

**Dublin City University  
School of Computing**

**MSc in Software Engineering (MSE)**

**MSc in Security and Forensic  
Computing  
(MSSF)**

**CA640: Research Skills**

**Part 3: Paper and Report Writing**

# Introduction

- Research is an *original contribution to knowledge*. You must show two things in a research write up:
  - identification of an unanswered question;
  - the answer!
- Researchers most commonly formally report scientific research in published papers.
- Your final practicum write up will be in the form of a research report, or a journal or conference report style submission.

# Publishing Scientific Papers

Scientific papers appear in journals and in the proceedings of research meetings such as conferences or workshops.

- Researchers write up their work and submit it to their selected publication venue.
- Submissions are viewed by experts in the field - typically 3 of them.
- Editors select papers for publication based on feedback from the reviewers.
- Publication in prestigious journals and conferences is often highly competitive: editors may only accept 10% - 20% of submissions!

# Publishing Scientific Papers

- Reviewers provide written comments on all submissions. These are passed on to authors, usually anonymously.
  - Authors use the comments to revise accepted submissions ready for final publication.
  - Authors of rejected submissions can use the comments to revise their paper for submission to another venue, or as the basis for additional research, or both.
- For your practicum write up, you will be asked to prepare a journal or conference paper manuscript in a form ready for submission for review.

# Typical Structure of a Scientific Paper

- Title, authors, institutions, date;
- Abstract
- Introduction
- Background review of related work.
- Solution
- Evaluation of solution
- Conclusions and further research
- Bibliography/References

## Abstract

- The *Abstract* should overview the material described in the paper.
- it should be possible for someone with a reasonable background in the topic of the paper to read and understand the abstract without needing to make reference to the paper itself, and have a clear idea about the issues explored and any conclusions reached in the paper.
- It should thus stand as a separate piece of writing which makes sense and can stand independent of the main sections of the paper.
- The abstract is typically very short, only 100 or 200 words in length.

## Bibliography - References

- These mainly relate to the literature review, but may also refer to experimental and evaluation methods, or datasets or software used.
- Examiners often check out this section early on (Does it look like this student has paid attention to existing work ? Does this look like a serious piece of work?), and will form preliminary assessment notions early on, so pay attention to this section.
- References must be cited in the main body of the paper.
- Usually journals and conferences publish instructions on how references should be structured, and are generally very fussy that authors follow their approved style.

You should receive guidance on this for your practicum paper from your supervisor or practicum co-ordinator.

## Appendices

Often not required in a scientific paper, they can be useful sometimes. They typically contain material which casts light on the work done, but which would impede the clear delivery of ideas in the main text. For example,

- Mathematical proofs. If they are not the main focus of the paper, mathematical proofs can be relegated to an appendix. A proof from another field with which readers of your paper are unlikely to be familiar would also be suited to an appendix. Reviewers often comment on the need for including missing proofs, or deleting unnecessary ones.
- **program listings** can illustrate something that does not need to be included in the text.
- Huge tables of data should also be in an appendix: you may wish to enable your readers to interpret data for themselves beyond the summary analysis of the paper.

## When to Write

- Write early, write often - writing can add thinking.
  - Write notes on research hypotheses, experimental plans, software design.
- You never get it right first time: think, plan, write, revise: many cycles of revision are typically required.
- It is generally best to develop gradually:
  - outline,
  - draft individual components,
  - polish.
- Avoid binges: write little and often.

## Writing versus Speaking

- For both: always consider the audience.
- With writing there is no interactive feedback - no way of knowing how your audience is reacting to your work.
- With speaking the audience gives feedback - interest, boredom etc - and can ask questions for clarification.
  - You need to write in a clearly structured way.
  - You generally need to say more than in a spoken presentation, but should avoid being verbose.

Clear and concise is better.

## Making it Readable

- Use consistent terms and notation, look at the conventions in existing published literature in your field.
  - In quantitative studies there is usually standard notation for your field.
  - Avoid synonyms: use the accepted expressions for your topic.
  
- Make sure that you have a clear structure of thoughts, ideas and aspects:
  - umbrella aspects (the central ideas),
  - major aspects (reinforce, clarify, elaborate),
  - little aspects (supporting or reinforcing the main),
  - attention aspects (road signs; on track).

## Making it Readable

- Coherence lends readability:
- Generally favour simple sentence structure.

The ideas are often complicated: do not make them more difficult to understand by using complex linguistic constructions or language.

- Use active voice as much as possible.

## Making it Readable

- Watch the chronology, and be consistent with tense: *was*, *has been*, *did* etc.
- Trim the padding in successive drafts.
- Learn from other writers.
- Get someone else to read your work: someone fussy, knowledgeable, and whose opinion you respect.
- Never argue with this person about *their opinion* of what you have written:: if they don't like it, you can improve it.

## Daily Research Activities

*Active Reading*: learn to write well by learning from others - observe what's good in published papers and what's not, what works and what doesn't.

- *Regular Research Activities* include:
  - reading papers;
  - writing reviews of papers and tracking papers;
  - discussing ideas;
  - having brilliant ideas and discovering which are worth bothering with;
  - keeping a journal

## Strategic Grinding

Learn what to read, how to read it, and when to read it

- Learn to be *selective* in what you read:
  - find appropriate conferences and journals,
  - quiz your supervisor and other academic staff members;
  - scan before reading - read *abstract* and *conclusion first*.
  - if a paper still looks interesting, read it and read it again and read it again, and probably keep returning to it.
  - Summarise the ideas in journal/work notes.
  - Do not worry if you sometimes feel overwhelmed: this is normal.

# Evaluating Papers

- Did the ideas described really work?
- Cut through the jargon: are there interesting ideas beneath it all?
- What motivated the authors ?
- What choices were open to the authors?
- What about the validity of their assumptions?
- What was their result?
- Any future directions?

## Role of the Supervisor

- *Supervision* is guidance and suggestion, teaching, correction, auxiliary worker input/analysis but usually NOT marking.
- *Realization of the research and quality* is up to the student:
- *Supervisor* is to decide the work plan with the student, try to keep the student *on track* and *to time*.

*Supervisor* is available to discuss ideas, problems and queries, but not to lay out a blueprint.

# Assessing Postgraduate Research

- Markers will generally ask themselves:
  - Is this a useful contribution to knowledge?
  
- Readers will ask:
  - what is the question here?
  
  - is it a good question?
  
  - is it adequately answered?
  
  - is there a contribution to previous knowledge

## Justifying your efforts

- Clearly state the question.
- Prove *Originality* by:
  - review of the topic and closely related topics;
  - reference review to demonstrate that
    - \* the question has not been previously answered,
    - \* the question is worth answering

## Writing Up

- This does NOT usually occur in the two phases: work followed by write-up, and can be highly *iterative*.
- You will have a range of tasks, and should keep a few for times when you do not feel up to the awkward ones.
- You should develop an outline *early* - but not treat it as set in stone.
- Remember to target the readers, and style it accordingly.

## Writing Up

- The reader will be *less* knowledgeable about the detail than you - remember, you did the original work.
- Explain the motivation, goals, methodology: make no assumptions apart from the basis.
- Get *Feedback*
  - from your Supervisor, from Seminars and Conference opportunities.
  - from friends and other researchers.
  - Naturally in your turn give feedback to others.

## How Long Does It take ?

- How long is a piece of string?
- Writing up is one of the *major* activities of research.
- Well structured organization of ideas, deciding what to include and what to leave out and then writing it down clearly: all this is *hard work*.
- You will find flaws and weaknesses in your work when you start to write up: state them explicitly and confront them.
- Allow approximately 30% of your overall time to writing up.

## Think of the Reader

- Make no unreasonable assumptions about your readers.
- Examiners hate to be made to work hard on trivia, such as having
  - to understand poorly named sections,
  - to organise the ideas from your work themselves, to wade through bad grammar.
- Draft, redraft and edit until you are sure you can make it no better. Take feedback from others and be critical of yourself.
- It is better to leave a day or so between each edit: you can read more objectively after time away from your writing.

# An Ocean of Code/Tabulated Analyses?

- Some projects deal with proving ideas by means of program implementation, some by data analysis, others by comparison.
- You do need to include *sufficient* information in your write up to support key findings and justify your claims.
- If you have impressive results that could only have been produced using a sophisticated computer program or data analysis, the need for this will generally be fairly obvious to the reader and the marker without your having to describe them.
  - You will have an oral presentation and question session available to make sure that your examiners know just how much work you did.
- Remember appendices are available if needed.