How to Write an Effective Technical Paper

Saifur Rahman, PhD
President, IEEE Power & Energy Society 2018 & 2019
Professor, ECE Department, Virginia Tech, USA

Invited Talk, IEEE PES Student Chapter
Georgia Tech, 28 January 2021
Webinar Speaker,
Saifur Rahman, Ph.D.
Professor and Director
Virginia Tech Advanced Research Institute

Education
M.S., Electrical Sciences, State University of New York at Stony Brook, 1975.
B.Sc., Electrical Engineering, Bangladesh University of Engineering and Technology, Dhaka, 1972

Professional Society Activities
- IEEE Member since 1975, Fellow 1998, Life Fellow 2014
- President, IEEE PES, 2018-2019
- Vice President, Publications, IEEE, 2006
- Editor-in-Chief, IEEE Transactions on Sustainable Energy, 2010-2012
- Launched, the IEEE Power & Energy Technology Systems Journal (Open Access), 2014
Writing Quality Technical Papers (Webinar)

Authoring Webinar

Presenter
Saifur Rahman, Ph.D.
Professor and Director
Virginia Tech Advanced Research Institute

Education
M.S., Electrical Sciences, State University of New York at Stony Brook, 1975.
B.Sc., Electrical Engineering, Bangladesh University of Engineering and Technology, Dhaka, 1972

Professional Society Activities
- IEEE Member since 1974, Fellow 1998
- Vice president, Publications, IEEE PES, 2001-2003
- Vice President, Publications, IEEE, 2006
- Editor-in-Chief, IEEE Transactions on Sustainable Energy, 2010-2012
- Vice President, Publications, IEEE PES Publications Board, 2012-2013
- Launched, the IEEE Power & Energy Technology Systems Journal (Open Access), 2014
Audience
1. Are you writing this paper for the sake of writing a paper?

2. Or do you want to show how others can benefit from your work?
Who writes scientific papers?

- Engineers, scientists, educators and researchers from:
  - Corporations
  - Academia
  - Government

- Students typically write and present conference papers before submitting journal articles
Audience

What IEEE editors and reviewers are looking for

- Content that is appropriate, in scope and level
- Clearly written original material that addresses a new and important problem
- Extension of previously published work
- Valid methods and rationale
- Illustrations, tables and graphs that support the text
- References that are current and relevant to the subject
Audience

How does the review process work?

• Editor-in-Chief gets the paper after it goes through content match check (iAuthenticate) and “banned author” check
• If the paper is in scope for the journal, it is assigned to an editor (associate editor)
• Editor assigns the paper to five or more reviewers
• Reviewers send their comments back to the editor
• Editor makes a recommendation to the EIC as follows:
  o Accept
  o Revise & Resubmit
  o Reject
• The EIC makes the final decision and informs the corresponding author
Audience

Why IEEE editors and reviewers reject papers

- The content is not a good fit for the publication
- There are serious scientific flaws:
  - Inconclusive results or incorrect interpretation
  - Fraudulent research
- It is poorly written
- It does not address a big enough problem
  or advance the scientific field
- Most of the work was previously published
- The quality is not good enough for the journal
- Reviewers have misunderstood the article
Structure
Paper Structure

Elements of a manuscript

Title
Abstract
Keywords
Introduction
Methodology
Results/Discussions/Findings
Conclusion
References
An effective title should...

- Answer the reader’s question: “Is this article relevant to me?”
- Grab the reader’s attention
- Describe the content of a paper using the fewest possible words
  - Is crisp, concise
  - Uses keywords
  - Avoids jargon
Title Dos and Don’ts

A Human Expert-based Approach to Electrical Peak Demand Management

VS

A better approach of managing environmental and energy sustainability via a study of different methods of electric load forecasting
Paper Structure

Abstract

A “stand alone” condensed version of the article

- No more than 250 words; can use past or present tense
- Uses keywords and index terms
The objective of this paper was to propose a human expert-based approach to electrical peak demand management. The proposed approach helped to allocate demand curtailments (MW) among distribution substations (DS) or feeders in an electric utility service area based on requirements of the central load dispatch center. Demand curtailment allocation was quantified taking into account demand response (DR) potential and load curtailment priority of each DS, which can be determined using DS loading level, capacity of each DS, customer types (residential/commercial) and load categories (deployable, interruptible or critical). Analytic Hierarchy Process (AHP) was used to model a complex decision-making process according to both expert inputs and objective parameters. Simulation case studies were conducted to demonstrate how the proposed approach can be implemented to perform DR using real-world data from an electric utility. Simulation results demonstrated that the proposed approach is capable of achieving realistic demand curtailment allocations among different DSs to meet the peak load reduction requirements at the utility level.

**Vs**

This paper presents and assesses a framework for an engineering capstone design program. We explain how student preparation, project selection, and instructor mentorship are the three key elements that must be addressed before the capstone experience is ready for the students. Next, we describe a way to administer and execute the capstone design experience including design workshops and lead engineers. We describe the importance in assessing the capstone design experience and report recent assessment results of our framework. We comment specifically on what students thought were the most important aspects of their experience in engineering capstone design and provide quantitative insight into what parts of the framework are most important.
Use in the Title and Abstract for enhanced Search Engine Optimization
Paper Structure
Introduction

- A description of the problem you researched
- It should move step by step through:
  - Generally known information about the topic
  - Prior studies’ historical context to your research
  - Your hypothesis and an overview of the results
  - How the article is organized

- The introduction should be:
  - Specific, not too broad or vague
  - About 1-2 pages
  - Written in the present tense
Problem formulation and the processes used to solve the problem, prove or disprove the hypothesis

Use illustrations to clarify ideas and support conclusions:

- **Tables**
  - Present representative data or when exact values are important to show

- **Graphs**
  - Show relationships between data points or trends in data

- **Figures**
  - Quickly show ideas/conclusions that would require detailed explanations
Paper Structure

Results/discussion

Demonstrate that you solved the problem or made significant advances

Results: Summarizes the Data
- Should be clear and concise
- Use figures or tables with narrative to illustrate findings

Discussion: Interprets the Results
- Why your research offers a new solution
- How can it benefit other researchers professionals
**Paper Structure**

**Conclusion**

- Explain what the research has achieved
  - As it relates to the problem stated in the Introduction
  - Revisit the key points in each section
  - Include a summary of the main findings and implications for the field
- Provide benefits and shortcomings of:
  - The solution presented
  - Your research and methodology
- Suggest future areas for research
Support and validate the hypothesis your research proves, disproves or resolves.

There is no limit to the number of references.

But use only those that directly support your work (about 30).

Ensure proper author attribution.

Author name, article title, publication name, publisher, year published, volume and page number, Digital Object Identifier (DOI).
Who should be on the Authors’ list

**A Report**

A report documents in detail the work done including results for a project and has a lead author and other multiple authors.

**A Technical Paper**

- It highlights one or more aspects of a report
- Multiple papers can come out of one report
- Include any and all who have contributed to the writing of the paper
- Others can be acknowledged
Ethics
**Ethics**

**Types of misconduct**

**Conflict of Interest**
- A financial or other relationship with the publication at odds with the unbiased presentation of data or analysis.

**Plagiarism**
- Copying another person’s work word for word or paraphrasing without proper citation.

**Missing Author Attribution**
- Must be given if you use another author’s ideas in your article, even if you do not directly quote a source.
**Ethics**

**Ethical publishing**

**Plagiarism**

- Avoid plagiarism
  - Cite and separate any verbatim copied material – *but how much?*
  - Paraphrase other’s text properly, and include citation
  - Credit any ideas from other sources
  - Familiarize yourself with IEEE Policies

Refer to our Tips Sheet
Ethics

Ethical publishing

Duplication, Redundancies & Multiple Submissions

- Author must submit original work that:
  - Has not appeared elsewhere for publication
  - Is not under review for another refereed publication
  - Cites previous work
  - Indicates how it differs from the previously published work
  - Authors MUST also inform the editor when submitting any previously published work

Refer to our Tips Sheet http://www.ieee.org/publications_standards/publications/authors/plagiarism_and_multiple_submissions.pdf
Where to Publish?
Traditional Journals -
Articles available through subscription

Open Access Journals –
Author pays, free download

Hybrid Journals –
Most articles are traditional, some are open access (author preference)
Open Access Publications
Next Steps

Open Access Opportunity for IEEE Authors (Author pays model)

IEEE provides 3 open access publishing options to meet the varying needs of authors:

• New multidisciplinary journal, IEEE Access
• 100+ Hybrid journals
• Fully open access topical journals

http://open.ieee.org/
PES Full Open Access Option #1

IEEE Open Access Journal of Power and Energy

- Will start publishing articles from January 2020
- Existing OA Journal of Power and Energy Technology Systems will be rebranded with this new name, scope covering the entire field of PES for both practice-oriented and academic articles
- Article processing charge subsidised at US$1350
- Between 10-15 articles each year will receive further subsidy depending on authors' affordability/circumstances
PES Full Open Access Option #2

A dedicated section on Power & Energy for publishing papers in the PES field in IEEE Access

- The section will start from January 2020, submissions started in September 2019
- Paper will be handled by 3 PES-appointed Editors
- APC: US$1750
Impact Factor
Are we depending too heavily on Impact Factors?
Impact Factor from Journal Citation Reports

Journal Citation Reports
The recognized authority for evaluating journals

Description:

Journal Citation Reports® offers a systematic, objective means to critically evaluate the world’s leading journals, with quantifiable, statistical information based on citation data. By compiling articles' cited references, JCR helps to measure research influence and impact at the journal and category levels, and shows the relationship between citing and cited journals. Available in Science and Social Sciences editions.

To find out more, visit us on the Web of Science™ website
Impact Factor is not necessarily enough of a metric

Other attributes:

• Journal’s reputation in the community is important
• For new and lesser known journals – look at the editorial board, their reputation
Other ways of judging a journal’s value to the engineering community

1. **Number of Downloads** (IEEE uses this information for revenue distribution)

2. **Patent Citations** (Available from IEEE)
Follow-up Steps
Process of Writing the Paper

- Discuss the content among team members
- Literature search – Reference List
- Description of the Experiment/Model
- Results/Discussion
- Write the Conclusion
- Collect the components – Prepare the draft
- All members comment on the draft
- Produce the final copy
Thank you!