# Writing a Research Paper: From the Parts to the Whole

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# Writing a Research Paper: From the Parts to the Whole

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## Abstract

*Good research paper writing can be made much simpler than most people think, provided a few important principles are kept in mind. We cover these principles here, as we go through a brief description of the successive parts of a typical research paper. We hope this will help young researchers achieve in a short time the high standards expected at top international journals and conferences.*

The tradition of research paper writing and peer reviewing dates back to 1665, when Henry Oldenburg, the German tutor of Charles Boyle's nephew, inspired Great Britain's Royal Society to start to publish the Philosophical Transactions (Boorstin, 1988). The "parliament of scientists" resulting from this "network of correspondence" became the universal scientific community of our days (Boorstin, 1988). In spite of the many centuries passed since the inception of the Philosophical Transactions, we still observe its basic model, which gradually materialized into a small and universally agreed set of principles. Any scientist from any part of the world who becomes familiar with those principles will become a natural member of the worldwide parliament of scientists. He, or she, must, however, be able the master the principles. The aim of this text is to revisit the principles in the context of a simulated research paper that concentrates on how to write research papers. To keep it short and easily actionable, the paper covers only two main sections, one devoted to the description of the conventional components of a research paper, and another that discusses some additional considerations.

## The Components of a Research Paper

The components of a research paper are presented here in the order in which they are read. This order may not correspond, however, to the order in which most papers are written. In practice, as we shall see, the introduction to the paper and the final version of the abstract are often the last parts to be written.

*Title*. The title describes in a logical, rigorous, brief and grammatically sound way the essence of the paper. Sometimes it is made up of two parts, the title and a sub-title, separated by a colon, as in the case of this paper.

*Author and affiliation*. The name of the author (or authors) is given below the title, followed by the indication of the institution to which the author belongs. The email address of the author is often also required.

*Abstract*. The abstract should not exceed 200 words, and should clarify very concisely, but not telegraphically:

1. The work the authors did, which is described in the paper.
2. How the authors did it, if relevant (the method).
3. The key results (numerically, if possible).
4. The relevance and impact of those results.

It should be kept in mind that the abstract is not an introduction to the paper, but a description of its whole in a concise way that highlights all the relevant points. It must be written discursively, rather than as a list of topics, and it should get into the subject straight off, with no introductory circumlocutions or fill-in expressions. It must also be self-contained, so that it can be freely reproduced in collections of abstracts, and it must not include any references.

*Keywords*. To facilitate searching online for papers on a topic or set of topics, it is helpful if each paper includes a short list of the keywords, or index terms, that better describe these topics. If you chose a good selection of keywords, your paper will be more easily found on digital libraries and on the Web. For this reason, you should select keywords that are both faithful to the topics of your paper and general enough to be used by anyone looking for your paper. A good rule of thumb is to choose the keywords you would use to find quickly on the Web a paper exactly like yours.

*Introduction.* The introduction should characterize the context for the proposal you present in your paper and should describe:

1. The nature of the problem you address in the paper,
2. The essence of the state of the art in the domain of the paper (with bibliographic references),
3. The aim of the paper and its relevance to push forward the state of the art.
4. The methods used to solve the problem, and
5. The structure of the paper, describing briefly its successive sections.

*Body of the paper.* The body of the paper is the description, through various sections and paragraphs, of all the relevant points of the work explained in the paper. The designation "body of the paper" is used here to refer to the collection of sections and paragraphs that make up the core of the paper. The body of this paper has only two sections: "The Components of a Research Paper" and "Additional Considerations".

*Conclusions.* The conclusions must be stated clearly, and should cover:

1. A summary of what you have achieved with the work you describe in the paper, stressing its novelty and relevance.
2. An assessment of the advantages and limitations of the proposals you have presented in the paper.

When justified, it should also include:

3. A description of possible applications and implications of the results presented in the paper.
4. Recommendations for future work.

*Acknowledgement.* A good paper often results from the commitment of many people beyond the authors (members of the research team and friends who contributed one way or the other), and this commitment should be acknowledged. When the research activity leading to the paper is totally or partially financed by external institutions, their support should also be acknowledged, even when they do not explicitly request it.

*References.* The references correspond to the list of papers, book chapters, books, and other bibliographic elements that have been referenced throughout the paper. Various referencing guidelines exist. This paper follows those of the American Psychological Association (APA, 2009), but you must use the guidelines of the journal or conference where you intend to publish.

## Additional Considerations

*Language.* Badly written papers tend to loose their scientific credibility almost instantly. For this reason, the authors who are not used to write in English should make sure their papers are revised by knowledgeable English writers.

*Relevance.* Your paper must be clearly relevant to the audience of the journal or conference where you intend to publish it. Otherwise, you are likely to have it rejected by the reviewers.

*Rigor.* There is no room in a research paper for unsupported expressions of belief. Every single claim of your paper must be fully supported by empirical or analytical evidence, or by the authority of a reputable source. Any source you refer to must be mentioned in the text and included in your reference list. You should avoid by all means the use of sources (namely those found on the Internet) whose scientific reputation is unknown.

*Abstract.* The abstract convinces the reader that the paper is worth reading. This is why it should be made as objective, readable and catching as possible, in spite of its small length.

*Introduction.* The introduction must be able to grab the interest of the reader, from the very first sentence, into the second sentence, the third, and so on. A dull introduction is halfway to losing the readers even before they start getting to the substance of the paper. To save time and preserve flexibility, it may be useful to write the introduction only when the rest of the text is finished. This is so because writing is, to as large extent, a sort of experimental ground that helps us structure our own thoughts. As we write, the text tends to gain a life of its own, and often ends up becoming much different (and much better) than originally intended. This means that there is no point in writing the introduction (or producing the final version of the abstract) of a text that we do not know yet how it is going to become.

*Conclusions.* Most authors write the conclusions in a hurry, when they are already tired of their paper and anxious to get it out of their sight. This is a bad practice because most of the impression the readers keep in their minds, after reading a paper, is (re)built by the conclusions. The conclusions should, thus, be written with a fresh mind and with the concern of leaving a structured and lasting favorable impression in the mind of the reader.

*Self-referencing.* Authors should avoid unnecessarily referencing themselves. A paper is a humble, hopefully solid, contribution to the progress of human knowledge in a given field, usually inspired by the contributions of many other authors. It should not be seen as fanfare of the author's past achievements or as a stage where the spotlights are turned to the author in detriment of the credits due to other, earlier, authors. Of course, if some of the author's former work is essential to understand the paper, it should by all means be referred to, but this should be done with discretion and elegance.

## Conclusions

We have quickly gone through the successive steps of a research paper, describing the role played by each one of its parts and offering simple hints on how their effectiveness, impact, and appeal can be greatly improved. We hope that this will help young authors get their papers together in a short time, while achieving a high level of paper quality. The small size we have intentionally imposed upon our paper obviously leaves out many more elaborate principles, but, following a corollary of Pareto's law, we have tried to make sure that the readers would become aware of the 20% of paper writing principles that let them achieve 80% of the desired effectiveness, impact, and appeal.

# References

Boorstin, D. J. (1988). *The discoverers* (1st ed.). Random House USA Inc.

APA (2009). *Publication Manual of the American Psychological Association* (6th ed.). American Psychological Association.

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