Academic
Writing
vocabulary
punctuation
referencing
quoting
paraphrasing
style
audience
summarising
grammar
language
synthesising
reflection
purpose
originality
spelling
structure

# Writing Research Report/Paper

Acknowledgment - Thanks to Dr Christof Lutteroth and Dr Gerald Weber (UoA) for the slides

# Research report/paper

Typical structure of a research report/paper:

1. **Title:** comprehensive & presents the theme in a sentence.
2. **Abstract**: brief summary, typically 100-200 words
3. **Introduction**: What is the research problem? Introduce and motivate it. Summarize your contributions.
4. **Related Work**: What have others done? How is it different? Cite, summarize other solutions & compare it with your own.
5. **Design**: Describe it in enough detail so others can implement / replicate it. Software architecture (e.g. class diagram)? User interface (e.g. screen diagram)? Algorithms?
6. **Implementation**: How have you implemented your solution? Tools and technologies used? Implementation challenges?
7. **Evaluation**: why it is good/useful/better than others
8. **Conclusion**: Summarize contributions. Point out future work.

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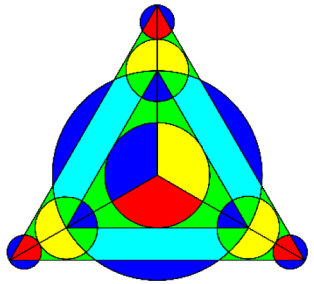
# Abstract



**Aim:** concise summary of your paper/research report

- Informative: concisely describe the problem and your solution contributions; every word has a purpose
- Complete: contains all important contributions
- Self-contained: can understand the main points of the whole paper just by reading abstract (no references)

## Structure

1. Introduce/specify/motivate problem
2. Summarize your solution contributions (main part)
3. Summarize evaluation results / conclusions

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# Introduction

What are you doing? Why are you doing it?

1. Introduce the topic and the context
2. Define & explain your research problem
   - What exactly is it? Be specific and precise!

     -> Some can be specified well with research questions
   - What does it mean?

     -> Add explanation or example where useful
3. Motivate your research problem
   - Why is it worth researching?
   - Explain importance: useful applications or Impact
   - Explain novelty: gap/limitation in literature
   - Significant consequences (e.g. cheaper, faster)?

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# Introduction (Continued)

4. Give an overview of the methodology & contributions
   - How did you approach the problem? E.g. implement prototype & evaluate with user study
   - What are the contributions (i.e. novel solutions)?
5. Outline of the paper
   - Briefly mention for each section what type of information is contained there (~1 sentence each), e.g. "Section 2 gives an overview of related work…"
   - Helps readers to get an overview of the paper structure (i.e. where to find what)

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# Finding Related Work

1. Gather phase
   - Keyword search
     (e.g. Google Scholar, ACM, IEEE)
   - Follow up the references
     (cited and citing papers)

Beyond **data warehousing**: what's next in business intelligence?
M Golfarelli, S Rizzi, I Cella - ... workshop on **Data warehousing** and OLAP, 2004 - dl.acm.org
... in the industrial context [10], the BI community has only marginally faced the **problems** related to ... 3.3 Design As one might expect, the crucial **issues** emerging in BPM design are different from ... This **issue** confines all other architectural choices to the background: if some piece of ...
Cited by 362 Related articles All 27 versions Cite Save More

2. Filter phase:
   read only abstract and throw blanks out
3. Reading phase
   - First just scan over it (figures? sections? methodology?)
   - What is the research problem? What are the contributions?
   - Do they cite related work that is useful for you?

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# Writing about Related Work

1. Summarize in a few bullet points what each related paper is about
   - What did they try to do? What was novel about it?
   - Did they achieve it? Did they evaluate it?
2. Organize the related works by grouping them in subsections
   - Define categories, write one section per category
   - Possibly subcategories, subsections
   - Alternative: organize by time rather than category

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# Writing about Related Work (Continued)

3. Compare the related works with your contributions to show how your contributions are novel
   - What are the similarities to your work? Give credit where it is due.
   - What are the differences?
     - Is yours new knowledge?
     - Is yours better in some way? E.g. more powerful, simpler, less limited



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# Design

## What is Design?

How do you solve your research problem or answer your research question?

- Top-down: start with the overall idea, then drill down to the details
  - What are the overall ideas used to solve the problem?
    -> Reader should get a complete picture first
  - What are the contributions (the new bits)?
    -> This is most interesting so should be described in all detail

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# Design (Continued)

## What is Design?

- Explore the design space of your project analytically
  - Scope: What are the possibilities? Alternatives?
  - Analyze: What are their advantages? Disadvantages? Limits? Sweet spots?
- Justify your design decisions with arguments, examples, experimental data, related work, heuristics, proofs...

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# Implementation

How did you build your system?

- What features?
- What tools/technologies were used?
- Implementation challenges and how you solved them
- Advantages and disadvantages of your implementation
- Use screenshots and/or small code snippets for illustration

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# Design Vs. Implementation


## Design (Solutions)

- Abstract, high-level
- Mostly independent of articular technologies, and tools
- Could be applied in many different projects, implemented in many different systems
- Consists of the contributions

## Implementation (Prototype)

- Concrete, low-level
- Build using particular technologies and tools
- Just one example of how the solutions (esp. the contributions) were applied
- Merely used to illustrate / demonstrate contributions

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# Evaluation


Provide empirical evidence of the quality of your contributions.

1. Methodology subsection: describe how you conducted the study, i.e. variables, tasks, methods etc.
2. Results subsection: summarize the data that was collected (qualitative and quantitative)
3. Discussion subsection:

a. How could you explain the results? What conclusions could you draw wrt. the quality of your solution?

b. Critically reflect on your work. What are the limitations?

c. What are the threats to validity?

Why might it be difficult to generalize your conclusions to other users/systems/environments?

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# Conclusions

- Sum up what it is all about
- Sum up your achievements
- Point out some future directions (e.g. new research questions)

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# Writing Style

- **Sections:** good overall structure is the first step
- **Paragraphs:**
  - Each expresses one idea clearly
  - Split larger ones, join smaller ones (< 3 sentences)
- **Sentences:**
  - Simplicity and clarity
  - Use examples for explaining complex stuff
  - Split larger ones (no runaway sentences)
- Avoid redundancy

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# Beating Writer's Block


- Vary the **structure**:
  - Just write section/subsection headers
  - Just write bullet points, flesh out later
- Vary the **topic**:
  - Write about anything that comes to your mind (e.g. some related work, design, introduction, …)
  - Organize/ reshuffle the parts later on
- Vary the **modality**:
  - **Visual**: create figures first, the simply describe what you see
  - **Auditive**: talk to others about it; write exactly as you would explain it verbally
  - **Kinesthetic**: Do some development or some experiments, then describe what you have done

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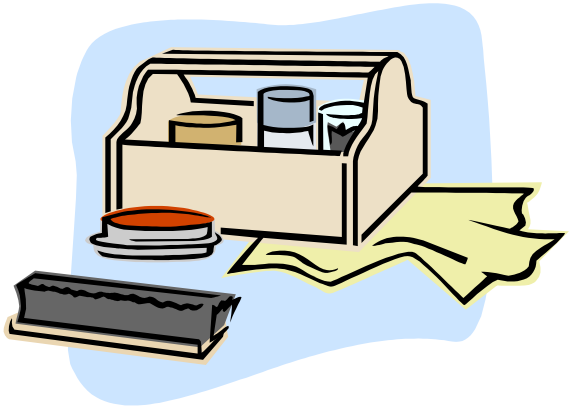
# Polishing your draft



- Same as with software development: iterative and incremental **refinement**
- Get (early) **feedback** from others:
  - Is it easy to understand?
  - Spelling/grammar
  - Obvious omissions?
  - Could there be more/less figures?
  - Other interesting references?
- Emphasize your **contribution** (abstract, intro, conclusion)
  - How is your work different? Better?
  - How have you evaluated your work?

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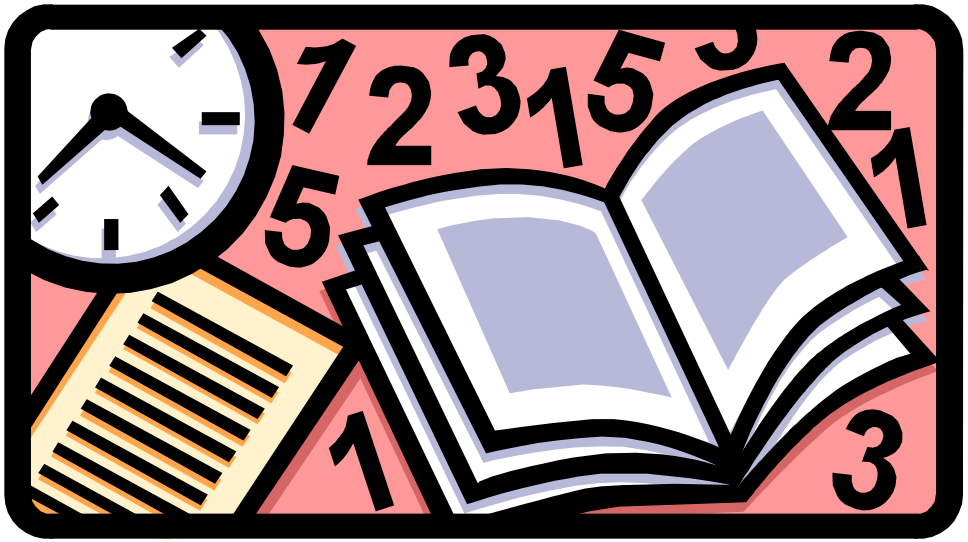
# Research Report in the Assessment-1



# Research Report

40% in total for the report

- The research report has to be written **individually**
- 6 pages IEEE style
  IEEE style is provided at AUT Blackboard or can be download from google
- Includes text, figures, bibliography
- Submit as PDF file
- Read the assessment document for more details.