discussed in the following three paragraphs.**

3.2. Numbering Paragraphs

The paragraphs of an essay need never be numbered, but in a technical report, the author may anticipate that he or she or another may need to reference an individual paragraph or section within a document. In this case, the section itself will contain a number and a title and the paragraphs will be given numbering subordinate to the section numbering together with appropriate titles.

5.2 Aliquam Non mi Ligula

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec pellentesque enim in nunc consequat fermentum. Praesent risus dui, iaculis eu ultrices eget, ultrices nec ligula. Morbi ultricies, ipsum venenatis cursus feugiat, magna magna imperdiet est, et tristique ante lacus ut felis. Sed vel risus sem. Three possible mechanisms can be used:

1. The Rudolph system,
2. The Donner device, and
3. The Blitzen instrument.

These will be discussed in the following three **sections**.

5.2.1 The Rudolph System

The Rudolph system aliquam sagittis nunc ac nulla dignissim sit amet blandit libero euismod. Nullam lobortis scelerisque quam, vel suscipit felis convallis ut. Curabitur erat sem, malesuada sed tristique nec, accumsan ac ante. In hac habitasse platea dictumst. Vestibulum lobortis purus et enim lacinia a varius est hendrerit.

5.2.2 The Donner Device

The Donner device ut quis dui eget urna congue aliquam. Maecenas vel tortor nec nunc aliquet laoreet ac quis nulla. Quisque cursus rutrum nunc in auctor. Fusce in velit quis lorem feugiat tincidunt. Mauris adipiscing ultricies imperdiet. Maecenas tempor molestie orci, vitae dapibus turpis ultricies et. Mauris euismod ultrices lacus, fermentum consequat est lobortis id. Mauris dapibus vestibulum auctor.

5.2.3 The Blitzen Instrument

The Blizen instrument sed sed urna in nisi pretium scelerisque. Fusce euismod fermentum dignissim. Curabitur fringilla ante ac nisi pharetra gravida. Ut sem nisi, fringilla quis tempus eget, euismod sit amet velit. Maecenas volutpat, felis id varius dignissim, eros eros gravida est, eget posuere nibh metus quis sapien. Donec laoreet sagittis arcu, eget tristique massa porta sit amet.

5.2.4 Summary

Consequently, pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Proin quis purus et orci viverra tincidunt.

The numbering of sections requires significantly more instruction than is provided here; however, this will be covered in Section 4 of this report.

3.3. A Common Error

One common error is to have an introductory paragraph indicate that there is a list of supporting information where each item requires a full paragraph, but to then blend the first item with the introductory paragraph. An additional *faux pas* is to blend the conclusion with the final paragraph. A reader attempting to navigate such a document would quickly become frustrated. For example, one might have the structure shown here:

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec pellentesque enim in nunc consequat fermentum. Praesent risus dui, iaculis eu ultrices eget, ultrices nec ligula. Morbi ultricies, ipsum venenatis cursus feugiat, magna magna imperdiet est, et tristique ante lacus ut felis. Sed vel risus sem. **Three possible mechanisms can be used: The Rudolph system** aliquam sagittis nunc ac nulla dignissim sit amet blandit libero euismod. Nullam lobortis

scelerisque quam, vel suscipit felis convallis ut. Curabitur erat sem, malesuada sed tristique nec, accumsan ac ante. In hac habitasse platea dictumst. Vestibulum lobortis purus et enim lacinia a varius est hendrerit.

The Donner device ut quis dui eget urna congue aliquam. Maecenas vel tortor nec nunc aliquet laoreet ac quis nulla. Quisque cursus rutrum nunc in auctor. Fusce in velit quis lorem feugiat tincidunt. Mauris adipiscing ultricies imperdiet. Maecenas tempor molestie orci, vitae dapibus turpis ultricies et. Mauris euismod ultrices lacus, fermentum consequat est lobortis id. Mauris dapibus vestibulum auctor.

The Blizen instrument sed sed urna in nisi pretium scelerisque. Fusce euismod fermentum dignissim. Curabitur fringilla ante ac nisi pharetra gravida. Ut sem nisi, fringilla quis tempus eget, euismod sit amet velit. Maecenas volutpat, felis id varius dignissim, eros eros gravida est, eget posuere nibh metus quis sapien. Donec laoreet sagittis arcu, eget tristique massa porta sit amet. **Consequently,** pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Proin quis purus et orci viverra tincidunt.

Blending the introduction or the concluding remarks with the list of paragraphs will result in confusion on the part of the reader. In addition, if the reader needs to refer back to the report, it will be difficult to find the relevant information.

3.4. Summary

Therefore, it is always necessary to introduce the order of paragraphs that support an essay or section topic and it is equally necessary to differentiate the introduction and concluding remarks from the listed paragraphs. If a section will either be referenced or requires more than depth than can be supported by a simple sequence of paragraphs—for example, if a supporting item itself requires a number of paragraphs—the only clear path forward is to used numbered sections.

4. Document Structure: Numbered Sections or Sub-sections

There are three common justifications for using numbered divisions within a document or report:

1. It is the standard for such reports, such as engineering technical or analysis reports.
2. The size of the document has extended beyond what could reasonably covered by an introductory paragraph, a reasonable number of supporting paragraphs in the body, and a concluding paragraph.
3. The reader will need to refer to specific sections or sub-sections within the document.

The complete document itself will be divided into a number of sections. We will look at the ordering of the top-level sections, subsectioning a section, a common mistake of undergraduate students, section numbering and section titles, and finally Microsoft Word tools for facilitating such practices in a document.

4.1. Sections

A document that is broken into sections will have a familiar format—especially when the document is written for a specific and standard purpose such as an engineering analysis report. The first section will be always be an introduction and if a background section is necessary, it may be incorporated into the introduction or it may form the second section in the document. Alternatively, background information that is not pertinent to the report but useful may be relegated to an index. Subsequent sections will be given appropriate titles.

1. Introduction
2. Background
   $\vdots$
n. Summary, Conclusions, or Recommendations

The last sub-section will usually contain a summary and possibly conclusions and recommendations; the exception to this rule being if the document is either a reference manual or a text book—that is, a document that is conveying known information that does not need summarizing.

4.2. Subsectioning Sections

A section can either be

1. a paragraph,
2. a sequence of paragraphs, or
3. an introductory paragraph or paragraphs followed by subsections.

The only purpose of sectioning off a paragraph there may be a need to reference that paragraph directly by an identifying number. Alternatively, a section may be divided into a sequence of paragraphs: the first will be an introduction to the section specifying its purpose. It will also introduce the order of the subsequent paragraphs in that section. The final paragraph in any such section will be concluding remarks that summarize the information covered in the section. Finally, if it is necessary to divide a section into subsections, the first paragraph or two immediately following the section title constitute the introduction to the section. Like before, it conveys the purpose of the section, but it also describes the order and purpose of the subsequent subsections. It may be quite reasonable to explicitly list the

subsections if such information will help the reader understand the flow of the document. The last subsection is always a summary of the section.

As an example, suppose that an external party may wish to refer specifically to a subsection describing the analysis of the Blitzen instrument. In the following example, one could then refer to Section 3.3. directly.

3. Analysis

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec pellentesque enim in nunc consequat fermentum. Praesent risus dui, iaculis eu ultrices eget, ultrices nec ligula. Morbi ultricies, ipsum venenatis cursus feugiat, magna magna imperdiet est, et tristique ante lacus ut felis. Sed vel risus sem. **Using the criteria specified in Section 2, the next three sections will analyze the Rudolph system, the Donner device and the Blizen instrument, respectively.**

3.1. The Rudolph System

Aliquam sagittis nunc ac nulla dignissim sit amet blandit libero euismod. Nullam lobortis scelerisque quam, vel suscipit felis convallis ut. Curabitur erat sem, malesuada sed tristique nec, accumsan ac ante. In hac habitasse platea dictumst. Vestibulum lobortis purus et enim lacinia a varius est hendrerit. Proin quis purus et orci viverra tincidunt.

3.2. The Donner Device

Ut quis dui eget urna congue aliquam. Maecenas vel tortor nec nunc aliquet laoreet ac quis nulla. Quisque cursus rutrum nunc in auctor. Fusce in velit quis lorem feugiat tincidunt. Mauris adipiscing ultricies imperdiet. Maecenas tempor molestie orci, vitae dapibus turpis ultricies et. Mauris euismod ultrices lacus, fermentum consequat est lobortis id. Mauris dapibus vestibulum auctor.

3.3. The Blitzen Instrument

Sed sed urna in nisi pretium scelerisque. Fusce euismod fermentum dignissim. Curabitur fringilla ante ac nisi pharetra gravida. Ut sem nisi, fringilla quis tempus eget, euismod sit amet velit. Maecenas volutpat, felis id varius dignissim, eros eros gravida est, eget posuere nibh metus quis sapien. Donec laoreet sagittis arcu, eget tristique massa porta sit amet.

3.4. Summary

Of these three possible mechanisms, pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Proin quis purus et orci viverra tincidunt.

While this example has only one paragraph associated with each subsection, if each of Sections 3.1, 3.2 and 3.3 have multiple paragraphs, the first would introduce the analysis of the specified device, the analysis would then be described in the intermediate paragraphs and this would be followed by a summary and any concluding remarks. In the case where each of the devices is following the same analysis pattern, it may be useful to introduce standardized subsectioning of each of the three interior sections. For example, Sections 3.1.1, 3.2.1 and 3.3.1 could all be named Design Setup; Sections 3.1.2, 3.2.2 and 3.3.2 might have the title Methodology; *etc*. Such regularity would be very useful for familiarizing any reader with the material being covered. The reader is, of course, welcome to examine the format of this report as an example.

Therefore, a reasonably subsectioned section will begin with an introduction and the final subsection will be concluding remarks. Such regularity will assist readers in observing and following the flow of a document.

4.3. A Common Error

A common mistake is to jump into subsections as if the purpose is clear from the title or to leave out a summary and conclusions. For example, the following represents what many undergraduates might include in an engineering analysis report:

3. Analysis

3.1. The Rudolph System

Aliquam sagittis nunc ac nulla dignissim sit amet blandit libero euismod. Nullam lobortis scelerisque quam, vel suscipit felis convallis ut. Curabitur erat sem, malesuada sed tristique nec, accumsan ac ante. In hac habitasse platea dictumst. Vestibulum lobortis purus et enim lacinia a varius est hendrerit. Proin quis purus et orci viverra tincidunt.

3.2. The Donner Device

Ut quis dui eget urna congue aliquam. Maecenas vel tortor nec nunc aliquet laoreet ac quis nulla. Quisque cursus rutrum nunc in auctor. Fusce in velit quis lorem feugiat tincidunt. Mauris adipiscing ultricies imperdiet. Maecenas tempor molestie orci, vitae dapibus turpis ultricies et. Mauris euismod ultrices lacus, fermentum consequat est lobortis id. Mauris dapibus vestibulum auctor.

3.3. The Blitzen Instrument

Sed sed urna in nisi pretium scelerisque. Fusce euismod fermentum dignissim. Curabitur fringilla ante ac nisi pharetra gravida. Ut sem nisi, fringilla quis tempus eget, euismod sit amet velit. Maecenas volutpat, felis id varius dignissim, eros eros gravida est, eget posuere nibh metus quis sapien. Donec laoreet sagittis arcu, eget tristique massa porta sit amet.

Each section requires an introductory paragraph or paragraphs, which immediately follow the section title, and each section requires concluding remarks in a final subsection.

4.4. Numbering

If a section of a report is further subdivided into numbered sub-sections, the paragraphs that follow the section title are the introductory paragraphs of that section. As before, these introductory paragraphs should include the purpose of the section, provide appropriate background if it is necessary and brief, and outline the structure of the following subsections. It is not necessary to explicitly state "Section 5.3.1 will discuss x, Section 5.3.2 will discuss y and Section 5.3.3 will discuss z. A conclusion will be stated in Section 5.3.4." When referencing a sentence in the middle of a paragraph, it is customary to drop the trailing period. It is useful to note that while a section may contain subsections, they are always identified as Section 3, Section 3.2, Section 3.2.5, *etc*. and references are not made to, for example, Subsection 3.2.5 (or worse, Subsubsection 3.2.5 of Subsection 3.2 of Section 3).

4.5. Capitalization of Titles

The titles of sections should be capitalized appropriately and consistently. Some rules that should be followed are that

1. words such as keywords in a programming language or proper names containing irregular capitalization (*e.g*., iTunes) should not be capitalized just because they appear in a title;
2. otherwise, the first and last words are always capitalized;
3. other short prepositions ('of', 'on', *etc*.), articles ('a', 'an', 'the'), coordinating conjunctions ('and', 'or', 'nor', 'for', 'but', 'yet' and 'so') and the 'to' in an infinitive are always in lower case; and
4. all other words are capitalized.

Some examples of appropriate capitalization for titles include:

1. Contrasting the Precision of `double` and `float`[1]
2. The Effect of iTunes on the Recording Industry
3. How to Write an Engineering Report

An inconsistent convention for capitalization will be noted by readers and appear unprofessional.

4.6. Microsoft Word Tools

In Microsoft Word, it is necessary to use a Home→Paragraph→Multilevel List in order to track the numbering of sections. Additionally, use Home→Styles→Heading 1, 2, 3, *etc.* for the various levels of subsectioning. To ensure that the numbering continues from one heading to the next, this author will often cut-and-paste a heading rather than attempt to select and merge the previous heading list. Additionally, placing the cursor immediately to the right of the section number allows you to increase or decrease the multilevel listing by using Tab and Shift-Tab, respectively. Using headings allows Microsoft Word to automatically generate a table of contents.

4.7. Summary

We have seen that a section in a document may just be a paragraph (if it is, for example, a brief background or a summary and conclusions); it may give more detail and may then require a sequence of supporting paragraphs, in which case the first and last paragraphs will be introductory and concluding, respectively; or it may be broken into subsections, in which case, the first paragraph or two may be introductory to the section followed by the body as a sequence of subsections followed by a concluding subsection. Not including the introduction or concluding remarks in a section is a common mistake made inexperienced authors. There are conventions for the numbering and capitalization of sections and there are useful tools in document processing packages such as Microsoft Word to facilitate this process.

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[1] You may note the use of the *Consolas* typeface for `double` and `float`.

5. Tabular Summaries and Conclusions

In preparing a summary of a section or a report, it may be possible to use lists to appropriately summarize the information and analysis presented, but it may also be possible to use a tabular approach. Such a table will greatly enhance the summary of the information for the reader and, in this case, a well prepared table is almost always better than equally well prepared text. We will look at the format of such a concluding table, its position within the text, and tools in Microsoft Word for achieving the desired formats.

5.1. Tabular Format

As suggested before, a defining characteristic of most reports is that there tends to be lists of supporting items that are being discussed. If such information is being summarized in a table, each row will specify the characteristics of one of the supporting items, while the criteria contrasting the items will be displayed in columns. Any units associated with the columns are usually placed underneath in parentheses. The first row and column usually use a bold font An example of such a table is shown in Table 1.

Table 1. Concluding tables.

	Criteria 1 (units)	Criteria 2 (units)	Criteria 3	Criteria 4 (units)
Rudolph system	53	23.52	Aliquam sagittis nunc ac nulla dignissim sit amet blandit libero euismod.	a, b, d, f
Donner device	103	9.475	Ut quis dui eget urna congue aliquam.	a, c, e
Blitzen instrument	45	12.95	Sed sed urna in nisi pretium scelerisque.	b, c, d, g

For each column, the information being conveyed determines the format:

1. Integers are right aligned and centred in the column.
2. Real numbers are aligned on the decimal point (which is always added) and centred in the column.
3. Significant text is left aligned. In all cases, minimize the amount of text as much as possible without losing information.
4. Smaller amounts of text should be centred.

Appropriate formatting will the reader in quickly interpreting the values.

One major issue with Table 1 is that the outstanding feature is not the information that is being conveyed, but, rather, the eye is drawn to the intersections of the many lines [2]. Looking down a column has the eye focusing primarily on the boxes and not the data. A cleaner version is to remove as many lines as possible and to use grey solid or dotted lines where necessary, as is shown in Table 2.

Table 2. Concluding tables (modified).

	Criteria 1 (units)	Criteria 2 (units)	Criteria 3	Criteria 4 (units)
Rudolph system	53	23.52	Aliquam sagittis nunc ac nulla dignissim sit amet blandit libero euismod.	a, b, d, f
Donner device	103	9.475	Ut quis dui eget urna congue aliquam.	a, c, e
Blitzen instrument	45	12.95	Sed sed urna in nisi pretium scelerisque.	b, c, d, g

You will note that it is now the data that forms the columns, not the lines. The art of creating beautiful tables is not one that is quickly learned. While there are rules and guidelines, each table is unique and requires its own special formatting.

5.2. Placement within the Text

A table can never replace a well written summary and conclusions. Instead, think of a table as a two-dimensional list. Just like a list can be separated from text, as discussed in Section 2.1, a summarizing table must be prefixed with an introducing explaining its purpose and followed by either further conclusions or some concluding remarks or recommendations.

5.3. Tools in Microsoft Word

To achieve the formatting seen in Table 2, there are a few features of Microsoft Word that you must be made aware of. We will look at cell alignment, cell dimensions, and cell design.

First, you will note the alignment with the cells: to change this, right-click on a cell or select a number of cells and then right-click to access the context-sensitive menu. From this, select Cell Alignment and choose the designed format, as is shown in Figure 1.
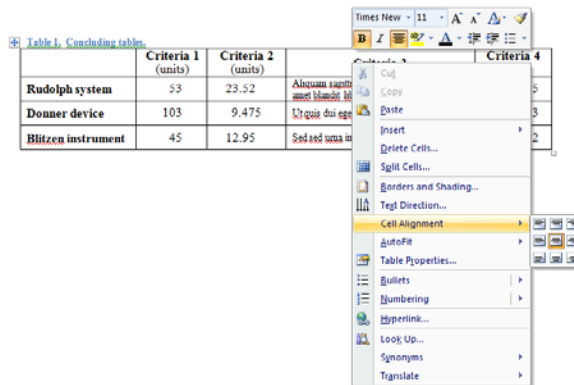

Figure 1. Adjusting cell alignment.

In order to add a caption to a table, select the entire table, right click, and select Insert Caption... The same may be done for figures.

Second, the spacing of the cells can be set manually using the cursor or can be adjusted by selecting a cell and then adjusting the heights and widths using Table Tools→Format→Cel 1 Size from the Ribbon. In Table 1, each cell was made 0.75 cm in height to accommodate the one two-line criteria.

The number and style of lines can be significantly reduced by selecting Table Tools→Design→Table Styles and Draw Borders from the ribbon, as shown in Figure 2.
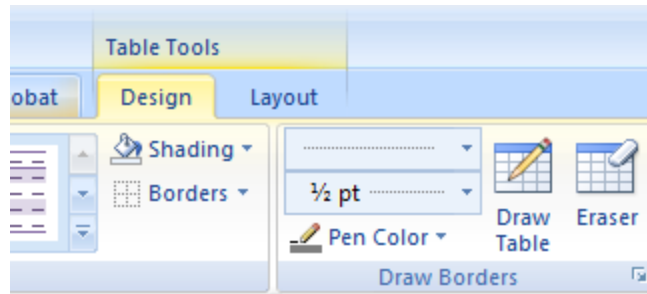
Figure 2. Table design tools in Microsoft Word.

By selecting the line style, thickness, and pen colour, it is possible to use the Draw Table tool to add or change lines within a table. Be careful about using the Eraser—it removes the cell division altogether. Instead, this author prefers to remove all lines initially by highlighting the entire table and selecting No Border from the Borders dropdown menu and then proceeding with the Draw Table tool.

5.4. Summary

Where possible, it is always best to summarize conclusions in some form of tabular format. This will convey significantly more information to the reader much more quickly than any well written prose. The format of the table must be clean with the minimal amount of unnecessary design or formats.

6. Summary and Conclusions

In preparing any essay, report or other document, there is usually a core subject that requires a list or sequence of supporting information. The presentation of this sorted information depends on how important it is for the reader to understand and identify the information. Lists of comma-separated phrases and sentences can either be part of the paragraph structure or they can be separated out. Lists of paragraphs should always be preceded by an introductory paragraph and followed by concluding remarks—indeed, this is the definition of an essay. With more complex document structures, or where it is necessary to refer to a component within a report, it is necessary to use numbered sections and sub-sections. As before, a numbered section may be either a single paragraph or a sequence of paragraphs where the first and last are the introduction and conclusions of that section, respectively; or a numbered section may have numbered subsections in which case the paragraph or paragraphs following the section title are the introduction to that section and all other subsections are appropriately named and numbered with the last subsection always being the concluding remarks for that section. In all cases, it is always the same pattern. Finally, where possible, it is always appropriate to present the conclusions either as a list or in a tabular format.

References

[1] Cicero, *Lorem Ipsum*, http://www.lipsum.com/ .

[2] Edward Tufte, *The Visual Display of Quantitative Information*, Graphics Press, 1992.