Guide to writing journal and conference abstracts

Despite their short length, many researchers find abstracts difficult to write. Abstracts usually follow the general structure of the research paper. However, different fields may omit some of these categories. Some fields or highly specialized journals may not have a concluding sentence or much background introduction. Instead, they might just focus on the results of the paper.

9.1. Framework for the structure of the abstract

<table>
<thead>
<tr>
<th>Structure</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Introduction</td>
<td>These introduction characteristics may not appear in order. Some engineering papers may start with a significant result and then describe the method.</td>
</tr>
<tr>
<td>A. Background of the research</td>
<td></td>
</tr>
<tr>
<td>B. Research problem or research question</td>
<td></td>
</tr>
<tr>
<td>C. Gap or lack of research in the field</td>
<td>More common in social sciences and almost required in dissertation writing to show that your work is a significant document that contributes knowledge to your field.</td>
</tr>
<tr>
<td>D. Purpose of the paper</td>
<td>Many sciences and engineering abstracts do not have much background, but start with the purpose of the research or even the method.</td>
</tr>
<tr>
<td>E. Description of the paper</td>
<td>Summarizes what the paper does.</td>
</tr>
<tr>
<td>2. Methods</td>
<td>Methods sections are relatively longer in dissertations.</td>
</tr>
<tr>
<td>3. Results</td>
<td>Many scientific abstracts concentrate more on the results rather than the introduction or conclusion.</td>
</tr>
<tr>
<td>4. Conclusion</td>
<td>Main contribution of the paper. May be hard to distinguish from results.</td>
</tr>
<tr>
<td>F. Blueprint: introduction of topics or issues that will be discussed</td>
<td>More likely in papers that are not based on an experimental design and in business or social sciences.</td>
</tr>
<tr>
<td>G. Recommendations</td>
<td>More common in other fields, but recommendations for building codes or standards occur in engineering.</td>
</tr>
<tr>
<td>H. Implications for the field</td>
<td>Importance of the results for the field as a whole. Results and conclusion may be mixed together in some abstracts.</td>
</tr>
</tbody>
</table>

To show how the framework in 9.1 can be used for the analysis of abstracts, a sample from a journal and a dissertation have been analyzed here.

9.1.1 Example of a journal article abstract analyzed
1. Abstract — Language is grounded in sensory-motor experience. Grounding connects concepts to the physical world enabling humans to acquire and use words and sentences in context.

Currently most machines which process language are not grounded. Instead, semantic representations are abstract, pre-specified, and have meaning only when interpreted by humans.

We are interested in developing computational systems which represent words, utterances, and underlying concepts in terms of sensory-motor experiences leading to richer levels of machine understanding. A key element of this work is the development of effective architectures for processing multisensory data.

Inspired by theories of infant cognition, we present a computational model which learns words from untranscribed acoustic and video input.

Channels of input derived from different sensors are integrated in an information-theoretic framework. Acquired words are represented in terms of associations between acoustic and visual sensory experience.

The model has been implemented in a real-time robotic system which performs interactive language learning and understanding. Successful learning has also been demonstrated using infant-directed speech and images.


<table>
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<tr>
<th>9.1.2 Suggested analysis of a conference abstract</th>
</tr>
</thead>
<tbody>
<tr>
<td>This paper proposes energy efficient real-time multi-task scheduling (EDF and RM) algorithms by using buffers.</td>
</tr>
<tr>
<td>The buffering technique overcomes a drawback of previous approaches by utilizing the slack time of a system fully.</td>
</tr>
<tr>
<td>It increases the CPU utilization and averages the workload of a system, so it enhances the effectiveness of the DVS technique.</td>
</tr>
<tr>
<td>We target multimedia applications where a slight buffering delay is tolerable within a latency constraint. We modify the state transition and queue handling mechanism of multi-task scheduling in the kernel.</td>
</tr>
<tr>
<td>In experiments, our algorithms achieve up to 44% of energy consumption saving for EDF scheduling and 49% for RM scheduling with realistic task set configurations and reasonable machine specifications.</td>
</tr>
</tbody>
</table>

Source: Im and Ha: LCTES’04, June 11–13, 2004, Washington, DC, USA
### 9.1.3 Suggested analysis of a Ph.D. student dissertation from the US

<table>
<thead>
<tr>
<th>The majority of Web site design literature mainly concentrates on the technical and functional aspects of Web site design.</th>
<th>1.A. Background</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is a definite lack of literature, in the IS field, that concentrates on the visual and aesthetic aspects of Web design.</td>
<td>1.C. Lack or “gap” in research</td>
</tr>
<tr>
<td>Preliminary research into the relationship between visual design and successful electronic commerce Web sites was conducted.</td>
<td>1.E. Description</td>
</tr>
</tbody>
</table>

The emphasis of this research was to answer the following three questions. What role do visual design elements play in the success of electronic commerce Web sites? What role do visual design principles play in the success of electronic commerce Web sites? What role do the typographic variables of visual design play in the success of electronic commerce Web sites?

Forty-three undergraduate students enrolled in an introductory level MIS course used a Likert-style survey instrument to evaluate aesthetic aspects of 501 electronic commerce Web pages. The instrument employed a taxonomy of visual design that focused on three dimensions: design elements, design principles, and typography. The data collected were correlated against Internet usage success metrics data provided by Nielsen/NetRatings.

Results indicate that 22 of the 135 tested relationships were statistically significant. Positive relationships existed between four different aesthetic dimensions and one single success measure. The other 18 significant relationships were negatively correlated. The visual design elements of space, color as hue, and value were negatively correlated with three of the success measures. The visual design principles of contrast, emphasis radiated through contrast, and contrast shape were negatively correlated with three of the success measures. Finally, the typographic variables of placement and type size were both negatively correlated with two of the success measures.

This research provides support to the importance of visual design theory in Web site design. This preliminary research should be viewed as a realization of the need for Web sites to be designed with both visual design theory and usability in mind.


### 9.2. BEST PRACTICES: Abstract writing

**BEST PRACTICES 9.2.1** Choose the journal or conference BEFORE you write the abstract.

The type of journal or conference should affect how you write the title, the abstract, and the introduction of your paper. A multidisciplinary or more general journal might require you to give more general background. Some famous journals like *Nature* do not even have traditional...
abstracts, but longer summaries for a more general reader instead. Other journals have different word limits for abstracts.

**BEST PRACTICES 9.2.2** Check the author guidelines carefully

Each journal will have “information for authors” that will tell you the number of words the abstract should be and often even the number of keywords for the journal, which is usually around five.

Many organizations have official lists of keywords or index words for their own field. Check a website from an engineering organization in your field to find them. Due to the increase in electronic publication and computer searching, keywords are becoming more and more important.

**BEST PRACTICES 9.2.3** Understand the real purpose of an abstract

There are three reasons to write an abstract:

1) To get someone to read your paper.
2) To get someone to accept your paper for a conference.
3) To get someone to come to your presentation.

An abstract does more than just summarize the paper. You need to persuade the reader or conference attendee that you have something new and significant to talk about. It shows the relationship between your own research and what is important in your field of study.

**BEST PRACTICES 9.2.4** Represent each section of the paper with at least one line in the abstract

It is a good idea to follow the same pattern as your paper when you write the abstract and you will produce more structured writing. Although not required, it is good practice for each section of the paper (method, results etc.) to be described by at least a line in the abstract.

**BEST PRACTICES 9.2.5** Clearly define the research problem or purpose of the research

Although not absolutely required, it is a good idea to clearly define the research problem or purpose of the research. The beginning of this computer engineering abstract clearly shows the research challenge taken on in this paper, and helps the reader understand the importance of the field.

**EXAMPLE**

Abstract—The quality of service limitation of today’s Internet is a major challenge for real-time voice communications. Excessive delay, packet loss, and high delay jitter all impair the communication quality. A new receiver-based playout scheduling scheme is proposed to improve the tradeoff between buffering delay and late loss for real-time voice communication over IP networks.

Write the abstract as if the rest of the paper did not exist

“Because the abstract will be published separately by abstracting services, it must be complete and understandable without reference to the text.”
Source: Journal of Infection and Immunity author guidelines.

- Some review or abstracting journals consist only of abstracts. Researchers also read abstracts to keep up with what is happening in the field and may not read your article at all.
- If you spell out an abbreviation in the abstract such as voice over Internet protocol (VoIP) you must spell it again in the introduction. If you do not repeat the abbreviation in the abstract, you do not need to introduce the abbreviation until the introduction section.
- Don’t include references except when talking about research instruments or giving the name of a model or theory. How could anyone find the references without referring to the paper? The instructions for submissions for a few extended abstracts for conferences may ask for or require references, but this is an exception.
- Define new terms, abbreviations, or theories that are not well-known in your field in both the abstract and the introduction.

Emphasize how your research is new or different from previous work

Many papers have a neutral title and do not even mention that a new method is being introduced. The purpose of a paper is to show that you have made a contribution to the field. The abstract below clearly states to the reader that something new was found in the paper.

EXAMPLE
Abstract: Direct experimental evidence that can be unambiguously attributed to the need of an ensemble of a minimum number of neighboring Pt atoms for methanol electro-oxidation has been observed for the first time. This was realized by a Pt coverage-dependent investigation of methanol and …

State directly what you found rather than discuss what the paper will talk about

Avoid wasted words such as “the results are discussed.” Why wouldn’t you discuss the results; it is a research article! It is clear that the editor of this journal is tired of receiving abstracts that are not precise.

“It should not contain literature cites, reams of data, or meaningless clauses such as 'the results are discussed'.”
Source: http://www.int-res.com/journals/ame/ameInstruct.html

Instead report directly what you found with as much detail as possible within the word limit. The following sentence provides very little information for the reader to evaluate the paper. What does “effectiveness” mean here exactly? How effective is it compared to the detailed result given below.

EXAMPLES
Simulation results showing the effectiveness of our proposed approach are discussed.

The proposed method significantly reduces the number of sinusoidal operations and multiplications in computing the coefficients of ART. Moreover, the memory requirements needed to store the ART basis functions in lookup tables are only 25% of the conventional method.


**BEST PRACTICES 9.2.9** Make a clear connection between research in your field and your article

Although not required, the best written abstracts often discuss the importance and relationship between the results and the greater field of research. What are the implications of your research? Areas for future research? Practical applications of your research? Recommendations?

**EXAMPLE**
As a result of the study, use of an experimentally verified finite element technique in conjunction with fatigue crack growth experiments is suggested as a potential means of developing future crack growth rate models in terms of the traditional fatigue parameters of strain range and mean strain.


**BEST PRACTICES 9.2.10** Show “gaps” in previous research

Although it is more common in dissertation and thesis abstracts, and in social sciences, it is useful to show a “gap” (Swales and Feak, 2004) or a lack of research concerning a problem that is the focus of your research paper. This structure can be found in introduction sections as well.

**EXAMPLE**
Fatigue may occur in undercarriages and support systems of trailers, haymakers, graders and swing-ploughs made up of thin-walled tubular sections with wall thicknesses less than 4 mm. Little research has been done on the fatigue of thin-walled tubular sections below 4 mm thickness. The weld profile and weld undercut may affect the fatigue crack propagation life of welded joints especially for thin-walled sections.


**BEST PRACTICES 9.2.11** Explain the background and research problem in one or two sentences for non-experts

According to research, authors regularly overestimate the specialist knowledge of their readers. Potential readers of your research may be graduate students, people with backgrounds in other areas of your field, researchers doing cross-disciplinary work who are not specialists in one field, or managers looking for new ideas in applied fields. Not everyone reading your paper will be a research specialist in your field.
There are many ways to start an abstract in engineering. Unlike the social sciences, some abstracts begin with a sentence describing the purpose or main result of a paper. However, it is generally a good idea to first give a sentence of background information before discussing the results. A simple present statement of fact, a formal definition, or a sentence reviewing the state of the art with a present perfect tense verb is often used. The first line of the abstract or the first paragraph of an introduction can describe the background information or current situation in the field to help the reader understand why the author's study is important.

One verb tense that is difficult for many Korean speakers is the present perfect verb tense or present perfect passive. It is used to give background information that is not specific to one time in the past, but gives a general overview of the field. It is formed as follows:

PRESENT PERFECT: has / have + past participle + ed for regular verbs

EXAMPLE
The addition of salts has been reported to shift chromatograms of coal-derived liquids to longer elution times (i.e. smaller molecular masses). The observation has been attributed to the disagglomeration of sample molecules. The aim of this work is to investigate whether size exclusion chromatograms (SEC) obtained, using NMP (1-methyl-2-pyrrolidinone) as eluent, are free from sample agglomeration.


Links
This page compares how to use present perfect tense vs past tense: http://web2.uvcs.uvic.ca/elc/studyzone/410/grammar/ppvpast.htm

This page gives clear information on when and how we use the present perfect: http://www.englishpage.com/verbpage/presentperfect.html

See GRAMMAR POINT 6.3.1 in the chapter on writing introduction sections for more detail on how to use the present perfect.

Sentences indicating missing areas or “gaps” in research in the field usually start with an unusual and difficult grammar structure with no article. This is one time when you don’t have to worry about articles! In fact, you shouldn’t use them if you are indicating a lack of research:

There is an important difference in meaning between
1. There are few computers (not much, not enough).
2. There are a few computers (some, maybe enough).

Use Little/Few/No/None of these... in the beginning of a sentence to indicate a gap.
Source: (Swales, 2004 p.258)
EXAMPLES

- However, no study has combined the methods effectively ...
- Few studies, however, have examined the effects of …, and none, to our knowledge, have compared ...

**GRAMMAR POINT 9.3.3** Grammar for certainty of results/conclusion statements

The last line of the abstract often contains a sentence that summarizes the main result or conclusion. The grammar of describing results is quite difficult, however. The degree of certainty in results/conclusions runs from the present tense to various modal forms to indicate the certainty of the conclusions. In natural sciences and engineering where data is mathematically tested or simulated, there is a greater tendency to use the present tense.

Generally, those fields that have fewer variables or variables that can be controlled in the laboratory or simulated mathematically are much more likely to use the present tense to give their conclusions. Fields like the social sciences involving human beings, or natural processes that are hard to isolate as in life sciences and medicine, are more likely to use modal or other weaker forms (may, tend to, suggests, etc) to discuss results. In this sense, biology is more similar to education than engineering.

See GRAMMAR POINT 8.8.6 for details on the use of words like “can” and “could” in concluding sentences.

### 9.4. Common abstract writing mistakes

1) **Holding back significant points or information to try to get the reader to read the article.**
   An abstract is not a mystery story. Rather, it should contain all the significant points of the article.

2) **Including references such as (Kim et al., 2000) or [1] or ¹ in the abstract.**
   Only very few conferences may ask for conference abstract proposals that include references.

3) **Including paragraphs**
   Since abstracts are put in databases, they don't usually have paragraphs. Even most 350 word dissertation or thesis abstracts don't have paragraphs. Individual university departments may be flexible, however.

4) **Wasting introduction sentences**
   Although it is a good idea to give a sentence or two of background information in an abstract, a lead sentence should not be too general; it should include the topic of your paper. Here is an example of a wasted first sentence. The statement is too general and there is not enough information to give the reader the purpose of the paper.

   **EXAMPLE**
   “The Internet is becoming increasingly important for business these days.”

5) **Using the same sentence for the first line of the abstract and the first line of the introduction.**
It is considered poor writing style.

9.5. Frequently asked questions

9.5.1. How can I count the number of words for my abstract?
The computer can automatically count the number of words for you. First, highlight the text you want to count with your cursor. Then in the MS WORD menu, select Tools -> Word count.

9.5.2 How long should an abstract be?

Almost all English thesis and dissertation abstracts I receive at the writing center are too long. Here are the word limit guidelines for the Proquest database for dissertations. You might be surprised about the length requirements.

“An abstract of not more than 350 words for dissertations or not more than 150 words for master's theses should accompany the manuscript. Also, a completed agreement form should accompany the material.”
Source: http://www.proquest.com/products_umi/dissertations/gradefault.shtml

General guidelines
- Journal articles range from short communications or letters with abstracts ranging from 50-125 words to full length articles with abstracts of around 150-250 words.
- Conference abstracts: 150-600 words
- Master’s thesis: 150-300 words
- Dissertation: 350 words see http://wwwlib.umi.com/dissertations/ for examples
- However, always check the author guidelines for the journal or conference and check with your department for thesis or dissertation guidelines.

9.5.3 Why pay attention to word limits?

1) The journal or publisher’s website might reject your manuscript.

“Please take note of Abstract word limits - Manuscript Central will not accept any abstracts exceeding this word count [200].”
Source: http://www.blackwellpublishing.com/submit.asp?ref=1600-6135

2) Other indexing services or review journals of abstracts may simply cut your abstract off after the word limit.

See PROQUEST http://wwwlib.umi.com/dissertations/ for examples of US dissertations, which are only 350 words and some have simply been cut off at the word limit.

3) It makes you look more professional as a scholar.

Links
How to write an abstract, from Professor Koopman of Carnegie Mellon University
http://www.ece.cmu.edu/~koopman/essays/abstract.html
This website contains examples of thesis and dissertation abstracts and the first 24
pages of dissertation introductions in a wide range of fields for study and analysis.
Other abstract writing links
http://www.rpi.edu/dept/llc/writecenter/web/abstracts.html
http://darwin.bio.uci.edu/~sustain/Abstract.html

This checklist may help when writing your abstract for full journal articles that have an
experimental structure.

9.6. Abstract writing checklist

1. I have found and followed the “guidelines for authors” from the journal website.

2. The abstract is the correct number of words.

3. I have written my abstract as a complete text. The reader can understand the key results of
   my research without reading the whole paper.

4. The main keywords or index words are contained in the title and abstract.

5. I have used as many index words as possible (usually 5) to make it as easy as possible to
   search my article online. I have consulted the official keywords in my field if if appropriate. I
   have included both general (for non-specialists) and specific (for specialists) key words for
   interdisciplinary journal papers.

6. I have fully spelled any abbreviations that should be spelled in my field. I have reintroduced
   those abbreviations in the introduction since the abstract should be written as a separate
document.

7. I do not include references from other individual papers directly in the abstract. I only
   describe my own research, well-known theories or methods, or problems of the field in
   general.

8. I have included a sentence describing the research methodology used in the paper.

9. I did not copy and paste any of the sentences from the paper directly into the abstract—
especially the first two sentences of the introduction.

10. There are no weak verbs such as “discuss,” or “examine,” or unclear terms such as
    “various methods.” I have described precisely how I did my research and what I found.

11. (Recommended but not required.) The sentences of my abstract follow the same general
    structure as the rest of my paper: introduction, methods, results, and discussion.

12. I have specifically stated the exact results, implications, and/or importance of the findings. I
    have quantified (used numbers or %) if possible.

13. In the first few sentences of the abstract, I have shown how my paper addresses a
    research problem, a limitation of previous methods, or an issue or “gap” in the research in my
    field (not required but a characteristic of well-written abstracts in any field).

This material is adapted from English Solutions for Engineering Research Writing http://www.hanyangowl.org

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