

How To Write a Scientific Paper – A General Guide

Kwang Y. Lee

Professor and Chair

Department of Electrical & Computer Engineering

May 2019

Overview

- Task of writing a research paper can be daunting
- Even with groundbreaking research, unless the paper is correctly written:
 - at best, publication will be delayed
 - at worse, never published
- Presentation will provide an overview of ‘how to write a well-structured research paper for publication’

Background: Author's Perspective

Motivation to publish:

- Dissemination (54% 1st choice)
- Career prospects (20% 1st choice)
- Improved funding (13% 1st choice)
- Ego (9% 1st choice)
- Patent protection (4% 1st choice)
- Other (5% 1st choice)

Bryan Coles (ed.) The STM Information System in the UK, BL Report 6123, Royal Society, BL, ALPSP, 1993

Author Publishing Priorities

- Quality and speed
 - Top items were
 - Refereeing speed
 - Refereeing standard
 - Journal reputation
- Editor/board, physical quality and publication services

Author versus Reader Behaviour

- **Author behaviour**

- Want to publish more
- Peer review essential
- Other journal functions crucial
- Wider dissemination

- **Reader behaviour**

- Want integrated system
- Browsing is crucial
- Quality information important
- Want to read less

Elsevier study of 36,000 authors (1999-2002) presented by Michael Mabe at ALPSP Seminar on “Learning from users” 2003; www.alpsp.org

Reader's priorities

- Authoritative quality articles
- Ease of access
- Rapid delivery
- Convenient format
- Linking of information - clustering
- Low or no cost
- Up-to-date information

Differences: Authors and Readers

- Authors are journal focused
- Readers are article focused
- Publish more/read less dichotomy

Priorities for Readers in Low-Income Countries (discussion)

Rank on a Scale of 5:1 -

5 (very useful), 4 (somewhat useful), 3 (average),
2 (somewhat not useful), 1 (not useful)

- Authoritative quality articles
- Ease of access
- Rapid delivery
- Convenient format
- Linking of information - clustering
- Low or no cost (Open Access or HINAGOA publisher)
- Up-to-date information
- Other

Key Elements of Publishing

- Ethical Issues
- Style and language
- Structure of paper
- Components of paper
- Article submission/journal selection
- Publisher's process/peer review

Ethical Issues

- Disclosure of Conflict of Interest
- Acknowledgment of funding sources
- Image manipulation guidelines
- Online submission - supplemental information (datasets, videos)
- For Health Sciences
 - Submission of a Clinical Trials to a Central Registry
 - Institutional Review Board approval

See: Blackwell Science - Best Practice Guidelines on Publishing Ethics

<http://www.blackwellpublishing.com/Publicationethics/>

Style and Language

- Refer to the journal's author guide for notes on style (see Publishing Skills Web-Bibliography for examples)
 - Some authors write their paper with a specific journal in mind
 - Others write the paper and then adapt it to fit the style of a journal they subsequently choose
- Objective is to report your findings and conclusions clearly and concisely as possible

Style and Language

- If English is not your first language, find a native English speaker (if possible) to review the content and language of the paper before submitting it
- Regardless of primary language, find a colleague/editor to review the content and language of the paper

See: Uniform Requirements for Manuscripts Submitted to Biomedical Journals: Writing and Editing for Biomedical Publication

<http://www.icmje.org/>

Structure of a Paper

Scientific writing follows a rigid structure – a format developed over hundreds of years

Consequently, a paper can be read at several levels:

- Some people just will refer to the title
- Others may read only the title and abstract
- Others will read the paper for a deeper understanding

Components of a Paper

Section	Purpose
Title	Clearly describes contents
Authors	Ensures recognition for the writer(s)
Abstract	Describes what was done
Key Words (some journals)	Ensures the article is correctly identified in abstracting and indexing services
Introduction	Explains the problem
Methods	Explains how the data were collected
Results	Describes what was discovered
Discussion	Discusses the implications of the findings
Acknowledgements	Ensures those who helped in the research are recognised
References	Ensures previously published work is recognised
Appendices (some journals)	Provides supplemental data for the expert reader

Authors Listing

- ONLY include those who have made an intellectual contribution to the research
- OR those who will publicly defend the data and conclusions, and who have approved the final version
- Order of the names of the authors can vary from discipline to discipline
 - In some fields, the corresponding author's name appears first

Title

- Describes the paper's content clearly and precisely including keywords
- Is the advertisement for the article
- Do not use abbreviations and jargon
- Search engines/indexing databases depend on the accuracy of the title - since they use the keywords to identify relevant articles

Abstract

- **Briefly** summarize (often 150 words) - the problem, the method, the results, and the conclusions so that
 - The reader can decide whether or not to read the whole article
- Together, the title and the abstract should stand on their own
- Many authors write the abstract last so that it accurately reflects the content of the paper

Introduction

- Clearly state the:
 - Problem being investigated
 - Background that explains the problem
 - Reasons for conducting the research
- Summarize relevant research to provide context
- State how your work differs from published work
- Identify the questions you are answering
- Explain what other findings, if any, you are challenging or extending
- Briefly describe the experiment, hypothesis(es), research question(s); general experimental design or method

Methods

- Provide the reader enough details so they can understand and replicate your research
- Explain how you studied the problem, identify the procedures you followed, and order these chronologically where possible
- Explain new methodology in detail; otherwise name the method and cite the previously published work
- Include the frequency of observations, what types of data were recorded, etc.
- Be precise in describing measurements and include errors of measurement or research design limits

Results

- Objectively present your findings, and explain what was found
- Show that your new results are contributing to the body of scientific knowledge
- Follow a logical sequence based on the tables and figures presenting the findings to answer the question or hypothesis
- Figures should have a brief description (a legend), providing the reader sufficient information to know how the data were produced

Discussion/Conclusion

- Describe what your results mean in context of what was already known about the subject
- Indicate how the results relate to expectations and to the literature previously cited
- Explain how the research has moved the body of scientific knowledge forward
- Do not extend your conclusions beyond what is directly supported by your results - avoid undue speculation
- Outline the next steps for further study

References

- Whenever you draw upon previously published work, you **must** acknowledge the source
- Any information not from your experiment and not 'common knowledge' should be recognized by a citation
- How references are presented varies considerably - refer to notes for authors for the specific journal
- Avoid references that are difficult to find
- Avoid listing related references that were not important to the study

Harvard Reference Style

Uses the author's name and date of publication in the body of the text, and the bibliography is given alphabetically by author

- Adams, A.B. (1983a) Article title: subtitle. Journal Title 46 (Suppl. 2), 617-619
- Adams, A.B. (1983b) Book Title. Publisher, New York.
- Bennett, W.P., Hoskins, M.A., Brady, F.P. et al. (1993) Article title. Journal Title 334 , 31-35.

Vancouver Reference Style

Uses a number series to indicate references; bibliographies list these in numerical order as they appear in the text

1. Adams, A.B. (1983) Article title: subtitle.
Journal Title 46 (Suppl. 2), 617-619.

2. Lessells, D.E. (1989) Chapter title. In: Arnold, J.R. & Davies, G.H.B. (eds.) Book Title , 3rd edn. Blackwell Scientific Publications, Oxford, pp. 32-68.

3. Bennett, W.P., Hoskins, M.A., Brady, F.P. et al. (1993) Article title. Journal Title 334 , 31-35.

Article Submission

- Select your journal carefully
- Read the aims and scope
- Think about your target audience and the level of your work – do you have a realistic chance of being accepted?
- **Follow the guidelines** in the notes for authors and include everything they ask – it makes the editor's job easier...
- Articles should **not** be submitted to more than one journal at a time

See: Instructions to Authors in Health Sciences

<http://mulford.mco.edu/instr/>

Online Submission

- Many publishers now offer a completely electronic submission process
- Article is submitted online and all of the review procedure also happens online
- Speeds up the editorial process
- Is invaluable for authors in low-income countries

Author Priorities for Journal Selection (Elsevier)

- Key (Determining) factors
 - Impact Factor
 - Reputation
 - Access to the target audience
 - Overall editorial standard
 - Publication speed
 - International coverage
 - Open Access or HINARI participating publisher
- Marginal (Qualifying) factors
 - Experience as a referee
 - Track record
 - Quality and colour illustrations
 - Service elements

Author Priorities for Journal Selection (INASP)

- Quality / prestige
- Collection / specialisation
- Habit / previous publication
- Speed / time delay

Journal Selection for Authors from Low-Income Countries (discussion)

Rank on a Scale of 5:1 -

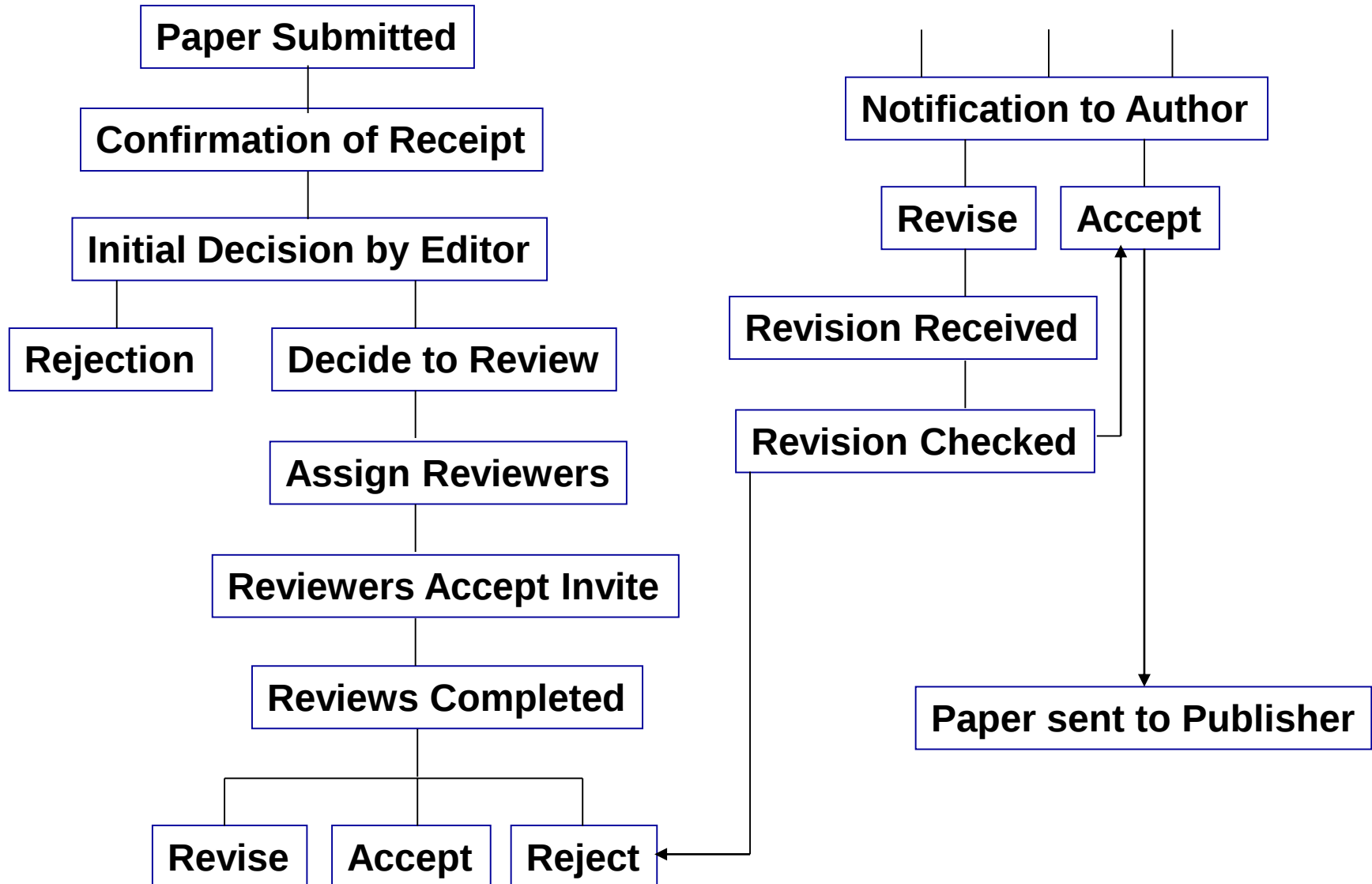
5 (very useful), 4 (somewhat useful), 3 (average),
2 (somewhat not useful), 1 (not useful)

- Impact Factor
- Reputation or quality/prestige
- Access to the target audience or specialization
- Overall editorial standard
- Publication speed
- International coverage
- Habit/previous publication
- Open Access or HINARI/AGORA/OARE participating publisher
- Other

After Submission

- Most journal editors will make an initial decision on a paper - to review or to reject
- Most editors appoint two referees
- Refereeing speed varies tremendously between journals
- Authors should receive a decision of Accept, Accept with Revision (Minor or Major), or Reject
- If a paper is rejected, most editors will write to you explaining their decision
- After rejection, authors have the option of submitting the paper to another journal - editor's suggestions should be addressed

Overview of Peer Review Process



Publishing Tips

Editors and reviewers are looking for original and innovative research that will add to the field of study; keys are:

- For research-based papers, ensure that you have enough numbers to justify sound statistical conclusions
- For a larger study, it may be better to produce one important research paper, rather than a number of average incremental papers

Further Resources

- Davis, Martha, Kaaron Joann Davis, and Marion Dunagan. *Scientific papers and presentations*. Academic press, 2012.
- Grossman, Michael (2004) “Writing and Presenting Scientific Papers”, 2nd edition, Nottingham University Press, (ISBN 1-897676-12-3).
- Clare, J & Hamilton, H (2003) “Writing research transforming Data into Text”, Churchill Livingstone (ISBN 0443071829).
- HINARI Publishing Skills Web-bibliography 11 2007
- Essential Health Links/Publishing Skills
<http://www.healthnet.org/essential-links/publishing-skills.html>