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Technical Writing and Presentation
Writing Technical Reports/Theses

SOICT - 2020

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- Differences between a Report and a Thesis
- Writing a technical report
- Writing a thesis
- Maping your ideas to text
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Differences between a Report and a Thesis

- Reports describe a simple format used to present data and analyses, and then to come to some conclusion about that data, including recommendations if appropriate
- A report is written for several people who know the topic very well

- A thesis is often produced in order to obtain a higher academic degree.
- A thesis is evidence of the candidate's capacity to carry out independent research, to analyze and communicate the significant results of the work.
- A thesis is a public document that may be read by many people
- Generally the thesis represents a work of greater depth and academic inclination
- Length of 60-120 pages is typical of a thesis, while a report is roughly half as many pages.

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Genre (style) of Technical Report

- A technical report is a formal report designed to convey technical information in a clear and easily accessible format
- It is divided into sections which allow different readers to access different levels of information.

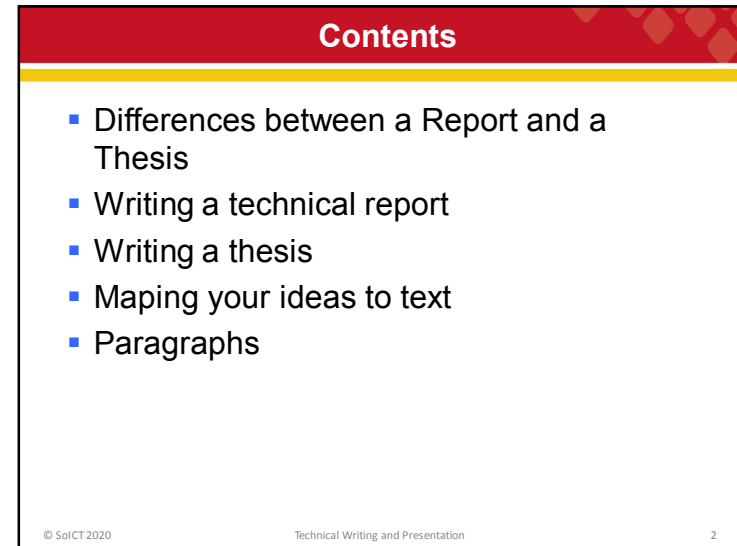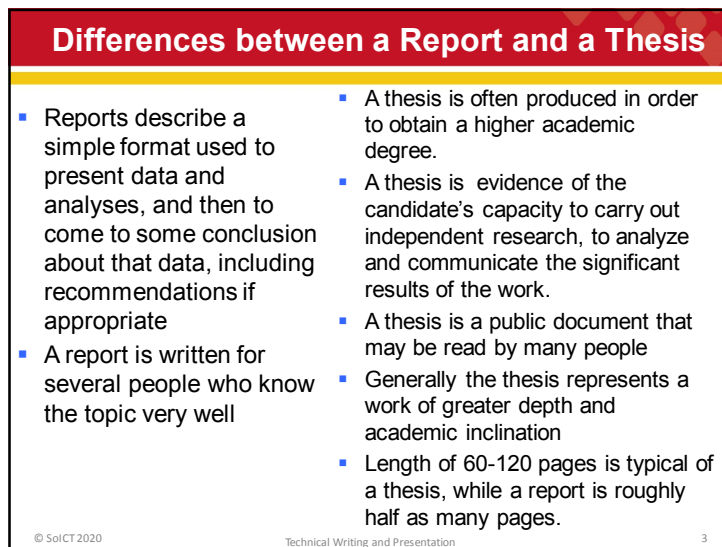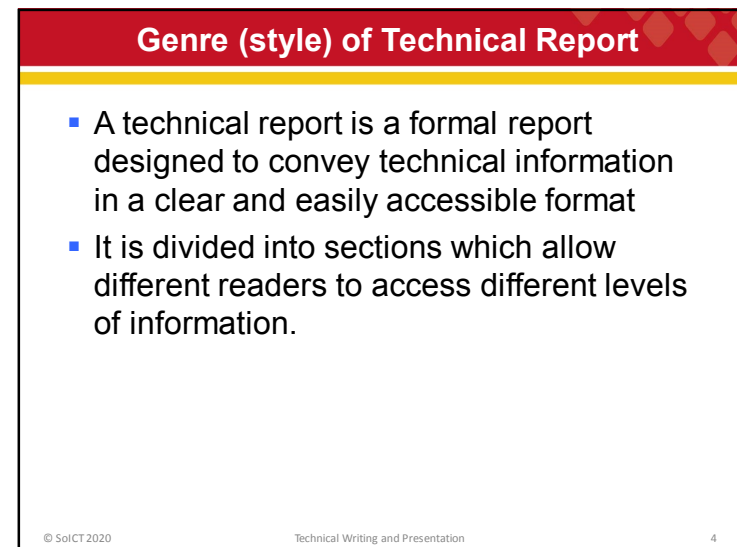© SoICT 2020   Technical Writing and Presentation   4

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Structure of a technical report

- Title page
- Summary
- Contents
- Introduction
- Body of the report
- Conclusions
- References
- Bibliography
- Acknowledgements
- Appendixes (if appropriate)

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Details of components

- Title page: The page includes the title of the report.
- Summary: includes important features, results and conclusions
- Contents: Numbers and lists all section and subsection headings with page numbers

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Details of components

- Introduction : The objectives of the report and comments on the way the topic of the report is to be treated.
- The sections which make up the body of the report:
  - Divided into numbered and headed sections.
  - Separate the different main ideas in a logical order
- Conclusions: A short, logical summing up of the theme(s) developed in the main text

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Details of components

- References: Details of published sources of material referred to or quoted in the text
- Bibliography: Other published sources of material, not referred to in the text but useful for background or further reading.
- Acknowledgements: List of people who helped you research or prepare the report,
- Appendices: further materials which are essential for full understanding of your report (e.g. large scale diagrams, computer code, raw data, specifications) but not required by a casual reader. Only comprehensive technical reports, such as some theses, have a bibliography.

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Planning the report

- Collect your information: laboratory handouts, lecture notes, the reference books and journals
- Creative phase of planning.
  - Write down topics and ideas from your researched material in random order.
  - Arrange them into logical groups.
  - Keep note of topics that do not fit into groups in case they come in useful later.
  - Put the groups into a logical sequence which covers the topic of your report.
- Structuring the report: Using your logical sequence of grouped ideas, write out a rough outline of the report with headings and subheadings.

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Writing the first draft

- Who is going to read the report? The answer will affect the content and technical level, and is a major consideration in the level of detail required in the introduction.
- Begin writing with the main text, not the introduction
- Make rough sketches of diagrams or graphs.
- Keep a numbered list of references as they are included in your writing and put any quoted material inside quotation marks
- Write the Conclusion next, followed by the Introduction. Do not write the Summary at this stage.

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Revising the first draft

- The essence of a successful technical report lies in how accurately and concisely it conveys the intended information to the intended readership
- Ask yourself these questions;
  - Does that sentence/paragraph/section say what I want and mean it to say?
    If not, write it in a different way.
  - Are there any words/sentences/paragraphs which could be removed without affecting the information which I am trying to convey?
    If so, remove them.

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Finalizing the report and proofreading

- Your report should now be nearly complete
- an introduction, main text in sections, conclusions, properly formatted references and bibliography and any appendixes are completed.
- It is the time to add the page numbers, contents and title pages and write the summary.

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The Summary

- The summary, with the title,
  - indicate the scope of the report and give the main results and conclusions.
  - must be intelligible without the rest of the report, because many people may read, and refer to, a report summary but only a few read the full report
- Purpose - a short version of the report and a guide to the report.
  - Length - short, typically not more than 100-300 words
  - Content - provide information, not just a description of the report.

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Proofreading

- Check every aspect of a piece of written work from the content to the layout
- Never send or submit any piece of written work, from email to course work, without proofreading.
- Before stapling your report, you must check it very carefully yourself.
- Give your report to someone else to read carefully and check for any errors in content, style, structure and layout.
- Do not forget to record the name of the proofreader in your acknowledgements.

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Word processing / desktop publishing

Advantages

Word processing and desktop publishing packages offer great scope for endless revision of a document. This includes words, word order, style and layout.

They allow for the incremental production of a long document in portions which are stored and combined later

They can be used to make a document look stylish and professional.

They make the process of proofreading and revision extremely straightforward

Disadvantages

Word processing and desktop publishing packages never make up for poor or inaccurate content

They can waste a lot of time by slowing down writing and distracting the writer with the mechanics of text and graphics manipulation.

Excessive use of 'cut and paste' leads to tedious repetition and sloppy writing.
If the first draft is word processed, it can look so stylish that the writer is fooled into thinking that it does not need proofreading and revision!

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Tips

- Do not bother with style and formatting of a document until the penultimate or final draft.
- Do not try to get graphics finalised until the text content is complete.

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Front Matter

- Cover*
- Label*
- Title Page
- Abstract
- Table of Contents
- List of Figures and Tables

* May be an optional element

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Cover and Label

- A cover is used if the report is over 10 pages long
- A label is placed on the cover to identify
- Report tittlr and subtitle (if a subtitle is appropriate)
- Author's name
- Publisher
- Date of publication

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Title page

- The title page duplicates the information found on the front cover (if the cover is used)
- The title page also provides descriptive information that is used by organizations that provide access to information resources.

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Select a title

- Think about the reader's first impression.
- Include important and distinguishing key words, for example the words that somebody will use in a literature search.
- Leave out any words that are not essential. Avoid meaningless expressions or longwinded descriptions. Every word must count.

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Abstract

- An abstract is a short summary that provides an overview of the purpose, scope and findings contained in the report.
- Purpose: identifies the issue, need or reason for the investigation
- Scope: review the main points, extent and limits of the investigation
- Findings: includes condensed conclusions and recommendations

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Abstract

- no more than 200 words
- provides an "in a nutshell" description without providing underlying details
- contains no undefined symbol, abbreviations, acronyms
- makes no reference by number to any references or illustrative material

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Abstract

- Provides no background information.
- Every word is important. Limit the use of words that do not convey important information to a minimum
- The abstract is usually the last part of the report to be written.
- Include in the abstract the keywords that someone may use to search for the report in a literature database.

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Table of Contents

- numbers and lists all section and subsection headings with page numbers
- list the title and the beginning page number of each major section within the report (excluding the title page and the table of contents)

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List of Tables and Figures*

- A list of *figures* and *tables* helps the reader to locate illustrations, drawings, photographs, graphs, charts, and tables of information contained in the report.
- A *figure* is any drawing, photograph or chart is used to explain and supportthe technical information in the text
- The figure number and title will appear below the image
- Refer to a figure or table within the text and place the image close to the reference

*May be an optional element

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List of Tables and Figures*

- A *table* is an arrangement of detailed facts or statistics that are arranged in a row and column format
- The table number and tittle appear above the table

*May be an optional element

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Text

- The text is the part of technical report in which the author
  - describes the methods, assumptions, and procedures
  - present and discusses the results
  - draws conclusions
  - recommend actions based on the results

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Text

- Summary
- Introduction
- Methods, assumption and procedures
- Results and discussion
- Conclusion
- Recommendation
- References

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Summary

- Includes important features of the report
- States the problem, method of investigation conclusions, and recommendations
- Contains no new info that is not contained in the report
- Does not contain references

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Introduction

- The Introduction prepares the reader to read the main body of the report.
- This page focuses on the **subject, purpose**, and **scope** of the report
- **Subject**: defines the topic and associated terminology; may include theory, historical background, and its significance
- **Purpose**: indicates the reason for the investigation
- **Scope**: indicates the extent and limits of the investigation

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Methods, Assumptions, Procedures

- The methods, assumptions, and procedures used in the investigation are described so the reader could duplicate the procedures of the investigation. Information in this section includes:
  - System of measurement
  - Types of equipment used and accuracy
  - Test methods used
- The sections which make up the body of the report:
  - Divided into numbered and headed sections.
  - Separate the different main ideas in a logical order

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Methods, Assumptions, Procedures

- **Methods**: How did you discover the problem? What measuring tools were used? What measurement system was used?
- **Assumptions**: What do you think, but cannot substantiate as fact?
- **Procedures**: How did you gain a better understanding of the problem?

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Results and Discussion

- The *results and discussion* section describes what you learned about the problem as a result of your research, identifies the degree of accuracy related to your findings, and gives the reader your view of the significance of your findings.
- Results What did you learn about the problem through your research?
- Discussion How accurate are your findings? What is the significance of the results of the research?

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Conclusions

- A short, logical summing up of the theme(s) developed in the main text
- *Restatement of Results*
  - What are the factual findings that resulted from your research?
  - What are you implying as a result of these findings?
- *Concluding Remarks*
  - What are your opinions based on the findings and results?

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Recommendations*

- A section called *recommendations* is often included in reports that are the result of tests and experiments, field trials, specific design problems, and feasibility studies.
- The author may recommend additional areas of study and suggest a course of action, such as pursuing an alternate design approach
- *Additional Studies* Is there information that still needs to be learned?
- *Suggested Actions* What does the author want the reader to do with the information?

May be an optional element

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References

- The references section is the place where the author cites all of the secondary research sources* that were used to...
  - develop an understanding of the problem
  - support the information contained in the report

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Back Matter

- The back matter supplements and clarifies the body of the report, makes the body easier to understand, and shows where additional information can be found.
- The back matter may includes
  - Appendixes*
  - Bibliography*
  - List of Symbols, Abbreviations, and Acronyms Glossary*
  - Index*
  - Distribution List*

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Appendixes*

- Anything that cannot be left out of a report, but is too large for the main part of the report and would serve to distract or interrupt the flow belongs in the appendixes .For example:
  - Large tables of data Flowcharts
  - Mathematical analysis
  - Large illustrations
  - Detailed explanations and descriptions of test techniques and apparatus
  - Technical drawings

*Mav be an optional element

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List of Symbols, Abbreviations, and Acronyms*

- If more than five *symbols* , *abbreviations* , or *acronyms* are used in the report, they are to be listed with their explanation.

*Mav be an optional element

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Parts of a thesis

- Abstract
- Introduction
- Main chapters
- Conclusions
- References
- Appendixes

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Examples of theses

- A new application or method
- Literature review
- Suitablity of existing approaches to a new problem

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Example1: a new application or method

- The new application (a program) is in central role.
- It has to be related to the existing research and evaluated.
  - Introduction: the problem
  - Background theory and main concepts
  - Related research (other existing solutions to the same or similar problems)
  - Your own application
  - Evaluation: comparison to other methods, empirical tests, or theoretical analysis
  - Conclusions

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Example 2: Literature review

- Introduction
- Main concepts
- Approaches + their analysis (2-3 chapters)
- Or a chapter for comparison and analysis of all approaches
- Conclusions

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Ex3: Suitablity of existing approaches to a new problem

- Introduction
- The new problem + criteria for an ideal solution method
- Potential solution methods + analysis of their suitability (2-3 chapters)
- Possibly discussion (comparison, new solution ideas)
- Conclusions

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Abstract

- Tells compactly the research problem, methods and results.
- At most 1 page, no literature references.
- Key words.

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Introduction

- Define the problem clearly
- Give suffiecient background information for the following chapters.
  - What is the purpose of the research? Main research questions?
  - What is the scope? Indicate explicitly all limitations and restricting assumptions!
    - Why the topic is important or interesting?
    - What methods are used?

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Introduction (continued)

- Briefly references to related research (just the main references – more references in chapter "Related research" or throughout the thesis)
- Emphasize your own contribution: what is original or new?

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Conclusions

- Just 1-2 pages!
  • Summarize the main results in a general level.
  • Tell what was your own conctribution and what was based on other sources.
  • Possibly also critics (e.g. limitations), alternative approaches, topics for future research.
  • No more new results and seldomly any references (at most for alterantive, unmentioned approaches)

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Appendixes

- Additional material which is relevant to the research and is referred in the text.
- No chapter numbers, but enumerate the appendixes (Appendix A, Appendix B,...).
- If you have only one appendix, then just "Appendix".

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Process of thesis writing

- Reading literature
- Planning
- To get started

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Reading literature

- Try to find the most relevant articles.
- To get a wider perspective, search papers by different authors/research groups.
- If there are several approaches to solve or study the problem,try to study something from all of them.
- Use several digital libraries or bibliographies for searching – one collection may be biased.
- Plan how much time you can spend for studying literature! In some point you have to stop collecting new material and begin to write.

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Planning

- Begin by brainstorming. Draw concept maps. Discuss with your friends or supervisors.
- Write down all ideas which come into your mind.
- Collect literature and scan through it. Select the most important sources.
- Try to write the disposition as early as possible. Process it with your supervisor until it looks good (logical structure and order).
- List the main research problems (in the form of questions) and write the introductory paragraphs for the chapters

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To get started

- Arrange a comfortable working place. Reserve time for writing every day. Try to make writing a routine for you!
- Set deadlines. Preferably fix them with your supervisor – it is always more effective.
- Work together with your friends. You can set the deadlines, discuss your topics, and read each other's texts. After good work you can reward yourself by doing something fun.
- Imagine that you are writing to your friend about your research topic!
- Summarize articles you have read.

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To get started

- Begin to write immediately, when your disposition is finished.
- Write down ideas when they come – even in the middle of night
- Invent good examples and write them down
- If some part is difficult to write, beging from an easier one.
- Write the difficult parts, when you are in a good working mood.
- Draw figures which describe the some method or model and write a description.
- Try to divide the problem or phenomenon into subproblems or parts and describe them separately.
- Collect main concepts and write definitions for them. Fix the notations.

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How to write the beginning of chapters?

- Look at the opening sentences of similar compositions by other people
- Possibly beginnings are
  - a summary,
  - a statement of the problem,
  - a hypothesis,
  - necessary and interesting background information,
  - a new idea,
  - an accepted procedure (then explain advantages of another procedure), ...
- Don't spend too much time trying to find an effective beginning – you can always modify it afterwards.
- **Go straight to the point** and, if possible, refer to things that you expect your readers to know (vs. contructivism)

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Revising

- First of all, admit that the first draft(s) is not perfect! Ask critics and respect it.
- If possible, ask at least two people to read your thesis. Preferably one who is an expert on the subject, and one who is not.
- Have a break when your work is finished. At least, sleep one night before revising the text yourself

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Technical hints

- Read text aloud and check if it sounds well
- Check all references. Especially, are names correctly spelled?
- Save old versions, you may need them afterwards

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Technical terms

- If there is no widely accepted definition then
  1. Tell whose definition you follow and give this definition with reference,
  or
  2. Give a definition yourself and tell that in this work the term is defined as given.
- Technical terms must be defined clearly and then used with accuracy and precision

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Symbols

- Don't use the same symbol for different things!
- Use indexes in a uniform manner.
- If some special notation is widely used in literature, follow it.
- If different sources use different notations, harmonize them
- Do not use Greek letters if there is no reason. If there is a danger of confusion, then Greek letters are justified.

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Equations

- Avoid listing mathematical equations!
- Try to integrate equations into sentences so that the results is readable.
- Do not replace words by mathematical symbols (e.g. $\nmid$) in the text

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Map your ideas to text

- Writing *w* is a mapping from a set of ideas *I* to a set of scientific texts *S*, $w : I \rightarrow S$.

- Problem: Given a set of ideas $i \in I$, produce $f(i) \in S$

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Instructions

1. Organize your ideas in a hierarchical manner, as a tree of ideas *t* ("minimal spanning tree" of idea graph)

2. Write the tree *t* as text such that

- The root node of *t* corresponds to your topic (title)

- Its children correspond to chapters

- Their children and grand-children correspond to sections and subsections

- Leaf nodes correspond to paragraphs (actual text)

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Writing tree *t*

- Each node $n \in t$ contains three fields:
  - *title*(*n*): the main title or the name of the chapter, section or subsection. In leaf nodes (paragraphs) *NULL*
  - *children*(*n*): *n*'s children (chapters, sections or subsections). In leaf node *NULL*.
  - *content*(*n*): description of the idea in *n*. In non-leaf nodes very brief, in leaf nodes longer.

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Properties of a good tree *t*

- *t* is balanced: all paths from the root to a leaf are approximately of equal length, usually ≤ 4 or at most ≤ 5
- Each node in *t* has a reasonable number of children *k*: $k \leq 2$ and typically $k \leq 7$ (in maximum $k = 10$)
- For all leaf nodes *n*, the sizes of *content*(*n*) are balanced: each paragraph contains at least two sentences, but is not too long (e.g. ≤ 7 or ≤ 10 sentences)
- For all non-leaf nodes *m*, the sizes of *content*(*m*) are balanced.
- Exceptionally, in introduction, you can use more than one paragraph.

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Alg. 1 WriteTree(*t*)

Input: tree of ideas *t*
Output: scientific text *s*
1 **begin**
2   Write *title*(*n*)
3   **if** (*n* is not leaf node)
4   **begin**
Writing an introductory paragraph:
5   Write *content*(*n*)
6   **for** all *u = child*(*n*)
7   Write *title*(*u*)
8   **for** all *u = child*(*n*)
9   **WriteTree(*u*)**
10   **end**
11   **else**
Writing a main paragraph:
12   Write *content*(*n*)
13 **end**

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Paragraphs

- Helps the reader: tells what the paragraph is about.
- Helps the writer: forces you to organize the material logically.
- In an ideal case, you get a summary of the whole section by reading the topic sentences.
- If you cannot write a clear topic sentence, ask yourself whether the paragraph is needed at all!

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Combining sentences in a paragraph

1. Use (but do not overuse!) conjunctions or transitional words:
   - Time links, when you describe a process: then, next, first-secondthird, while, ...
   - Cause-effect links, when you describe reasons or results: therefore, as a result, thus, ...•
     Addition links, when you add points: in addition, moreover, similarly, ...
   - Contrast links, when you describe two sides of one thing: however, despite (=inspite of sg), ...
   Other: For example,...
2. Link the beginning of a sentence to the end of the previous sentence.
   E.g. the subject of sentence 2 is the object of sentence 1.
   "A model consists of a model structure and model parameters. The model structure defines..."
3. Repeat the key terms througout the paragraph. However, do not repeat the same word twice in one sentence.

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Dividing a section into paragraphs

- Logically structured disposition (topic outline) is the most important thing in writing

- An iterative process:
1. The main structure of the whole thesis: the main chapters and their contents in a couple of sentences or key words. The order of chapters.
2. For each chapter (or an article), the main sections + key words, introductory sentences or phrases. The order of sections.
3. In each section, the subsections or paragraphs. The introductory sentences, key words, and the order of paragraphs. List the related tables and figures.

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