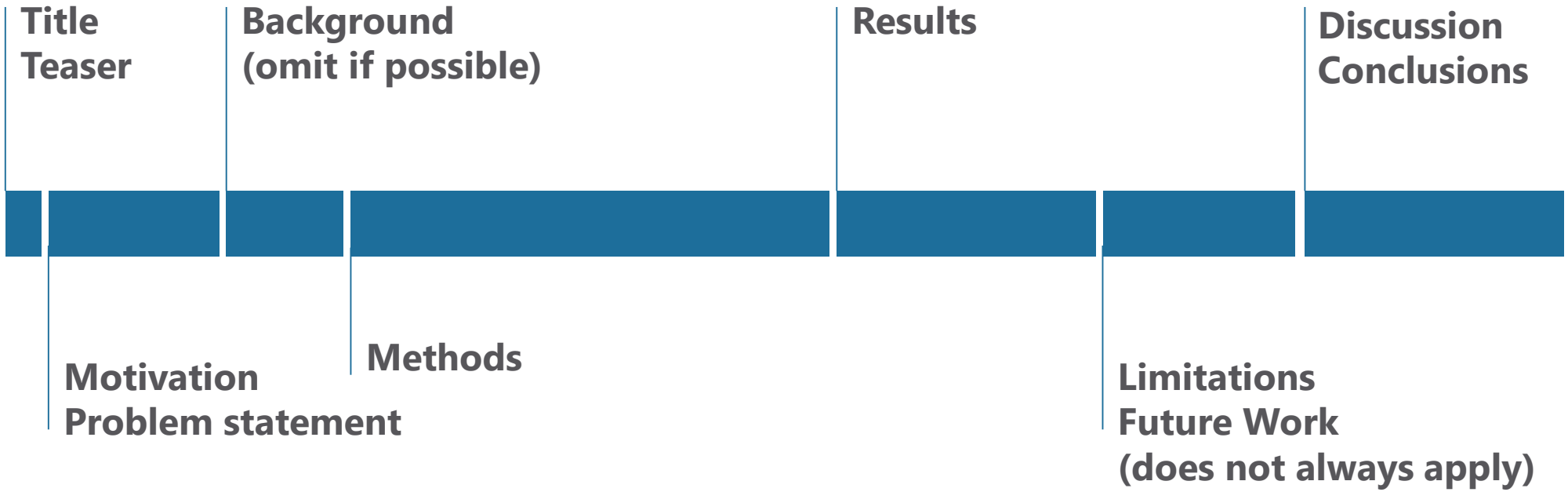
Writing Scientific Reports – Some Hints

Vlad Coroamă

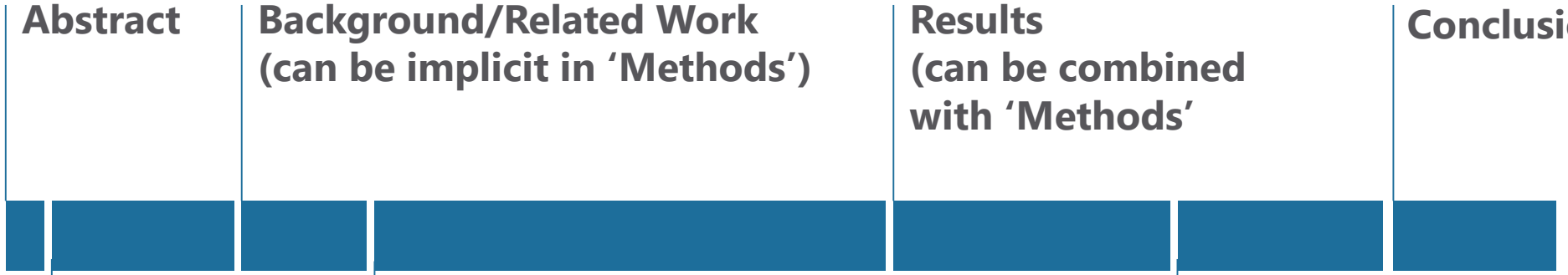
Digitalisation and the Rebound Effect seminar, 15 October 2020

Typical structure of an academic presentation



Inspired by Prof. Markus Püschel (ETH), Small Guide to Giving Presentations

Typical structure of an academic report (also paper etc)



Intro (includes
- Motivation
- Problem statement)

Methods (can be woven into the 'Results' in the context of our seminar)

Discussion (includes
- Limitations
- Future Work, but also
- zooming out, larger picture
- some well argued-for speculation)

The abstract is a micro-paper – Example: a recent abstract of mine

Information and communication technologies (ICT) are increasingly seen as key enablers for climate change mitigation measures. They can make existing products and activities more efficient or substitute them altogether. Consequently, different initiatives have started to estimate the environmental effects of ICT services. Such assessments, however, lack scientific rigor and often rely on crude assumptions and methods, leading to inaccurate or even misleading results. The few methodological attempts that exist do not address several crucial aspects, and are thus insufficient to foster good assessment practice. Starting from such a high-level standard from the European Telecommunication Standardisation Institute (ETSI) and the International Telecommunication Union (ITU), this article identifies the shortcomings of existing methodologies and proposes solutions. It addresses several aspects for the assessment of single ICT services: the goal and scope definition (analyzing differences between ICT substitution and optimization, the time perspective of the assessment, the challenge of a hypothetical baseline for the situation without the ICT solution, and the differences between modelling and case studies) as well as the often-ignored influence of rebound effects and the difficult extrapolation from case studies to larger populations.

(Coroamă, Bergmark et al. 2020), A Methodology for Assessing the Environmental Effects Induced by ICT Services: Part I: Single Services, ICT4S 2020, Bristol, UK, 36-45, https://doi.org/10.1145/3401335.3401716

1) Micro-Intro: Motivation/context

Information and communication technologies (ICT) are increasingly seen as key enablers for climate change mitigation measures. They can make existing products and activities more efficient or substitute them altogether. Consequently, different initiatives have started to estimate the environmental effects of ICT services. Such assessments, however, lack scientific rigor and often rely on crude assumptions and methods, leading to inaccurate or even misleading results. The few methodological attempts that exist do not address several crucial aspects, and are thus insufficient to foster good assessment practice. Starting from such a high-level standard from the European Telecommunication Standardisation Institute (ETSI) and the International Telecommunication Union (ITU), this article identifies the shortcomings of existing methodologies and proposes solutions. It addresses several aspects for the assessment of single ICT services: the goal and scope definition (analyzing differences between ICT substitution and optimization, the time perspective of the assessment, the challenge of a hypothetical baseline for the situation without the ICT solution, and the differences between modelling and case studies) as well as the often-ignored influence of rebound effects and the difficult extrapolation from case studies to larger populations.

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2) Micro-Intro: Research question(s) (RQs) the paper addresses

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3) Micro-background / related work: Why no one else adequately answered the RQ

Information and communication technologies (ICT) are increasingly seen as key enablers for climate change mitigation measures. They can make existing products and activities more efficient or substitute them altogether. Consequently, different initiatives have started to estimate the environmental effects of ICT services. Such assessments, however, lack scientific rigor and often rely on crude assumptions and methods, leading to inaccurate or even misleading results. The few methodological attempts that exist do not address several crucial aspects, and are thus insufficient to foster good assessment practice. Starting from such a high-level standard from the European Telecommunication Standardisation Institute (ETSI) and the International Telecommunication Union (ITU), this article identifies the shortcomings of existing methodologies and proposes solutions. It addresses several aspects for the assessment of single ICT services: the goal and scope definition (analyzing differences between ICT substitution and optimization, the time perspective of the assessment, the challenge of a hypothetical baseline for the situation without the ICT solution, and the differences between modelling and case studies) as well as the often-ignored influence of rebound effects and the difficult extrapolation from case studies to larger populations.

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4) Micro-methods: How the paper addresses the RQ(s)

Information and communication technologies (ICT) are increasingly seen as key enablers for climate change mitigation measures. They can make existing products and activities more efficient or substitute them altogether. Consequently, different initiatives have started to estimate the environmental effects of ICT services. Such assessments, however, lack scientific rigor and often rely on crude assumptions and methods, leading to inaccurate or even misleading results. The few methodological attempts that exist do not address several crucial aspects, and are thus insufficient to foster good assessment practice. Starting from such a high-level standard from the European Telecommunication Standardisation Institute (ETSI) and the International Telecommunication Union (ITU), this article identifies the shortcomings of existing methodologies and proposes solutions. It addresses several aspects for the assessment of single ICT services: the goal and scope definition (analyzing differences between ICT substitution and optimization, the time perspective of the assessment, the challenge of a hypothetical baseline for the situation without the ICT solution, and the differences between modelling and case studies) as well as the often-ignored influence of rebound effects and the difficult extrapolation from case studies to larger populations.

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5) Micro-results: What results the paper provides

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6) Micro-conclusions: How the paper advances scientific knowledge

Information and communication technologies (ICT) are increasingly seen as key enablers for climate change mitigation measures. They can make existing products and activities more efficient or substitute them altogether. Consequently, different initiatives have started to estimate the environmental effects of ICT services. Such assessments, however, lack scientific rigor and often rely on crude assumptions and methods, leading to inaccurate or even misleading results. The few methodological attempts that exist do not address several crucial aspects, and are thus insufficient to foster good assessment practice. Starting from such a high-level standard from the European Telecommunication Standardisation Institute (ETSI) and the International Telecommunication Union (ITU), this article identifies the shortcomings of existing methodologies and proposes solutions. It addresses several aspects for the assessment of single ICT services: the goal and scope definition (analyzing differences between ICT substitution and optimization, the time perspective of the assessment, the challenge of a hypothetical baseline for the situation without the ICT solution, and the differences between modelling and case studies) as well as the often-ignored influence of rebound effects and the difficult extrapolation from case studies to larger populations.

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A similar view from Steve Easterbrook (U of T)

(1) In widgetology, it's long been understood that you have to glomp the widgets before you can squiffle them.

(2) But there is still no known general method to determine when they've been sufficiently glomped.

(3) The literature describes several specialist techniques that measure how wizzled or how whomped the widgets have become during glomping, but all of these involve slowing down the glomping, and thus risking a fracturing of the widgets.

(4) In this paper, we introduce a new glomping technique, which we call googa-glomping, that allows direct measurement of whifflization, a superior metric for assessing squiffle-readiness.

(5) We describe a **series of experiments** on each of the five major types of widget, and show that in each case, googa-glomping runs faster than competing techniques, and produces glomped widgets that are perfect for squiffling.

(6) We expect this new approach to dramatically reduce the cost of squiffled widgets without any loss of quality, and hence make mass production viable.

Source: https://www.easterbrook.ca/steve/2010/01/how-to-write-a-scientific-abstract-in-six-easy-steps/

Steve Easterbrook's abstract writing guide (1)

(1) In widgetology, it's long been understood that you have to glomp the widgets before you can squiffle them.

(2) But there is still no known general method to determine when they've been sufficiently glomped.

(3) The literature describes several specialist techniques that measure how wizzled or how whomped the widgets have become during glomping, but all of these involve slowing down the glomping, and thus risking a fracturing of the widgets.

1. **Introduction. In one sentence, what's the topic?**

2. **State the problem you tackle.**

3. **Summarize (in one sentence) why nobody else has adequately answered the research question yet.**

Source: https://www.easterbrook.ca/steve/2010/01/how-to-write-a-scientific-abstract-in-six-easy-steps/

Steve Easterbrook's abstract writing guide (2)

4) In this paper, we introduce a new glomping technique, which we call googa-glomping, that allows direct measurement of whifflization, a superior metric for assessing squiffle-readiness
5) We describe a series of experiments on each of the five major types of widget, and show that in each case, googa-glomping runs faster than competing techniques, and produces glomped widgets that are perfect for squiffling.
6) We expect this new approach to dramatically reduce the cost of squiffled widgets without any loss of quality, and hence make mass production viable.

4. **Explain, in one sentence, how you tackled the research question.**

5. **In one sentence, how did you go about doing the research that follows from your big idea**.

6. **As a single sentence, what's the key impact of your research?**

Source: https://www.easterbrook.ca/steve/2010/01/how-to-write-a-scientific-abstract-in-six-easy-steps/

Intro and conclusions both are mini-papers, with different emphasis

.. in a similar way as the abstract has the structure of a micro-paper

Intro

- Context & motivation
- Research question(s)
- Methods
- Results
  - rather briefly, to leave some surprise for the paper
- Discussion
  - also rather briefly

Conclusions

- Context & motivation
  - rather briefly
  - perhaps after reminding the RQs
- Research question(s)
- Methods
  - not so detailed as in the intro and without motivating them
- Results
  - in more detail than in the intro
- Discussion
  - in more details than in the intro
  - choice of most insights / open questions / etc

“Once you learn the rules, you can (cautiously) break them”

… and develop your own style

Van Gogh as we know him

V. Van Gogh: Thatched Cottages in Chaponval, 1890
(Kunsthaus Zürich, own photo)

Early Van Gogh

V. Van Gogh: Carpenter‘s Workshop as seen from the Artist‘s Atelier, 1882
(Rijksmuseum Amsterdam, museum photo)

Acknowledging external material

- Make a clear difference between
  - your results, and
  - those of others
- Acknowledge everything included with copy-paste
  - images
  - graphics
  - text (even a single sentence)
- Plagiarism has many forms
  - copy & paste without explicit citation
  - paraphrase of text without reference
  - unacknowledged adoption of ideas, structure, design, …
- But also do not use the words of others to write your report
  - even if those words are, of course, tempting, as the original authors thought quite thoroughly about the topic
  - and they are most likely more experienced than you are (at this stage) in writing academic papers
- Even if you properly acknowledge the sources, do not use the words of others
  - otherwise you not have committed plagiarism, but neither will you have written an own report
- You can, nevertheless, use the figures from the original papers
  - (would be uselessly inefficient to redraw them)
  - properly acknowledged, of course

Inspired by Prof. Friedemann Mattern (ETH), How to give good seminar presentations