Writing Introduction & Literature Review

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Research Methods

Data collection methods

- Good data is very hard to get
- If you have good data, the rest is easy
- Methods:
  - Software analyzers
  - Reports, e.g. EDA
  - Interviews – may introduce some bias

Lab vs. Field

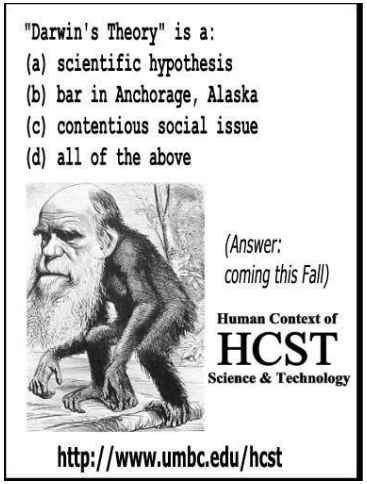
- Lab Research -
  + internal validity
  - external validity (generalizability)
- Field Research
  - internal validity
  + external validity (maybe)
- Wanted by many researchers (for example Conte & Dunsmore & Shen)
  - standard research databases
  - standard definitions and metrics

Some problems with models

- Models are probabilistic -- faults (probably) go up as a function of size
- People often fake and diddle data for their own purposes
- Maybe we simply can't do it right now and it is all more trouble than it’s worth?!

Discovery Methods

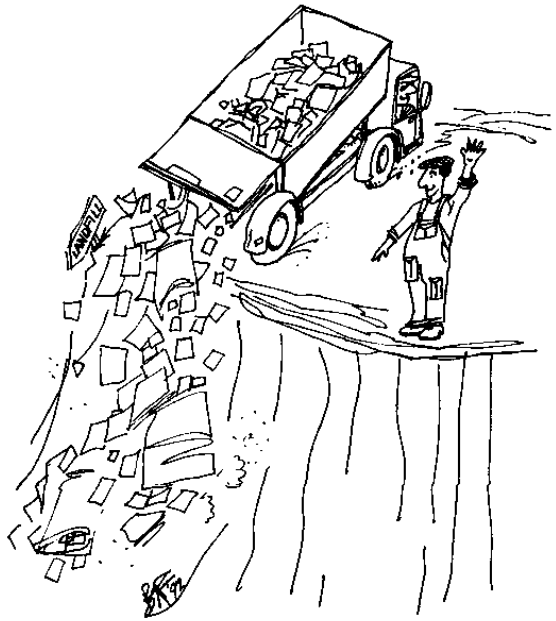
- What qualifies as a valid discovery method?
  - mathematical proofs
  - verbal argumentation
  - common sense
  - Darwinian methods
  - empirical methods
  - authority
- Which of these you accept will affect you as a practicing engineer?
- What evidence that a new whizzy works will you accept?



- *Objectives of the course and your tasks*
- *Comments on research and research evaluation*
- How to evaluate a research paper

Steps in evaluating a good paper

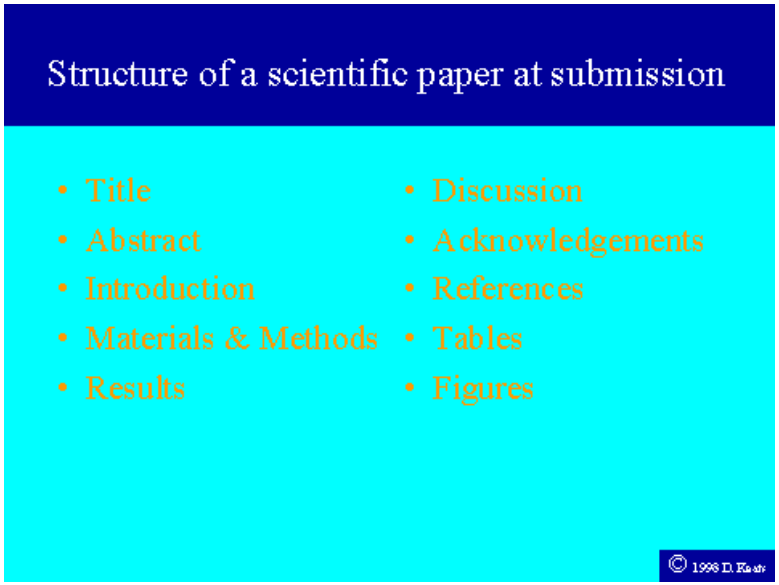
- Structure of the paper
- Why was the article written?
- Is the paper readable?
- Sound content
  - references, …
  - methods, …
  - experiments, data, ….
- Contributions



A Contribution to the Field

Evaluate the structure …(1/2)

- Structure of a good paper:
  - Abstract
  - Introduction
  - Related literature
  - Body of the Paper (experimental setup, data, technique and scientific methods, results, discussion)



Evaluate the structure …(2/2)

- Structure of a good paper (continued):
  - Threats to validity (internal and external)
  - Conclusions
  - Acknowledgements
  - References
  - Tables
  - Figures (and captions)

Evaluate the content …(1/3)

The paper should:

- identify the problem being addressed
- identify previous work on this problem
- identify the proposed research
- describe the evaluation criteria used and the claimed results
- identify problems not handled by this approach

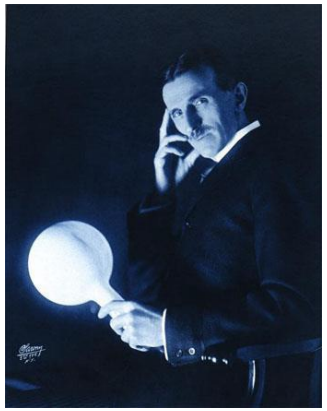
Evaluate the content …(2/3)

- Literature review
  - a summary or evaluation of related research is included to put the current study into a historical or scientific perspective
  - this is often a very weak part of article
- A description of the methods or procedures used is needed

This needs to be detailed enough to allow a replication

Evaluate the content …(3/3)

- Results section
  - summarizes data or observations. includes any computations or analyses of the data
  - This section should answer the researchers' specific questions.
- Final section
  - interpret the results in broader terms
- Contribution to the community, science, industry, …



Why was the Article written?

- Is the author trying to deceive or conceal something
- Creation of phony data
  - e.g. Paul Kammerer -- Austrian Zoologist, believed acquired characteristics could be transmitted.
- Is this happening today in Computer Science?
- Researchers as safeguards
  - “Extraordinary claims demand extraordinary proof”

Impact factor of journals

- The best journals “tend” to weed out poor papers, but you need to know the journal.
- Journal impact factors (see for example: www.scimagojr.com)
  - Exercise: Do a review of some major journals in the part of CS that you work in.

Evaluating what is not there …

- Parts of a journal article, e.g.
  - Title
  - Key Words (from the taxonomy of the journal)
  - Abstract
  - Summary of results
- Introduction
  - a statement of the questions or problems under investigation & **some justification for their importance**

Evaluating what is not there …

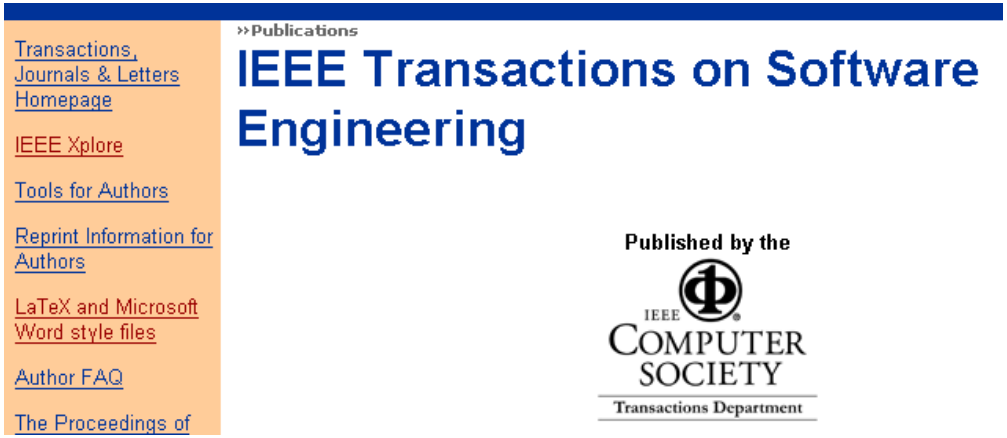
- Future Work
  - what work needs to be done in future
  - a source of research problems to work on
- Acknowledgement
- References
  - endnote
- Appendices

Language as a Smoke Screen

- Language can be used as a smokescreen to hide what is being said
- This is sometimes done on purpose to misguide the reader
- It is sometimes done because of misconceptions about what technical and academic writing should be
  - observe quotations in classical languages
  - complex equation
  - excessive footnotes
  - long sentences & long words

Formats

- Many technical journals in C.S. have moved to a different format and use tech editors to improve communication.



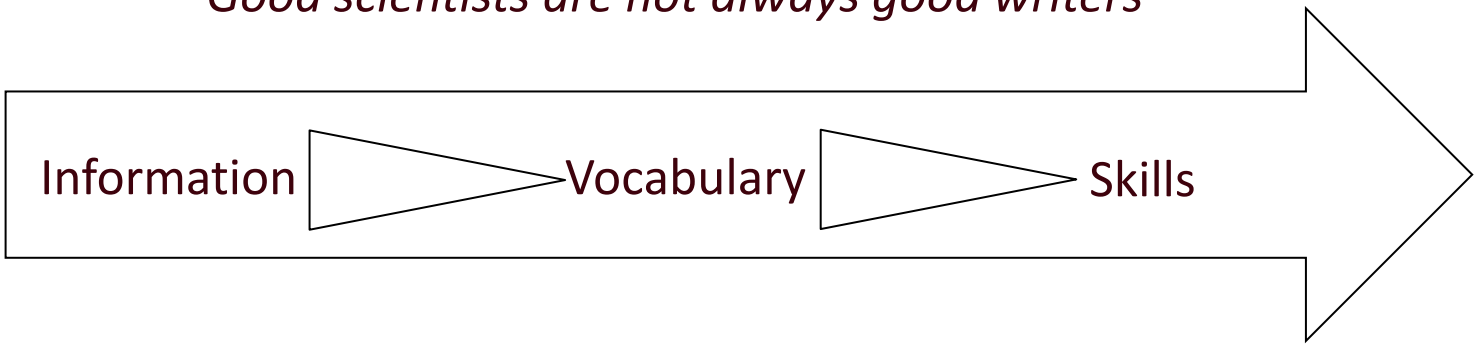
Skim Efficiently and Quickly

1. READ THE TITLE
   and try to predict the type of information you expect to see
2. LOOK AT THE NAME OF THE AUTHOR
   What you know about the writer will help you predict and evaluate the content.
3. CHECK THE DATE
   and use it to help you assess the content.
4. READ THE ABSTRACT
   to find out what the researchers did and/or what they found
5. LOOK QUICKLY AT THE FIRST PARAGRAPH
   without trying to understand all the words.
6. LOOK QUICKLY AT THE FIRST SENTENCE OF EACH PARAGRAPH
   without trying to understand all the words
7. LOOK QUICKLY AT EACH FIGURE/TABLE AND READ ITS TITLE
   to try and find out what type of visual data is included
8. READ THE LAST PARAGRAPH
   especially if it has a subtitle like 'Summary' or 'Conclusion'

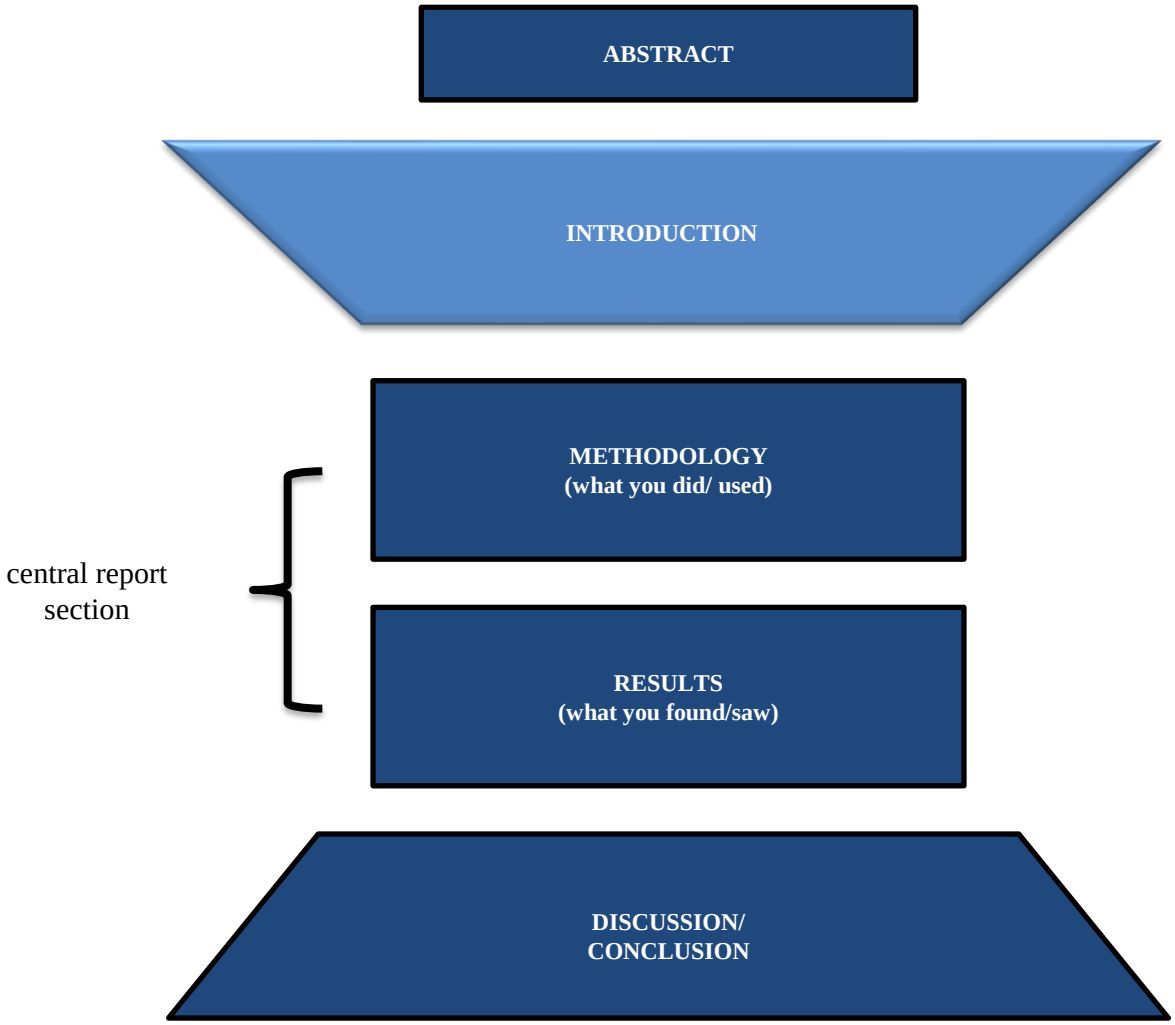
Scientific Research

Publications

Good scientists are not always good writers



The Shape of a Research Article



Introduction of your own research

To write the Introduction of your own research, the model you build must answer the following three ques tions:

1. How do writers normally start the Introduction?
2. What type of information should be in my Introduction, and in what order?
3. How do writers normally end the Introduction?

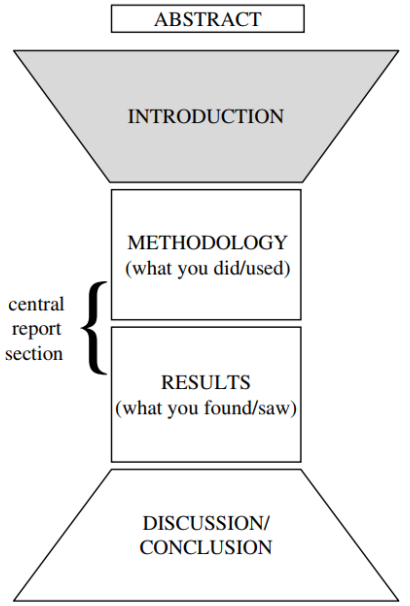


Fig. 1. The shape of a research article or thesis.

Building a model

1	ESTABLISH THE IMPORTANCE OF YOUR FIELD
	PROVIDE BACKGROUND FACTS/INFORMATION (possibly from research)
	DEFINE THE TERMINOLOGY IN THE TITLE/KEY WORDS
	PRESENT THE PROBLEM AREA/CURRENT RESEARCH FOCUS
2	PREVIOUS AND/OR CURRENT RESEARCH AND CONTRIBUTIONS
3	LOCATE A GAP IN THE RESEARCH
	DESCRIBE THE PROBLEM YOU WILL ADDRESS
	PRESENT A PREDICTION TO BE TESTED
4	DESCRIBE THE PRESENT PAPER

Building a model

- The introductory article generally follows the following order.

  - ✓ most Introductions begin with item 1, that the order of the model components is usually reliable
  - ✓ items 2 and 3 can occur more than once
  - ✓ almost all Introductions finish with number 4

Building a model

10 sentences over 4 components

• ESTABLISH THE IMPORTANCE OF YOUR FIELD • PROVIDE BACKGROUND FACTS/INFORMATION (possibly from research) • DEFINE THE TERMINOLOGY IN THE TITLE/KEY WORDS • PRESENT THE PROBLEM AREA/CURRENT RESEARCH FOCUS
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Literature review

- The section should begin with an introductory paragraph summarizing the goals and the contents.
- The section should contain a classification (grouping) of the existing works.
  - ✓ You can identify the factors on the basis of which you will create this grouping.
  - ✓ The section could contain both a diagram (a tree structure) presenting the grouping and a brief description of the diagram explaining why you grouped the existing work the way you did.
- A section for each group of methods, explaining in detail each method:
  - The problem that was solved
  - How it solved the problem
  - How did it perform the validation
  - What are the main results
  - What are its strengths and weaknesses

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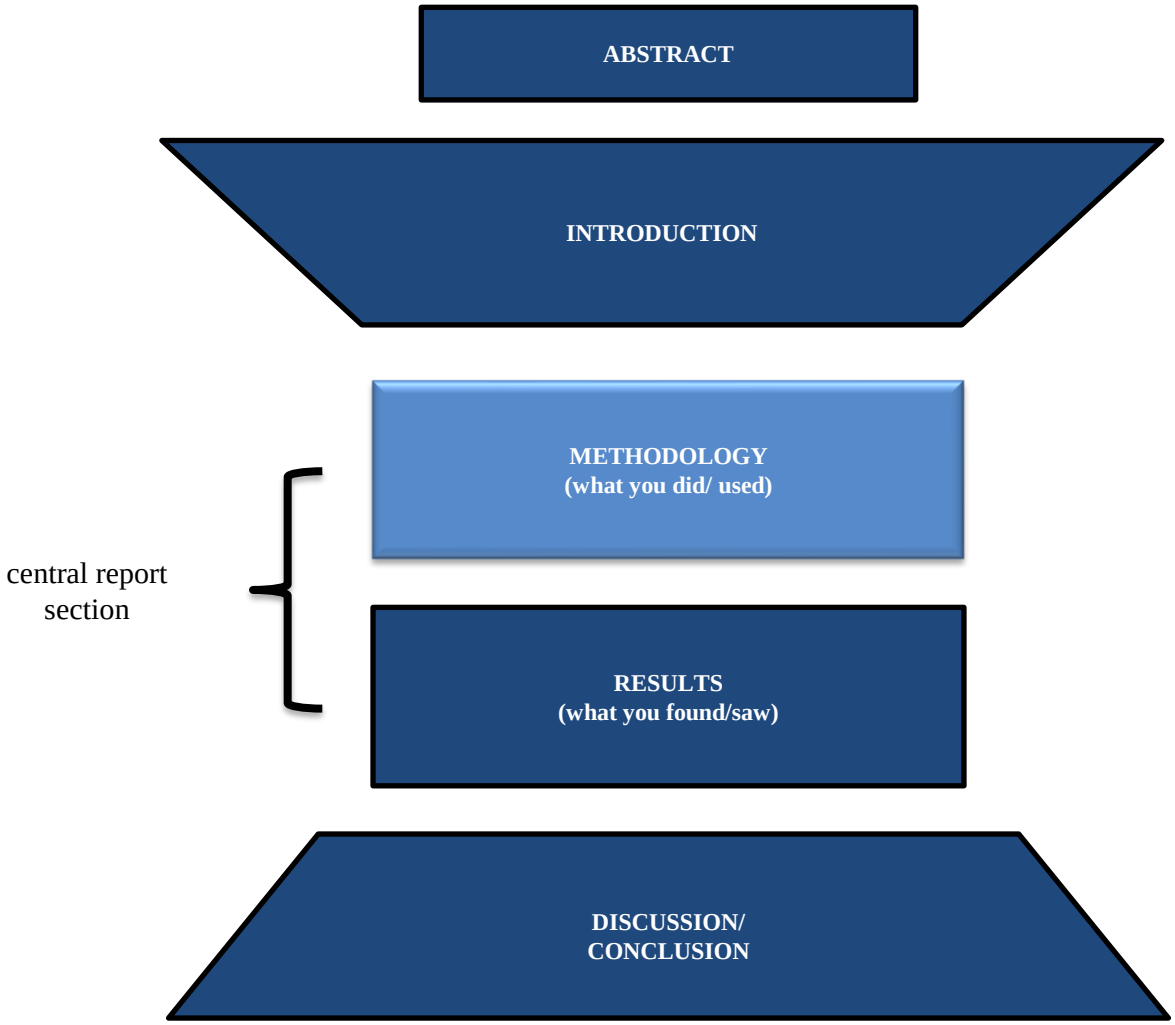

Thanks