Writing Research Articles for Publication

AIT
Asian Institute of Technology

Writing Research Articles for Publication

Suggested citation:

Burrows, T. (2011). *Writing research articles for publication*. Unpublished manuscript, the Asian Institute of Technology Language Center, Khlong Luang, Thailand.

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Preface

This project began with a request for reference material which could assist Asian Institute of Technology students with the production of written, publishable research. Although it is impossible to create one volume which is accurate across all disciplines, an effort has been made to provide erudite and applicable information for anyone interested beginning to publish their scientific work.

Much gratitude is owed to those colleagues who contributed, directly or indirectly, to the final version of these materials.

This first major revision of the original document would not have been possible without feedback from the students who use it. Thanks guys.

Your comments, corrections, requests, suggestions, complaints, criticisms, and so forth may be directed to tylorb@ait.asia.

1. Introduction

What is scientific research?

The concept of research is familiar to most people, but it cannot be said that all people have the same understanding of what research is. Even dictionaries may include more than one definition, making a distinction between:

(1) a detailed study aimed at creation or discovery, and,
(2) the simple task of looking up information.

For scientists it is the first meaning, where deliberate processes are followed and something original has been designed or discovered, which is most accurate. That is to say, simply doing an Internet search for the term ‘what is global warming’, and reading a few websites on the topic, does not alone constitute research in the academic sense. This approach lacks process, and analysis, and does not contribute anything unique. A scholar, on the other hand, would perhaps begin answering the same question by narrowing the search to trusted sources, collecting a large set of relevant information, analyzing and synthesizing, then finally creating a new definition based on justifiable criteria. This approach is not necessarily limited to the sciences, but it is on scientific research that we will focus.

Scientific research in the twenty-first century, particularly in the so-called developed world, is based on the scientific tradition of Europe in the seventeenth century (Ziman, 1978, p.110). The work of 'natural philosophers' such as Galileo, Newton, Kepler, Bacon, Descartes and many others include not only what have become the fundamental principles of modern science, but contributed enormously to the ascendancy of the scientific method as we know it today. Challenging long held beliefs about the universe required that conclusions be drawn from observable and reproducible evidence obtained through systematic processes. In order for

conclusions to be accepted as fact, it was also necessary to share scientific work with other members of the community. This social aspect, whereby results are shared, reviewed, and criticized by fellow members of the academic community is another special characteristic of modern science (Ziman, 1978, p.110). The standard method for dissemination of research results across the academic community has become the academic or scientific journal.

What are scientific journals?

Philosophical Transactions of the Royal Society became the first published journal of science in 1665 (The Royal Society, 2010). Journals contain articles related to a broad field (*The International Journal of Engineering*), a sub-field (the *Power Engineering Journal)*, or may be interdisciplinary (the *Journal of Biomedics Optics*).

Journals belong to the family of publications called 'periodicals', due to the fact that they come out periodically; it is common for new journal issues to be released every one, two, or four months. In the past, journals were ordered through the mail, usually by paid subscription.

Today, journals are most easily accessed over the Internet, where some are freely available while others require subscription. Universities will often provide access to a variety of selected journals through their libraries; in electronic and/or hard copy formats.

The following list of journals is based on AIT fields of study.

Engineering and Technology

- *Journal of Construction Engineering and Management*
- *Journal of Geotechnical and Geoenvironmental Engineering*
- *Journal of Structural Engineering*

- *Journal of Transportation Engineering*
- *Journal of Irrigation and Drainage Engineering*
- *Disaster Management & Response*
- *Journal of Hydraulic Engineering*
- *IEEE/ASME Transactions of Mechatronics*
- *IEEE Embedded Systems Letters*
- *The Journal of Manufacturing Systems*
- *IEEE Transactions on Nanotechnology*
- *Journal of Computer Science and Technology*
- *IEEE Transactions on Software Engineering*
- *International Journal of Information Management*
- *Canadian Journal of Remote Sensing*
- *IEEE Transactions on Communications*
- *IEEE Communications Letters*

Environment, Resources and Development

- *Journal of Agricultural Engineering Research*
- *Aquaculture*
- *Journal of Energy Engineering*
- *Journal of Environmental Engineering*
- *Journal of Food Engineering*
- *Journal of Gender Studies*
- *Geography and Natural Resources*
- *Journal of Pulp and Paper Science*
- *International Journal of Sustainable Development and Planning*
- *Journal of Urban Planning and Development*

Business Administration

- *Business Process Management Journal*

What are journal articles?

Journals are composed of collections of academic articles, which are written by scholars and are usually read by other experts in the discipline. Journal articles can be written by anyone who has something to contribute to the field, and the type of article written will depend on the kind of information the writer wishes to share. Journal articles are often categorized as: empirical research articles, literature reviews, case studies, technical articles, theoretical articles, methodological articles, book reviews, or letters.

The most common of these is the empirical research article. These report original studies and include descriptions of why and how the work was done, as well as what was learned. Literature reviews, also very common, rely on the use of previously published materials only, but the author will read and combine these papers in order to contribute some new idea or perspective.

Journals frequently dictate the types of articles in which they are interested. According to their websites, for example: the *Journal of Nanotechnology* publishes research articles or review articles (2010); the *Journal of Animal Sciences* accepts research articles, literature reviews, technical notes, or letters (2010); and *Administrative Science Quarterly* publishes research articles, theoretical articles, or book reviews (2010). The kind of article written will depend on the work which has been done, and the target journal for publication.

In order to guarantee the quality of a journal, submitted writing undergoes a process of review by a committee of peers. These peers are people accepted as experts in the field of study, and have proven themselves capable as publishing researchers. The reviewers will decide whether the written article is satisfactory, needs revision, or unacceptable. Although the value of peer-review is under debate, it remains that internationally respected journals are those which utilize this system.

Why publish articles?

Doing research is a lot of work, which is probably one of the reasons that not everybody holds a masters or doctoral degree. Writing articles, especially for inexperienced authors, takes the difficult task of research and makes it even more complicated. However, veteran professors are no doubt familiar with the phrase 'publish or perish'; publication is essential.

In fact, publishing is important as one of the steps in the research process (Derntl, 2003), or even the ultimate aim of research (Day, 1988) because it is the primary means for researchers to contribute to the advancement of human knowledge.

Wellington (2003, p.1-5) provides a comprehensive discussion of personal outcomes of publishing, which include:

- **Improving your professional opportunities** - in the academic world obtaining, retaining, or advancing your position often demands published research. Having published also demonstrates that the writer is considered knowledgeable in the field and has the skills to complete the difficult task.

- **Influencing people** - your work will inform the leaders who create policy and make decisions, it will also make people more generally aware of the subject of your research.

- **Financial rewards** - as well as increasing job opportunities, researchers often have the opportunity to receive extra remuneration as a result of successful publication.

- **Personal rewards** – learning new skills, being a respected part of a community, feeling a sense of achievement, and being able to travel as a conference speaker are additional perquisites of publishing.

Regardless of what motivates an individual to undertake the arduous task of publication, it remains that any work which is original, interesting, and useful enough to undertake is probably publishable if it is written well enough and submitted to the appropriate journal.

We hope this manual will help you in preparing your manuscript.

About this book

The primary audience intended for this book is the Asian Institute of Technology research community, particularly the students, many of whom are non-native users of English. However, anyone interested in the subject will surely find this an invaluable guide

This is not a text on English for academic purposes, or a discussion about the process of research. The specific aim of this manual is to provide a convenient reference for AIT students with little, or no, experience in writing research. Within the AIT community, those interested in the process of choosing journals, submission, and review are encouraged to contact their advisors; those desiring more general help with their writing should contact the Language Center.

In order to get the most benefit from this manual it is advisable to have research papers from your field in order to see examples. A list of recommended papers from participating AIT professors is included as an appendix.

2. Reading Research

If I have seen further, it is by standing on the shoulders of giants.

- Sir Isaac Newton

It may seem strange to begin a book on writing with a chapter about reading. However, reading is a fundamental skill for the research writer because: research relies on the published work of others, reading will improve your writing (Yoshimura, 2009), and reading articles in a given discipline provides field-specific examples of good writing.

The following information is meant to improve reading skills needed for writing research. First, there are suggestions to help identify sources which are acceptable in an academic paper. After that is an outline of how research papers are organized and structured. Third is a discussion on how active readers can use papers from their field to guide their writing. Finally, there is a description of the kinds of language that everyone who reads research should know in order to easily understand an article.

Identifying sources

Modern science is in many ways an archive of written research. Every scholar bases their work on the published studies and ideas of those who came before them. It is often necessary to sift through huge amounts of text in order to find useful information. The following section is meant to assist in finding credible and useful sources quickly.

Credibility

All sources are not created equally, and credibility is the measure of how trustworthy something is. A large amount of cited information will make your paper more believable *only* if sources are credible. This is especially an issue with the increasing use of the Internet. While the Internet is a superb resource, the author's motivation and credentials must be considered. Private companies and individuals often have interests to protect and may be biased in selecting information to show the public. Credentials are also important as it is increasingly easy to add new information on wikis, blogs, and so on. As a general rule, it is best to take information from: government websites, intergovernmental organizations, university websites, and peer-reviewed journals. The following table is as a guideline for selecting credible online source.

Always acceptable	**Sometimes acceptable**	**Rarely acceptable**
peer-reviewed journal articles (i.e. *Nature)*	respected magazine (i.e. *National Geographic, Time*)	popular magazine (i.e. *Maxim, Elle*)
scholarly books (with original work)	textbooks (without original work)	popular books (not research based)
reports from respected organizations (i.e. *The United Nations*)	newspaper articles	public wikis (i.e. *Wikipedia, Wikidebate)*
Doctoral dissertations or masters theses	websites and blogs of recognized professionals (i.e. university lecturers)	personal or corporate websites and blogs
	encyclopedias	
	dictionaries	

Table 1 A comparison of possible sources for reference in research

Sometimes the author or organization is not clearly identified on the website. In this case, check the homepage for links to information about the author. If you have looked and are still not sure if a source is credible, it is best to ask your advisor.

Usefulness

Hubbuch (1996) lists several details to consider for books and articles, some of which are summarized below with brief explanations:

- First check the title and subtitle – here the author should have encapsulated the main topic of their writing.
- If the title is promising you can read the summary or abstract – this should provide an overall view of the text in a single paragraph.
- Before you continue, check the date of publication – information which is too old may be obsolete.
- Finally, consider the publisher – this is especially true of journals, which should be peer-reviewed and well-recognized by others in your field.

If the title, summary, date, and publisher are promising, the next step is to skim. Skimming is a special kind of reading where not every word is read; rather, only pieces of the text are quickly glanced in order to get a general idea of the contents. While practice is required to become a better skimmer, it is usually helpful to focus on: headings, topic sentences, and words in bold. For books it is useful to skim: the preface, table of contents, introduction, and conclusion. For articles, skim: the introduction, discussion, and conclusion (Hubbuch, 1996).

Online databases

Probably the best way to get information for an academic paper is through the use of online databases. These databases contain collections of journals which can be electronically searched, quickly and easily. University libraries often pay for subscriptions to databases for the convenience of students, faculty, and researchers.

The Asian Institute of Technology, for example, has a total of nine databases with free access to thousands of peer-reviewed journals, providing access to hundreds of thousands of documents including research articles. It is usually necessary to connect with these databases through a university Internet connection, or through the university library. Contact your library for details on how to freely access this incredible resource. Following are some example indexing databases.

- **Springer (**www.springerlink.com**)**
  Over 1750 peer-reviewed journals available online, aand other sources.

- **Science Direct (**www.sciencedirect.com**)**
  2500 peer-reviewed journals, as well as books and other sources.

- **Emerald (**http://www.emeraldinsight.com/index.htm**)**
  200 journals, and other products, with a strong emphasis on business.

- **The Institute of Electrical and Electronics Engineers (**http://ieeexplore.ieee.org**)**
  151 journals, in addition to books and other sources, focusing on electrical engineering, computer science and electronics.

- **The American Society of Civil Engineers (**www.asce.org**)**
  Over 7000 papers every year, in 33 different journals related to civil engineering.

Research article structure

Most research papers follow the same basic structure: Abstract, Introduction, Literature Review, Methodology, Results, Discussion, Conclusion, and References. The usefulness of this standard linear structure to the reader cannot be overstated; as Katz (2006, p.1) points out, it allows the reader to know "what to expect." If the reader knows the functions of each section of a paper, it becomes much easier to understand the meaning of what is written. Furthermore, understanding the structure of a text improves ability to read and write (Lems, Miller, & Soro, 2010).

While the structure of a research paper is largely fixed, there is some variation depending on the journal requirements (c.f. **With [academic] style**, page 65). Possible variations include: the literature review may be included in the introduction, the methodology may be called 'materials and methods', the methodology may be included at the end of the paper, the results and discussion could be together, or the discussion might be combined with the conclusion.

The IMRAD format is probably the most commonly used: Introduction (including literature review), Methodology, Results, and Discussion (including conclusions). Each section will be discussed again, in greater detail, in Chapter 5 of this book.

- An introduction will usually have three primary functions:

  (1) discussing the research area by referring to the relevant literature;

  (2) demonstrating an area where more information could or should be added to the literature; and,

  (3) outlining the current study in terms of research objective, main findings and/or structure (Swales & Feak, 1994).

- A methodology will provide a detailed description of exactly how the research was conducted (Day, 1988).

- Results will illuminate key findings and indicate where the complete data set is located (Cargill & O'Connor, 2009).

- A discussion will most often have four main parts:

  (1) a statement about the completed research with regard to the research question or problem;

  (2) mention of any problems or limitations related to the study design, methodology, analysis, or assumptions;

  (3) a comparison with similar studies; and,

  (4) a conclusion which outlines implications of the findings and recommends future research (Gustavii, 2008).

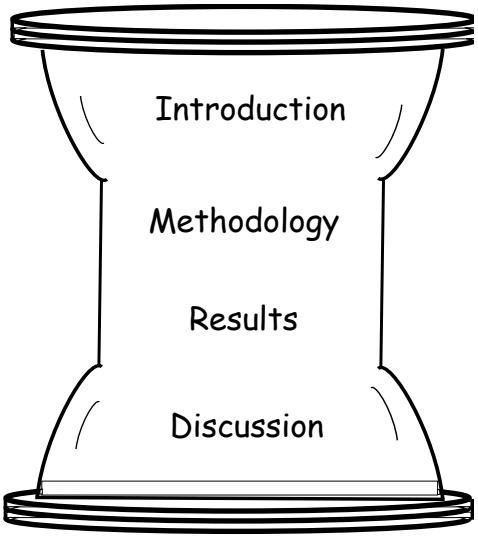

Figure 1 The hourglass model of a research paper

Variations of the 'hourglass' analogy have been used to display this overall framework (Cargill & O'Connor, 2009; Derntl, 2009; Hubbuch, 1996). Figure 1 illustrates how the introduction begins generally, and then narrows to a specific gap in the literature, finally stating the specific focus of the research. After the methodology and results, which are particular to that study, the scope of the paper expands in the discussion to include broader implications of the findings.

The topic of article structure is discussed in greater detail in the **Writing your research** section of this book (page ?). A list of selected sample research papers is included in Appendix I.

Analyzing written research

In the section **Identifying sources**, above, the idea of skimming quickly was introduced. While skimming is an excellent way to find information fast, it is not a substitution for carefully reading a text (Epstein, Kenway, & Boden, 2005, p.14). Careful, active, and analytic reading is necessary for complete understanding and language acquisition.

Active reading

As noted earlier, each section of a research paper has specific functions. Based on these functions, the reader can ask themselves specific questions for each section, most of which they should be able to answer. If you cannot answer these questions when reading, there is a good chance you do not understand the paper. Examples of possible questions to ask, based on the IMRAD model, include:

- Introduction:
    (1) How does this study relate to the literature?
    (2) Why is this study useful, important, or interesting?
    (3) What is the goal of this study?

- Methodology:
    (1) How were the data collected?
    (2) How were the data analysed?

- Results:
    (1) What did the research reveal?

- Discussion:
    (1) Was the research question answered? What was the answer?
    (2) Did the researcher have any problems?

(3) How do the findings relate to other studies which have been done?
(4) Does the writer explain how and why the findings are important?
(5) Are there suggestions for further research?

These questions help to form a starting point, but each reader must form their own questions as they gain understanding of written research in their field. As Swales points out, each discipline has unique conventions and standards when writing research (1987, page 60). This means that although the exact structure and content of research articles is not always exactly the same,, there are usually common traits within a field. Again we see the importance of extensive reading for anyone who wants to publish their research, because articles which have been published are written to an acceptable standard.

Text Mining

Text mining is the use of existing texts to help you become a better writer. It is not copying and pasting, but rather identifying words, phrases, or organizational techniques that you can use when writing your paper. Reading published research exposes the reader to models of exemplary writing (Swales, 1987, p.61-62; Brooks & Grundy, 1990, p.28-29; Epstein, Kenway, & Boden, 2005, p.27; Young, 2006, p.13) and is perhaps the single best way to improve scientific writing.

Specifically, there are some expressions often repeated in research writing and they contribute to clarity. Although they make the paper less original overall, it is still a common and acceptable strategy (Cargill & O'Connor, 2009). Following are some examples taken from a paper in the field of Agricultural Systems and Engineering, but could be included in any research paper, regardless of field of study:

Previous studies in … have shown…
This paper addresses the issues of…
This study comprises the…

This study used both primary and secondary data…
The analysis focused on…
This paper has examined…
This analysis has documented…
(Shivakoti & Bastakoti, 2006)

Useful words and phrases

Vocabulary is one of the most basic units of language. Although it is not necessary to know every word in a sentence in order to grasp the overall meaning, the difficult task of reading scholarly journals becomes easier when the reader has a strong vocabulary. In order to be a better reader, and writer, of academic articles, knowledge of academic vocabulary, signal words, and Latin is very useful.

Academic words

Academic writing is a genre of writing unlike poetry or novels, and it is possible to create lists of words which are especially 'academic' (Table 2). By focusing on learning these 'academic' words, users of English as a second language can improve their skills efficiently. An excellent list of academic vocabulary was created by Coxhead (2000), who used 3.5 million words from a wide range of academic texts to identify a total of 570 word families. Her list is divided into ten sublists, ranging from the most frequent words (Sublist 1) to the least frequent (Sublist 10). Learning these words, especially those in the first few sublists, is essential for graduate level studies. The complete Academic Word List is available in Appendix II.

Not surprisingly, studies which analyze the relationship between Coxhead's AWL and the research articles of a specific field find that there could be a stronger correlation (Martínez, Beck, & Panza, 2009; Chen, & Ge, 2007). Although it is

possible to form more accurate discipline-specific word lists, Coxhead's work still provides a useful cross-disciplinary tool.

analyze	constitute	establish
indicate	occur	role
approach	context	estimate
individual	percent	section
area	contract	evident
interpret	period	sector
assess	create	export
involve	policy	significant
assume	data	factor
issue	principle	similar
authority	define	finance
labour	proceed	source
available	derive	formula
legal	process	specific
benefit	distribute	function
legislate	require	structure
concept	economy	identify
major	research	theory
consist	environment	income
method	respond	vary

Table 2 Coxhead's Academic Word List, Sublist 1 (2000)

Transitions and signposts

Transitions and signposts are special words and phrases that help the reader to understand writing is connected. Carefully written academic texts will have many transitions left by the author to make their writing clear (Epstein, Kenway, & Boden, 2005, p. 15). The word 'signpost' is especially apt because they act like traffic signs and tell the reader: where they are, what they should do, and where they should go;

even if the text contains some difficult vocabulary readers should be able to continue reading (Lems, Miller, & Soro, 2010). Most people are familiar with transitions, even if they do not know it. Table 3 shows examples of common transitions and signposts.

and also	in addition as well	furthermore moreover
in contrast yet	on the other hand but	however rather
in other words such as	including for example	like for instance
when provided that	while due to	since as
as a result therefore	for hence	then thus
in summary altogether	in brief in shot	to sum up to summarize

Table 3 Some transitions and signposts

Appendix III contains a more comprehensive collection of transitions and signposts. It is easier to understand complicated academic writing if you understand these words and phrases. It is also useful, as you read papers in your field, to make lists of words, phrases, and structures that you can use in your writing (c.f. **Text mining**, page 14).

Latin

Latin was the language of ancient Rome, and remained the international language of philosophy and science, in Europe, for hundreds of years. Although English has become the international language of choice in most areas, certain words and phrases in Latin are still common in research writing. Table 4 shows a selection of such

expressions. This is by no means a comprehensive listing, and research writing in the life sciences in particular will contain far more Latin than is within the scope of this document.

Latin	**Meaning**	**Example**
i.e.	in other words	The former has three suboptions to choose (**i.e.**, average elevation, least-squares straight line and end-to-end straight line), while the latter has four suboptions to choose (**i.e.**, ignore topographic data, distorted finite-element grid with uniform distortion, distorted finite-element grid with damped distortion factor and the inverse Schwartz–Christoffel transformation).[1]
vs.	versus	As shown in Figure 10, the speed **vs.** distance relationship of the bus shows the events for bus before collision (e.g. Perception-Identification-Emotion-Volition (PIEV) distance and pre-crash braking), at collision (e.g. point of impact) and after collision (e.g. point of rest).[2]
et al.	and the rest	Wang **et al.** (12) extract color features then use a nearest neighbor classifier to identify retinal lesions.[3]
e.g.	for example	Most of the work just reviewed is based on imagery acquired after dilating patients' pupils, **e.g.** with eye drops, to make exudates and other retinal features clearly visible.[3]
etc.	and so on	At the pixel level, the RS data can be mixed, it could be composed of signatures coming from several land features such as a variety of crops, bare soil **etc**.[4]
ibid.	the same as the previous reference	The total irrigated area in the world has expanded rapidly since the 1950s, with almost three-fold of its increase between 1950 and 1980 and 50–60% of its contribution to

[1] (Giao et al., 2008)
[2] (Islam & Kanitpong, 2008)
[3] (Sopharak et al., 2010).
[4] (Ines & Honda, 2005)

		a huge increase in agricultural production in developing countries from 1960–1980 (Ostrom, 1992). The expansion of irrigated land has greatly affected the quantity of rice produced in Asian countries such as India, Indonesia, Pakistan, the Philippines, Sri Lanka, and Thailand (**ibid.**).[5]
per se	through itself / of itself	In exploring ways to improve the use of water in irrigated agriculture, it is always important to consider the issue of optimal water use considering the limited water resource and the limitations of the irrigation system **per se**, e.g. soil/water quality, heterogeneity in soils, etc.[6]
de facto	by fact, not by right	In this article, local forest management or 'institution' refers to the **de facto** or de jure rules or 'rules in use' that directly or indirectly influence that an actor must (obligation), must not (prohibition) and may do (permission) to resource management.[7]
per capita	for each person	Capital costs in Bolivia were approximately US$80 **per capita** at the time of construction (US$400 for an average household with five members); costs in Peru were probably comparable.[8]

Table 4 Latin for research writing

[5] (Shivakoti & Bastakoti, 2006)
[6] (Ines et al., 2006)
[7] (Karna, Shivakoti & Webb, 2010)
[8] (Whittington et al., 2009)

3. The Writing Process

There are many ways to go about writing, and no one method will work for everyone. Generally, we can identify four main stages to the writing process as:

(1) planning,
(2) writing,
(3) proofreading and sharing, and,
(4) revision and editing.

It is not necessary, or even advisable, to follow these steps by simply moving from beginning to end. The process of writing should not resemble a straight line; rather, it resembles a spider-web of connected steps. How often you return to these different stages will depend on you and on the text you are writing. Some important things to remember are:

- Use headings and the structure of the article (c.f. **Research article structure**, page 11) to help organize your writing.
- Begin writing as soon as you can, you can never start too soon.
- Don't worry about the details of sentences, you can change them later.
- Share your writing as much as possible, you can never get too much feedback.
- Revise, revise, revise. And then, revise.

Planning

The preparation of a scientific paper has less to do with literary skill than with organization (*Day, 1988).*

Planning is the consideration of how information is to be organized. Common planning methods include outlining and mind mapping.

An outline can begin with the IMRaD headings (c.f. **Research article structure**, page 11) followed by subheadings to delineate the information that you have, the information that you plan to get. As another example, consider that the Table of Contents for this book was written first, and then a copy of that was filled out as the project commenced. While there were some changes made along the way, the final product closely resembles the original outline. Figure 2 shows a mind map version of the same.

Wellington (2003) points out that individuals will plan their writing in different ways, and that they can use more than one planning method. When organizing the writing it is essential that the journal requirements are observed, and that the organization is both clear and logical.

Writing

It is a good idea to move through your writing quickly when you have something to write. Do not worry about style or mistakes so much as getting words down. Writing your ideas as they come is more important than revising while you write; you can review your writing and make changes later.

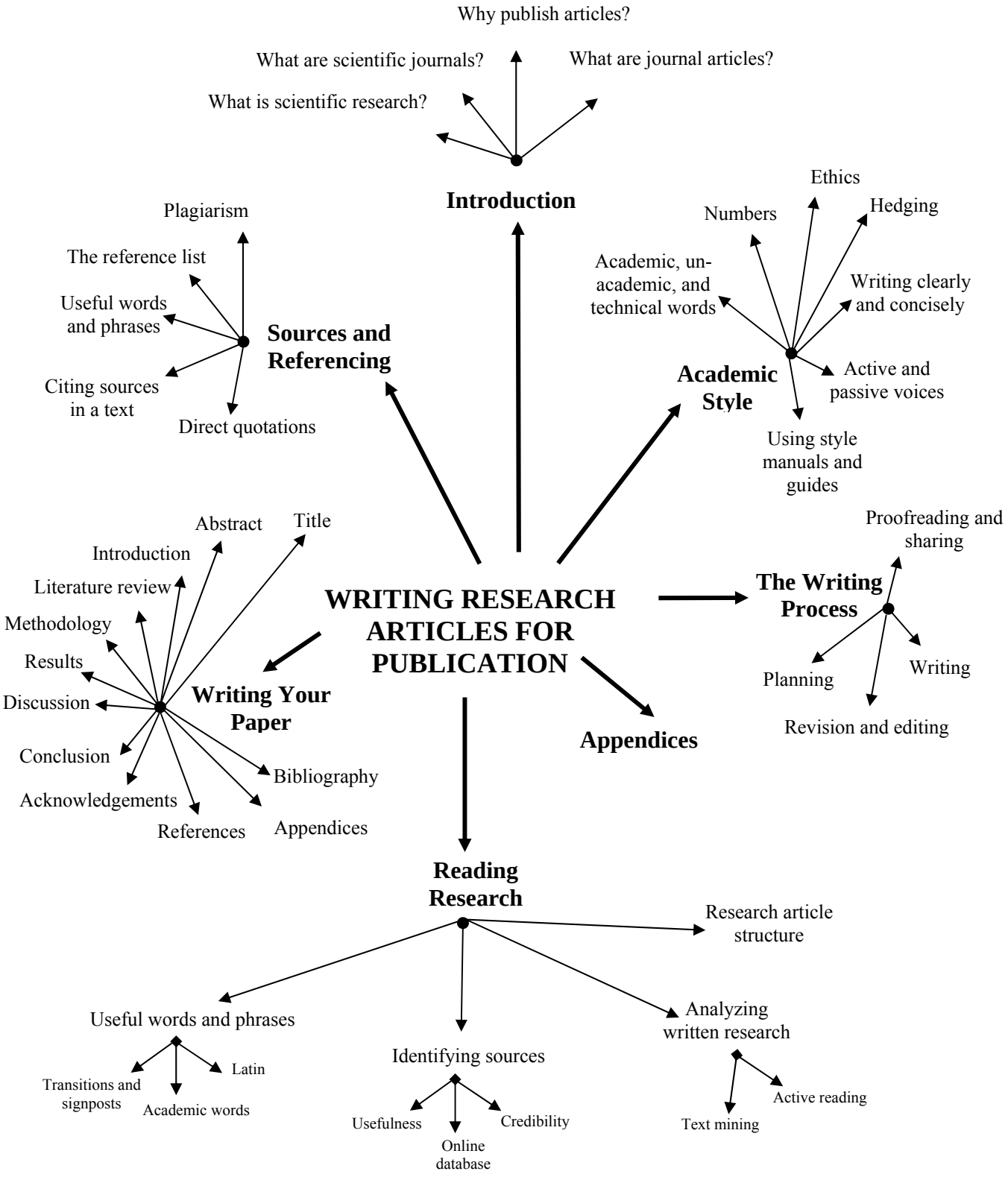

Figure 2 A mind map plan for this book

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Epstein, Kenway, and Boden feel very strongly that it is important to begin writing as quickly and regularly as possible (2005, page 18). They further state, in agreement with Katz (2006), that writing is "integral" to research. Katz goes on to point out that writing helps the researcher to gain a different perspective on their work, which in turn leads to better research. Sections such as the literature review and methodology are especially linked to the early stages of research.

Other advantages to writing while the research is being conducted include: it is unlikely that details will be forgotten, it gives something useful to do while waiting for results, and there is less pressure to write a great deal of the paper after the data have been collected.

Proofreading and sharing

This stage of the writing process is crucial. Young (2006) points out that many journals are forced to reject quality research because the standard of English is too low. Language use is not the only issue, journal requirements (c.f. **Using style manuals and guides**, page 65) and the risk of accidental plagiarism (c.f. **Sources and referencing**, page 25) are both important areas to consider. My list of things to check while proofreading is very simple:

1. Check everything.
2. Ask someone else to check everything for you.
3. Check everything again.

Check everything contained in this book, to start, as well as spelling, grammar, punctuation, and layout. Of course, people have difficulty in seeing their own writing objectively, therefore it is necessary to share your writing with someone who can read it and make suggestions (Bem, 2003; Epstein, Kenway, & Boden, 2005, p.34; Wellington, 2003; Young, 2006, p.29). Ideally your reader will be familiar with your

field and have experience in reading and writing scientific articles. For doctoral students obvious candidates include advisors, professors, and classmates.

Revision and editing

Research on writing shows us that good writers are people who reread, review, and revise their writing. Bem goes so far as to say that almost every sentence will be rewritten before the final draft is submitted (2003). Changing organization, using different language, finding places where information is missing, and correcting mistakes are some of the areas where a paper will need improvement. Expect to write several drafts of your paper as a mandatory part of the process (Hubbuch, 1996; Wellington, 2003; Booth, Colomb, and Williams, 2008).

As mentioned above, it is not easy to critically evaluate one's own writing. Bem offers two possible strategies for surmounting this problem: first, take a break from your writing and approach it with a fresh mind; second, gain a new perspective on your writing by hearing it as you read out loud. Personally, I like to revise my work at three points in the writing process: when I have been away from my computer for more than a few hours, when I don't know what I want to write next and need inspiration, and finally when I think the paper is finished and needs no more new content.

4. Sources and referencing

The use of sources and referencing lies at the heart of academic work. By referring to a variety of respected, recognized, and relevant publications a writer displays that they have read about the topic and understand it well enough to explain it in their own words (Lester & Lester, 2010, p.94). In order to avoid plagiarism, however, the writer must carefully cite their sources. Sources used in the body of the text will usually be paraphrased or summarized; sometimes an exact quotation of the original author's words is used, in which case the established standards must be observed. A short form of referencing is used within the text, allowing a reader to easily find the relevant entry in the references list. The complete list of all referred sources should be included at the end of the document.

Plagiarism

Quite simply, plagiarism is theft (Hubbuch, 1996).

Plagiarism occurs when someone tries to take credit the work of another, usually in the form of words or ideas. In the academic world plagiarism is regarded as a very low act, and being caught can lead to expulsion from top universities such as Harvard University (n.d.) and the University of Cambridge (2008). Of course, scholarly research relies on the work done by others. What is required is to clearly state the sources of all information. There are two steps for properly citing sources: first, in the body of the text where the information is introduced; second, at the end of the document in a complete list of references used. Record sources carefully while reading to help avoid plagiarizing. It is also good practice to construct the reference list throughout the process in order to avoid wasted time.

Citing sources in a text

Every time the words or ideas of another person are used in the writing of a paper it is imperative to make the sources clear. As well as allowing the author to avoid plagiarism, this places the article within the relevant literature of the field, a required part of writing research (Derntl, 2003). Booth, Colomb, and Williams point out further social benefits of citation: you show that you have read and learned about the topic, your writing is more credible, your readers can find relevant information on the topic, and you show respect to the scholars whose work you have used (2008). The most commonly used form of citation in journal articles has become parenthetical citation.

Parenthetical citation is the use of parentheses to contain information allowing the reader to locate the reference on the references list at the end of the article. There are many different styles, but there are also many similarities between them. Table 5 displays examples of some popular referencing systems, where they may be found, and how they are used. This table is only an illustration because the exact style you use will depend on what is expected by the journal to which your paper is submitted (c.f. **Using style manuals and guides**, page 65).

Citation Style	Fields Implementing	Examples
Institute of Electrical and Electronics Engineers (IEEE)	engineering, electronics, telecommunications, computer science and information technology	1. According to Smith [5]… 2. Data from other studies [9, 10, 11]… **the numbers indicate positions on the reference list*
Modern Language Association (MLA)	literature, modern languages, other humanities	1. According to Smith (42)… 2. Data from another study (Smith 42)… **the numbers indicate the page of the original source*
American Psychological Association (APA)	psychology, linguistics, education, business, other social sciences	1. According to Smith (1999)… 2. Data from another study (Smith, 1999)… **the numbers here indicate the year of publication*

Table 5 Examples of in-text referencing styles

In-text citation requires reporting verbs to show you are referring to another publication; the most popular phrase for this is probably *According to…*. The following examples, from Kusakabe (2003), can be used across the disciplines:

Nandeesha (1994) found that…
Song (1997) reported that…
[A]s FAO (2001) notes…
Minh et al. (1997) point out that…

Table 6 shows more useful reporting verbs and structures. Remember that not every reporting verb has the same meaning, and you should check a dictionary if you are not sure that you are using the correct verb.

Wilson	adds	that…
	argues	
	proves	
	recommends	
	states	
	agrees	that / with…
	disagrees	
	asserts	that / these / those…
	believes	
	challenges	
	claims	
	insists	
	refutes	
	advises	that / these / those / this…
	analyses	
	assesses	
	defines	
	describes	
	examines	
	explains	
	interprets	

	investigates	
	mentions	
	notes	
	points out	
	proposes	
	rejects	
	suggests	
As Wilson	adds	…
	argues	
	proves	
	claims	
	asserts	
	explains	
	defines	
	describes	
	mentions	
	notes	
	points out	
	states	
	advises	
	proposes	
	suggests	
	recommends	

Table 6 Reporting verbs and structures

Secondary citations are used when you want to reference, in your paper, a reference by another author, who is referring to a third paper. As a rule, you should try to avoid secondary citation; even if the paraphrase that you are reading is accurate, by paraphrasing the paraphrase you risk making mistakes or committing plagiarism. If possible, use the references list of the publication you are reading to locate the original source. If you cannot access the original source, your citation should make it clear that you are making a secondary citation.

For example, let us consider a reference made to another publication in the introduction of this chapter, and two possible ways for another writer to cite my citation:

Primary citation

> By referring to a variety of respected, recognized, and relevant publications a writer displays that they have read about the topic and understand it well enough to explain it in their own words (Lester & Lester, 2010, p.94).

Secondary citation 1

> According to Lester & Lester, reviewing the literature has benefits such as showing great knowledge of the topic (2010; cited in Burrows, 2011).

Secondary citation 2

> Burrows (2011) cites Lester & Lester (2010) as saying that reviewing the literature has benefits such as showing great knowledge of the topic.

Paraphrasing and summarizing

Paraphrasing and summarizing are techniques that use the writer's own words to convey the ideas and information of others. They are much more common than direct quotation and show that the writer has a strong understanding of the subject. The difference between the two is the length and level of detail; a paraphrase is the same length as the original, and contains all the information of the original, while a summary is much shorter than the original and contains only key points. Since it is easy to accidentally change meaning when rewriting, make sure that you understand what you read and write. When in doubt, show your writing to an advisor, senior student, or writing tutor. Every time a paraphrase or summary is used, it is crucial to cite the original source (c.f. **Citing sources in a text**, page 26).

Paraphrasing

Jordan (1999) provides us with the following suggested techniques to help when writing a paraphrase.

1. Use synonyms:

Original → The administration has become frustrated by frequent rescheduling.

Paraphrase → The administration has become frustrated by recurrent schedule changes.

2. Change the verb form:

Original → The administration has become frustrated by frequent rescheduling.

Paraphrase → The administration became frustrated by frequent rescheduling.

3. Change the parts of speech:

Original → The administration has become frustrated by frequent rescheduling.

Paraphrase → The high frequency of rescheduling has become a frustration for the administration.

A well-written paraphrase will simultaneously take advantage of more than one of these strategies. A writer may still be accused of plagiarism if they make only small changes when rewriting. The above examples highlight specific techniques, but

cannot be considered as ideal because there is too little variation. Below is an example using several techniques.

Original → The administration has become frustrated by frequent rescheduling.

Paraphrase → Regular changes to the schedule are frustrating the administration.

Summarizing

In addition to the above suggestions Jordan (1999) supplies tips for summarizing, including:

1. Skim the text to get a good understanding of the main idea.
2. Carefully read to find key points (often in topic sentences).
3. Use your own words as often as possible (paraphrase), use direct quotations sparingly.
4. Supporting details, such as statistics and examples, can usually be omitted.

Direct quotations

Unlike paraphrasing or summarizing, direct quotations are an exact copy of the original writing. It is best to use direct quotation as little as possible. Direct quotations use citations, like paraphrase and summary, as well as quotation marks to clearly label which words were written by another person. Although journals may have specific requirements (c.f. **With [academic] style**, page 65), these seven guidelines can be used as an aid when directly quoting (Hubbuch, 1996).

1. Direct quotes should be used if the original author's wording expresses their point of view much more clearly than any paraphrase.

2. Direct quotes should explain the original author's viewpoint, not yours.

3. Direct quotes should usually not be entire sentences.

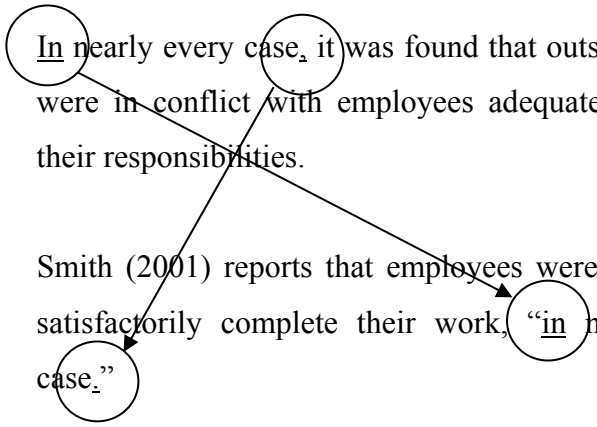
   OK: Smith (2001) found that employees were not able to satisfactorily complete their work, "in nearly every case."

   Not OK: Smith (2001) reports that, "In nearly every case, it was found that outside interests were in conflict with employees adequately fulfilling their responsibilities."

4. Direct quotes as part of a sentence are punctuated based on the entire sentence (except for the quotation marks).

   Original: In nearly every case, it was found that outside interests were in conflict with employees adequately fulfilling their responsibilities.

   Quote: Smith (2001) reports that employees were not able to satisfactorily complete their work, "in nearly every case."



5. Direct quotes that include a direct quotation should include the name of the original source. Use single quotes for the original source and double quotes for your source.

   Example: Smith (2001) cites Brown's (1999) research as an "important study into the use of 'focused avoidance' by long-term employees".

When quoting only the original source double quotation marks are used, but both sources should be acknowledged.

Example: Smith (2001) cites Brown's (1999) research on "focused avoidance" as a key study.

6. Direct quotes which are more than four lines are denoted using block quotation. Block quotation is indented on the left and right sides, and is separated from the writing above and below by an extra space.

7. Direct quotes are usually an exact copy of the original writing, however, sometimes small changes are unavoidable. If significant changes are required, it is better to use paraphrasing.

   When removing words from the direct quotation an ellipsis (…) is used to indicate the deletion.

   Original: In nearly every case, it was found that outside interests were in conflict with employees adequately fulfilling their responsibilities.

   Quote: Smith (2001) reports that, "in nearly every case… outside interests" prevented employees from satisfactorily completing their work.

   When adding new words, or changing words, use square brackets ([ ]) to indicate that this is not the original wording.

   Original: In nearly every case, it was found that outside interests were in conflict with employees adequately fulfilling their responsibilities.

Quote: Smith (2001) reports that, "in nearly every case, it was found that [outside projects for personal financial benefit] were in conflict with employees adequately fulfilling their responsibilities."

The reference list

Found at the end of a document, the reference list is a comprehensive catalog of all sources used in the paper and includes detailed information which readers can use to locate the original sources. It provides the connection between an article and the relevant literature (Katz, 2006) and is useful for later researchers interested in the same topics. By creating a reference list, you give your readers a convenient list of publications; at the same time remember that the reference lists of others can help you to locate useful information for your research.

A reference list works in tandem with the in-text citations, and hence every entry on your list must have a corresponding entry in your text. If you have read something, but it is not used anywhere in the body of the text, then it should not be included in the references list.

As with in-text citation the style of referencing can vary and is determined by the journal to which you are submitting (c.f. **With [academic] style**, page 65). Make sure that you write in the appropriate style, and that it matches the style used for in-text citations.

Beginning researchers may ask how long the reference list should be. There is no single answer to this question, but generally it is best to have as many references as is reasonably possible. While the use of too many in-text citations can make an article different to read, skillful use of many references show the reader that the paper is well grounded in the literature. It is also interesting to note that having more references on

a paper has been connected to the number of citations that paper receives; more citations in your paper will mean your paper is cited more (Webster, 2010).

For an example of a reference list, see: the end of this document, any scholarly textbook chapter, or any peer-reviewed and published academic article.

5. Writing Your Paper

Earlier, we briefly described the basic structure of a typical research paper and its usefulness for the reader (c.f. **Reading research: Research article structure,** page 11). We will now return to the concept of a structured paper and explore how it can help the writer.

The following discussion of how to write your paper is arranged to correspond with the order that sections usually appear, and not necessarily in the order you will choose to write them. For many authors, it is good to begin a paper by writing the headings; this helps to organize writing and gives a sense that the work has already begun.

Some fields of study, or some specific journals, may use different headings or organization; however, the information is usually of the same variety. That is to say, *materials and method*, *procedures*, *methodology* and *experiment* all refer to how the work was done. Even when no such title is used, at some point in the article there must be some methodological description.

Title

Although short, and usually written near the end of the process, the title of a research article requires great consideration. Derntl lists an "appropriate title" as one of the general features of successfully submitted articles, and points out that it is the most often read part of the paper and, perhaps ironically, that it is usually read first (2003). Furthermore, if your title is not informative, the paper may be overlooked busy readers who scan only a table of contents or bibliography (Montagnes, 1991).
A synthesis of Day (1988), Yang (1995) and Gustavii (2008) provides a list of guidelines to help with writing your title:

- Be specific, clear, and concise.
- Use a subtitle for additional detail, but only if necessary.
- Express the direction of changes found during the study.
- Abbreviations should be avoided. Standard abbreviations (such as PhD), and field specific abbreviations (such as DNA or RNA), may be accepted by some journals.
- Avoid question marks, state the answer if you have found it.
- Use key words at the beginning.
- Be objective.
- Avoid serial titles (titles ending with I, II, II…), your paper should be self-contained.
- Check the style guide of the journal you are submitting to (c.f. **With [academic] style**, page 65).
- If your title is long, then a shorter running title may be required as well. This will be used at the top of every page, as opposed to the full title which will only appear at the beginning.

Following are examples of well written titles, courtesy of participating AIT faculty. Where possible, the actual running title is included as well.

Example 1:

(Giao, Weller, & Adisornsupawat, 2008)

An approach to construct the weathering profile in a hilly granitic terrain based on electrical imaging

Example 2:

(Ines, Honda, Droogers, & Clemente, 2006)

Combining remote sensing-simulation modeling and genetic algorithm optimization to explore water management options in irrigated agriculture

Example 3:

(Kusakabe, 2003)

Women's involvement in small-scale aquaculture in Northeast Thailand

Running title: Women's involvement in small-scale aquaculture

Example 4:

(Dailey, Joyce, Lyons, Kamachi, Ishi, Gyoba, & Cottrell, 2010)

Evidence and a Computational Explanation of Cultural Differences in Facial Expression Recognition

Running title: CULTURAL DIFFERENCES IN FACIAL EXPRESSION

Abstract

After the title, the most often read part of the research paper is the abstract. The abstract is itself a miniature version of the entire paper, perhaps 200 words long, allowing readers to quickly get the gist of the entire work. As with the title, Derntl (2003, p.13) found that the quality of the abstract determined whether or not a paper is accepted for publication. Abstracts often follow a common structure (Gustavii, 2008; Derntl, 2003; Shaw, 2003; Bhatia, 1993) which has four parts: problem statement, methodology, main findings, and conclusion.

The four-part Abstract model

1. **Problem statement**: Give the primary research question, objective, and/or motivation.
2. **Methodology**: Provide a basic indication of how the data were gathered.
3. **Main findings**: Show only those results which relate *directly* to the research objectives and conclusions.
4. **Conclusion**: Choose the most important implication, application, or suggestion related to the problem statement and main findings.

Some tips for writing the abstract are:

- Abbreviations should not be used unless the full expression is both long and used frequently (Yang. 1995, p.53-54; Gustavii, 2008, p.60; Day, 1988, p.29).
- Do not use citations unless absolutely necessary (Yang. 1995, p.53-54; Gustavii, 2008, p.60).
- Do not direct the reader to the article for information (Yang. 1995, p.53-54).
- Do not give information which is not in the full article (Day, 1988, p.29).
- Use the past tense for the majority, if not all, of the writing (Day, 1988, p.28).

This model is only a guide; remember that journals may dictate the exact structure they require. It is the writer's responsibility to check the appropriate style guide (c.f. Section 6.1: **Using style manuals and guides,** page 65). Style guides will also state the expected word count of submitted abstracts.

The following abstracts are excellent examples, and have been provided courtesy of participating AIT faculty. Notice how in Examples 1 and 2, the authors have included information about Methodology and Main Findings together, which is an excellent technique for suing less words. Example has four clearly labeled sections, which was likely done as a requirement by the journal; this is not usual, but it does happen sometimes

Example Abstract 1: Resilience of community forestry under conditions of armed conflict in Nepal (Karna, Shivakoti, & Webb, 2010).

Armed conflicts pose a serious and potentially long term threat to institutions, societies and environments across the world.	**Problem Statement**
This study focuses on the small mountainous country of Nepal, which has experienced high levels of armed conflict for many years. This paper analyses the relationship between local forest institutions, institutional embeddedness and forest condition under conditions of active armed conflict. Seven community forest user groups with similar forest governance structure were examined, located in similar biophysical and ecological zones, but experiencing different degrees of conflict.	**Methodology & Main findings**
Those forest user groups facing severe armed conflict showed a decline in institutional arrangements but improvements in characteristics of institutional embeddedness, such as trust and reciprocity, whereas the forest user groups in low conflict environments had more stable institutional arrangements and stable embeddedness characteristics. Both types of locations showed an increase in forest density. These results emphasize the capacity of local institutions to organize and cooperate even in extremely vulnerable situations, building trust and reciprocity for sustainable forest use and management.	**Conclusion**

Example Abstract 2: Evidence and a computational explanation of cultural differences in facial expression recognition (Dailey, Joyce, Lyons, Kamachi, Ishi, Gyoba, & Cottrell, 2010).

Facial expressions are crucial to human social communication, but the extent to which they are innate and universal versus learned and culture dependent is a subject of debate. Two studies explored the effect of culture and learning on facial expression understanding. In Experiment 1, Japanese and U.S. participants interpreted facial expressions of emotion. Each group was better than the other at classifying facial expressions posed by members of the same culture. In Experiment 2, this reciprocal in-group advantage was reproduced by a neurocomputational model trained in either a Japanese cultural context or an American cultural context. The model demonstrates how each of us, interacting with others in a particular cultural context, learns to recognize a culture-specific facial expression dialect.

Problem Statement

Methodology & Main findings

Conclusion

Example Abstract 3: Real-time optimal control for rotary inverted pendulum (Sukontanakarn & Parnichkun, 2009). * *labeled in publication*

Problem statement: The rotary inverted pendulum system was a highly nonlinear model, multivariable and absolutely unstable dynamic system. It was used for testing various design control techniques and in teaching modern control. The objectives of this study were to: (i) Develop a real rotary inverted pendulum which derived the mechanical model by using Euler-Lagrange and (ii) Design controller algorithm for self-erecting and balancing of a rotary inverted pendulum. **Approach:** Research shown a convenient way to implement a real-time control in self-erecting a pendulum from downward position and balancing the pendulum in vertical-upright position. An Energy based on PD controller was applied in self-erecting of the pendulum while LQR controller was applied to balance the pendulum. **Results:** Results of both control techniques from computer simulation and experiment were given to show the effectiveness of these controllers. **Conclusion:** Both simulations and experiments were confirmed the control efficiency of the method.

Introduction

The introduction is the first major section of a research article. Since this section introduces the rest of the paper, some authors choose to write it last. On the other hand, it is useful to have a tentative introduction at the beginning of the writing process, which can later be finalized when the entire article is finished (Booth, Colomb, & Williams, 2008).

The *Create a Research Space* (CARS) model is based on analysis of introductions from research articles (Swales, 1990, p.140-166) and provides a useful tool for research writers. Of course, not every introduction will be written in exactly the same, formulaic, style. It is, however, usually possible to see three major stages, as described below.

Swales' CARS model for Introductions

I. **Establishing a territory**

1. **Claiming centrality**:	Demonstrates how the study contributes to an important or interesting area of research (*Recently, there has been a great deal of interest in…*).
and/or	
2. **Making topic generalization(s)**:	These are usually statements about "knowledge or practice" *The established method for…*), or "phenomena" (*A common issue in the field is…*).

and/or

3. **Reviewing items of previous research**: Relates this study to associated research. The level of detail depends on the paper being written, and whether or not a literature review is included after the introduction (c.f. **Writing your paper: Literature review**, page 48).

II. **Establishing a niche**

1A. **Counter-claiming**: Demonstrates the need for this study by pointing out flaws or limitations of previous research.

or

1B. **Indicating a gap**: Demonstrates the need for this study by pointing out that no such studies have previously been done.

or

1C. **Question raising**: Demonstrates the need for this study by pointing out unanswered questions or unsolved problems.

or

1D. **Continuing a tradition**: Demonstrates the need for this study by pointing out how it logically follows, or is directly related to, previous work.

III. **Occupying the niche**

1A. **Outlining purposes**:	Explicitly state why the research was done, including the scope (*The goal of this study was to…*).
or	
1B. **Announcing present research:**	Explicitly state what research was conducted, including the scope (*This study investigated…*).
2. **Announcing principal findings**:	Outline the key results of the study, and their implications.
3. **Indicating RA structure**:	Briefly outline how the research article is organized.

Day (1988) and Gustavii (2008) both advise that, if applicable, it is best to mention previous publication of any part of your research article in the introduction.

When constructing an introduction the author will use the information which best illustrates their case.

The following suggested examples, courtesy of participating AIT faculty, illustrate how different introductions take advantage of the above structure in different ways.

Example Introduction 1: Hydraulic characteristics of an anaerobic baffled reactor as onsite wastewater treatment system (Sarathai, Koottatep, & Morel, 2010).

In 1981, the anaerobic baffled reactor (ABR) was developed by McCarty and his co-workers to treat high-strength wastewater (Bachmann et al., 1982; McCarty, 1982). Conceptually, the ABR system consists of a series of vertical baffles that force the wastewater to flow under and over them as travels from inlet to outlet. Biomass within the reactor gently rises with up-flowing wastewater and gas production in each compartment and settle down when no flow.	**Topic generalizations**
Previous hydrodynamic studies on ABR showed that the low dead space (7% to 30%) occurred in ABR and the tank-in-series (TIS) model correlates closely with the actual number of compartments in the reactor (Gopala Krishna and Kumar, 2007; Grobicki and Stuckey, 1992; Langenhoff et al., 2000; Manariotis and Grigoropoulos, 2002). The fraction of dead space of ABR was lower than that of other alternative high-rate anaerobic treatment systems, such as the anaerobic filter (AF) and the upflow anaerobic sludge blanket (UASB) reactor (Morgan-Sagastume et al., 1997; Show and Tay, 1999).	**Reviewing items of previous research**
In those experiments, ABR units were operated under steady flow. However, there is no information on the hydraulic characteristics of an ABR under non-steady flow conditions which is occurred in small-scale or onsite treatment systems. In these systems, the flow rate could be varied by 2 to 4 folds of average flow (Butler et al., 1995; Mergaert et al., 1992). This may cause serious problems of reliability and lead to a certain prejudice against the use of anaerobic technology as onsite wastewater treatment system. Thus, the hydraulic characteristics of ABR under non-steady flow conditions should be investigated to evaluate the dead space and short circuits that reduce the active volume and to determine the mixing pattern (completely-mix or plug flow, etc.) that can influence the overall process efficiency.	**Establishing a niche**
In this study, the feasibility of ABR used as the onsite wastewater treatment system was discussed in terms of hydraulic aspects, including (1) the effects of different flow patterns; (2) the effects of superficial gas velocities; (3) the hydraulic model and the treatment performance.	**Occupying the niche**

Example Introduction 2: An integrated geotechnical–geophysical investigation of soft clay at a coastal site in the Mekong Delta for oil and gas infrastructure development (Giao, Dung, & Long, 2008).

With more and more petroleum facilities being developed on the soft clay grounds of the Mekong River Delta (MRD) in southern Vietnam, a poor site investigation could result in damage to newly constructed facilities, a major concern to administrators, construction managers, and engineers in the oil and gas sector. Deficiencies in site investigation have mostly been due to (*i*) a rapid development of oil and gas facilities, resulting in limited soil investigation and soil improvement; (*ii*) inadequate or outdated laboratory and in situ geotechnical testing capability; and (*iii*) a lack of conformance with the geotechnical standards and engineering practice codes.	**Establishing a niche**
This paper has the following objectives: (*i*) introduce the Mekong soft clay and emphasize the need for a systematical study prior to engineering and energy infrastructure development in coastal areas, (*ii*) review and analyze geotechnical data at a typical coastal site at Ca Mau in the Mekong Delta, and (*iii*) show the application of a near-surface geophysical technique (electric imaging (EI)) in mapping the soft clay deposit at the study site.	**Occupying the niche**

Example Introduction 3: Women's work and market hierarchies along the border of Lao PDR (Kusakabe, 2004).

In recent years, processes of international integration and globalisation and the resulting `borderless' economy has not only suppressed national borders, but formalised the existence of joint transborder actions, as can be seen in the formation of the North American Free Trade Agreement (NAFTA) and other regional agreements (Wong-Gonzalez, 1998).	**Topic generalizations**
However, the viability of the notion of the `region-state' (Ohmae, 1993) has been challenged by various empirical studies (Staudt, 1998; Bergeron, 2002; Razavi, 2001; Cohen, 2001; Sadowski-Smith, 2002). These studies maintain that the global, integrated and liberalised economy increases social fragmentation and disintegration, and that the process of global integration has been asymmetrical and uneven across countries, classes and gender (Grown et al., 2000, p. 1146; Evenett and Yusuff, 2001; Petras and Veltmeyer, 2001; Stiglitz, 2002, p. 5). As McDowell (1999) and Pratt and Yeoh (2003) contend, globalising forces reconstruct rather than destroy localities, and for many people everyday life continues to take place within a restricted locale.	**Reviewing items of previous research**
While proponents of market liberalisation claim that it eliminates barriers of trade and enhances the movement of goods, the officialisation of border trade under market liberalisation policies can strengthen international borders, functioning to create a market hierarchy across the border, and thus having an impact on women's and men's work in border areas. As Papademetriou and Meyers (2001) point out, market liberalisation and the offcial opening of borders actually make national governments reassert control at the border. Hence, new processes of inclusion and exclusion are developed under state control. Gooneratne and Mosselman (1996) also caution that regulating or formalising (legalising) activities may increase income for one group, while causing another to lose employment and income.	**Establishing a niche**
This article examines such exclusion/inclusion functions of geographical borders under market liberalisation, by taking a localised view from the Lao-Thai border.	**Occupying the niche**

Literature Review

A literature review is a summary of publications which are directly related to the article being written. 'The literature' is an expression often used by academics to describe anything which has been published on a topic: journal articles, conference papers, reports, etc. Thoroughly reviewing these relevant publications is a characteristic of accepted journal submissions (Derntl, 2003, p.13).

The goal of a written literature review is to provide the background information necessary for understanding an article, or to help create a space for the research. Other benefits of performing a comprehensive search of related publications are becoming very knowledgeable in the subject, displaying a deep understanding of the topic, and identifying holes in the literature which call for further research. If it contributes something unique to the field a literature review can be submitted to some journals for publication, even without original data.

Review of the literature may be a separate section of a research paper, included as a sub-section of the introduction or methodology, or spread across the paper as necessary. The journal requirements will often state how you should organize the reviewed literature.

Reviewing the literature requires critical analysis of what has been read, followed by logical organization. It is important to avoid simply summarizing a series of connected publications. Edith Cowan University (2008) suggests "The 5 C's," which can help with analysis: **cite**, **compare**, **contrast**, **critique**, and **connect**.

It is considered useful to use tables or matrices when analyzing information from different sources (Swales and Feak, 1994; Galvan, 2003), this helps one to visually compare large amounts of information quickly. For example, if all of the studies have one finding in common, it is probably important to make note of that in your literature review; on the other hand, something which is mentioned in only one publication, unless you have strong justification, can probably be left out (Figure 3).

	Finding 1	Finding 2	Finding 3	Finding 4
Study 1	x	x	x	
Study 2	x	x		
Study 3	x	x		
Study 4		x		x
Study 5			x	

Figure 3 Example of a matrix for reviewing literature

Some more tips for writing a literature review come from Galvan (2003, p.64-77):

- Explain why a study is important.
- Be specific about time frames. *In the last decade* is more accurate than *recently*.
- Clearly label any original studies which have led to further research.
- Include the results from replications of original research.
- Include other literature reviews in your analysis of the literature.
- Describe the methodology used to search the literature when pointing out gaps.

Another useful tip when collecting articles to include in a literature review is to scan the reference lists of the articles that you investigate, even if you don't use them in your paper.

Complete examples would be too long to include in this document, but **Example Introduction 1** (page ?) and **Example Introduction 3** (page ?) both contain sections where relevant publications have been summarized. Readers are also advised to consult papers in their field when looking for examples.

Methodology

The methodology section of a paper describes the research in sufficient detail to allow readers to evaluate the quality of the study, or, theoretically, replicate it. The titles 'Materials and Methods', 'Experiment', and 'Procedures' are also sometimes used. This section forms the "foundation of your paper," because the results obtained are dependent on the procedure (Katz, 2006). Methodological information that has already been published does not require reproduction, simply refer to the appropriate publication in the text.

It is a good idea to begin writing, or at least make notes for, the methodology while planning and conducting the research. Initially, you can mention every decision in the process; *who, what, when, where, why,* and *how* are important questions which need to be answered. Do not worry about writing too much; it is easier to cut a fat Methodology during revision than to remember details after the fact. It is important to remember that the resultant data should not be included. The structure of the Methodology will depend on the nature of the research, but will roughly fall into two categories: data collection and data analysis.

Data collection can include details about; materials, people, the setting, and the process. Examples of data collection devices, such as questionnaires or diagrams of apparatus, are important to include and can usually be contained in an appendix which is referred to in the text of the Methodology. Gustavii (2008, p.66) states that methods of randomization, when used, should be thoroughly described as well.

Descriptions about the reliability and validity of data collection methods may also be given.

Data analysis usually refers to the statistical methods, and computer software, used to interpret the collected information. Day (1988) suggests avoiding comprehensive explanation of standard techniques, and also states that previously published methods need only be referred to. When using illustrations as a part of the Methodology, refer to the guidelines for tables and figures (c.f. **Results**, page 52). Descriptions about the reliability and validity of data analysis methods may also be given.

Following are two examples which were kindly provided by AIT faculty, and are short enough to include in this manual. Of course, the best examples of a written Methodology in your discipline will be in papers which have been published in the major journals of your field.

Example Methodology 1: Helmet Use and Its Effectiveness to Reduce the Severity of Head Injuries in Thailand (Kanitpong, Boontob, & Tanaboriboon, 2008)

Method

The field observation was manually conducted by using designed forms to observe motorcycle occupants who use and do not use helmets. The influencing factors for helmet use such as age and gender, seating position, location, time of day, and day of week were included in the helmet observation form.

The observation data of motorcycle helmet use was collected during 2006-2007 from four provinces representing each region of Thailand. Four provinces including Bangkok, Khon Kaen, Chiang Mai, and Surat Thani represent the Central, North Eastern, Northern, and Southern regions of Thailand, respectively. The locations for data collection which are easily accessible to all kinds of drivers in the community such as intersections, residential areas and along the roadside were selected for field observation.

Data collection methods

Variables

Time period of data collection

Setting

Example Methodology 2: Women's involvement in small-scale aquaculture in Northeast Thailand (Kusakabe, 2003).

Methodology of the study

Time period of data collection

Fieldwork was conducted between October 1999 and May 2000, with support from the Asian Institute of Technology (AIT) and the Department of Fisheries in Thailand. The Department has been promoting low-input aquaculture for home consumption, as well as training farmers in techniques such as improved water quality.

Participants

Women aquaculturists were selected from different levels of production intensity, some engaged in aquaculture on their own, and others with their husbands. Almost all the women interviewed were engaged in pond aquaculture, while few were involved in cage culture along the riverbank and reservoirs as well as in the operation of hatcheries.

Setting

The interviews took place at their homes and at their ponds/cages, sometimes in the presence of their husbands, but most of the time by themselves.

Data collection methods

We conducted a series of interviews with key informants as well as in-depth case studies of 11 women aquaculturists. The interviews focused on how the women decided to start aquaculture, their roles in aquaculture, their plans for the future, and household gender relations. Later, a workshop was conducted with women aquaculturists, extension workers, and researchers to verify the findings.

In Northeast Thailand, women dominate the marketing of fish and are generally the moneykeepers in the household. The situation will, of course, be very different for women in areas where women's roles are more restricted.

Results

The purpose of the Results, which may also be labeled 'Findings,' is simply to provide readers with access to the original data. In fact, some papers will use the heading 'Data' because that is exactly what this section contains: the data. The results of statistical analysis should also be included here. When the Discussion is included in the same section, which is not uncommon, interpretation and evaluative statements

relevant to the results may be included. On the other hand, if the Discussion is to be contained in a separate section there should be no such subjective descriptions.

It is not necessary to include all of your data in a research paper; instead, a representative sample should be included (Day, 1988, p.40). Select only meaningful data which is directly relevant to your discussion; readers who wish to see the entire data set, if there are any such readers, can contact you. When you are only including a few data items, include the information in sentence form. Tables are preferred when it is useful for understanding of the results to provide a large data set. Other figures, such as charts or photographs, can also be included if they are necessary or helpful for clarity of the discussion.

Tables and figures

Properly implemented tables and figures are a characteristic of published journal papers (Derntl, 2003, p.13). Avoid using such visuals if they do not assist the reader to understand your findings. Clearly label tables and figures, readers should be able to understand illustrations without referring to the text. As a general rule, visuals larger than half a page should be included as an appendix, or not included at all. Norris (2010) suggests that horizontal lines should not be used on tables.

Authors should be aware that journals may have special requirements for visuals, so remember to check the style guides before submission (c.f. **With [academic] style**, page 65). Following are some examples from papers provided by participating AIT faculty.

Example 1 (Karna, Shivakoti & Webb, 2010):

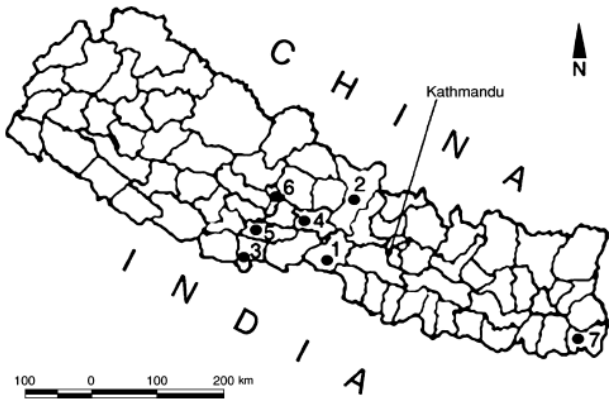


Figure 1 Map of Nepal, with study site locations indicated by black dots. 1 = Barandabhar, 2 = Ludi-Damgade, 3 = Samayamai, 4 = Aahal Danda, 5 = Chandraban, 6 = Bhadkhore, 7 = Thoplebiran.

Example 2 (Kanitpong, Boontob, & Tanaboriboon, 2008):

TABLE 7 Probability of Fatality by Head Injuries

Motorcycle occupants	Probability of fatality by head injuries		Relative changes in the probability of fatality if not wearing a helmet	Percent reduction in the probability of death due to head injuries
	Without helmet	With helmet		
Both riders and pillions	0.1301	0.0808	-0.0493	37.89%
Riders	0.1235	0.0797	-0.0438	35.47%
with alcohol	0.1071	0.0612	-0.0459	42.86%
without alcohol	0.1455	0.0962	-0.0493	33.88%
Pillions	0.1579	0.0660	-0.0919	58.20%

Example 3 (Islam & Kanitpong, 2008):

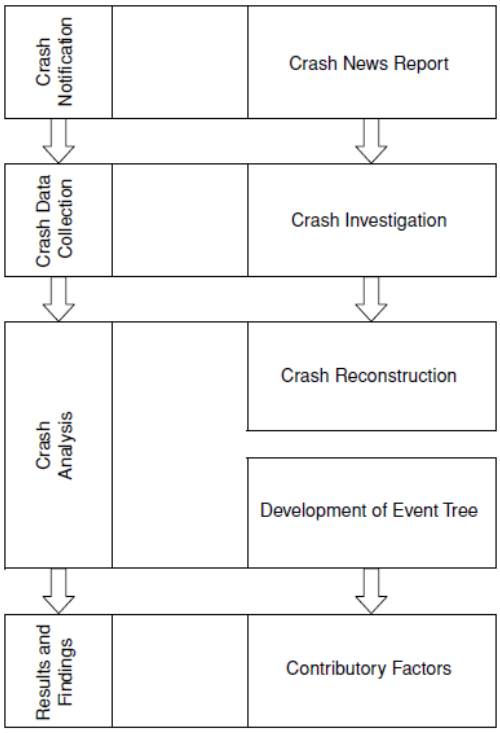
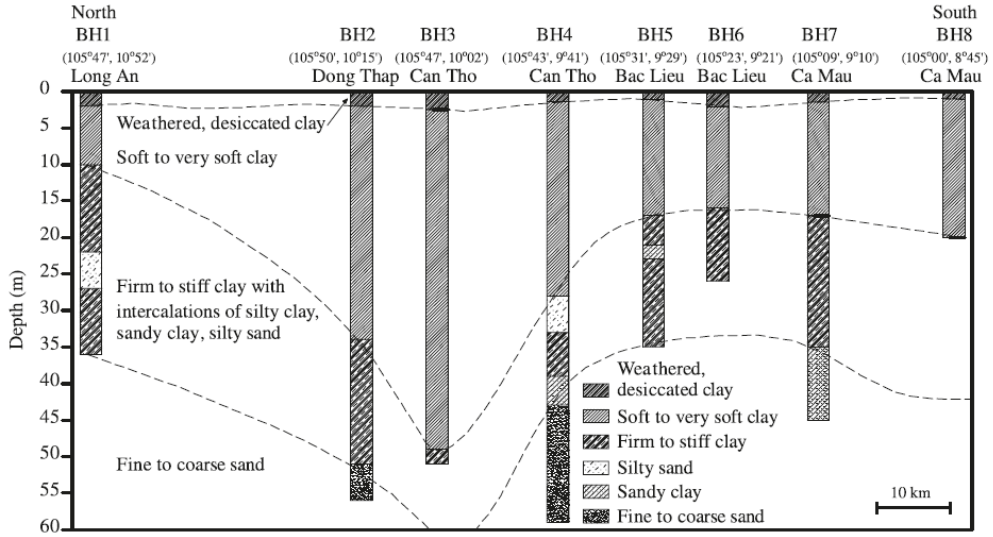


Fig. 2 Conceptual framework for the study

Example 4 (Giao, Dung & Long, 2008):

Fig. 2. Geotechnical cross section of the MRD (along the broken line indicated in Fig. 1). Latitude N and longitude E are given in parentheses for each borehole (BH).



Example 5 (Giao, Weller, Hien & Adisornsupawat, 2008):

Table 1
Some resistivity values of weathered and unweathered granitic rocks

References	Type of granite	Electric resistivity (Ω m)
Ebert (1952)	Weathered granite (Bodetal/Harz)	160
	Weathered granite (Lindenfels/Odenwald)	1150
	Highly weathered granites (Bensheim/Odenwald)	490
	Fresh granite (Thale/Harz)	4300
Heiland (1963)	Granites in Washington DC	5×10^{3}
Telford et al. (1976)	Fresh granites	300 to 10^{6}
	Wet granitic porphyry	4.5×10^{3}
	Dry granitic porphyry	1.3×10^{6}
Reynolds (1997)	Fresh granites	300 to 10^{6}
	Weathered granites	30 to 500
Clausthal University of Technology	Falkenberg Granite (Bavaria)	310–3465

Text

"The results should be short and sweet, without verbiage," (Day, 1988, p.41).

Since the Results section, when standing alone, does not attempt to interpret the results, it is not necessary to write profusely. Most importantly, the Results should point out interesting facts found in the study which will be included in the later Discussion.

The text will also include reference to any tables or figures included in the body of the text, or as an appendix. When referring to a table or figure, be sure to use an uppercase 'T' or 'F', followed by the appropriate number. In order to save space, Day suggests that for textual reference to tables and figures, use the name of the illustration in brackets after the statement, instead of pointing to it in the text (1988, p.42).

That is to say:

Write: Most respondents were female (Table 1).

Do not write: As one can easily see from Table 1, most respondents were female.

In addition, do not write anything in the text which is contained in tables or figures, and vice versa.

The following example illustrates one way to effectively present results.

Example Results: Resilience of community forestry under conditions of armed conflict in Nepal (Karna, Shivakoti, & Webb, 2010).

RESULTS

Degree of conflict
Based on the final weighted scores of conflict articulated by different user groups, four community forest sites (Aahal Danda, Chandraban, Bhadkhore and Thoplebiran) were categorized as sites experiencing high conflict (Table 2). All of these sites experienced at least one conflict event. Three sites (Ludi-Damgade, Samayamai and Barandabhar) were considered to be low conflict sites.

Forest vegetation
A Mann-Whitney pair-wise analysis of differences between two periods of time revealed that most of the forests had experienced an increase in both tree and sapling density during the study periods (Table 3). In particular, most of the locations experiencing high conflict had also experienced a significant increase in tree and sapling density over time.

Institutional strength and embeddedness
In sites with low degree of conflict, the distribution of institutional arrangements between the first and the second visits remained stable over time (Table 4). In contrast, three of the four high-conflict sites exhibited a significant decrease in institutional strength, while one site showed no difference (Table 4). However, institutional embeddedness significantly increased during the period of conflict at all high conflict sites (Table 5), while there were no significant changes at any of the low conflict sites.

Table 3 Relative differences in forest condition over period of study for sites with low and high conflict, based on a one-tailed Mann-Whitney U-test of the significance of differences in forest condition between the two time periods (* = significant at $p < 0.05$).

Variable	*Low conflict*			*High conflict*			
	Barandabhar	*Ludi-Damgade*	*Samayamai*	*Aahal Danda*	*Chandraban*	*Bhadkhore*	*Thoplebiran*
Mean tree density (per ha)	1996 < 2006	1997 < 2006	2000 < 2007*	1997 < 2006	2000 < 2007*	2001 < 2007*	2001 < 2007*
Mean sapling density (per ha)	1996 < 2006	1997 < 2006*	2000 < 2007*	1997 < 2006	2000 < 2007*	2001 < 2007*	2001 < 2007*

Text tables

Kozak makes an argument for the resurrection of text tables in scientific publishing (2009). Text tables resemble the tables frequently seen in scientific writing, but are incorporated into the preceding sentence and do not have lines. Kozak cites Tufte (2001) who points out that a sentence with more than two numbers becomes cumbersome to read. In addition, says Kozak, the common table format with lines and headings is separated from the text and thus the reader spends more time to leave the text, view the table, and return to the text.

Some rules suggested by Kozak for using text tables include keeping them small, having three columns or less, and of course not too much data. Since text tables are introduced by the preceding sentence there is no need for any headings or footnotes.

Here is an example summarizing the data from a hypothetical experiment:

> Questionnaires were sent to three sample groups with the following response rates:
>
> | | | |
> |---|---|---|
> | Sample | 1 | 95% response |
> | | 2 | 91% |
> | | 3 | 93% |

For the sake of comparison, here is the same information written as a conventional sentence:

> The questionnaires were sent out to three sample groups with the following response rates: Sample 1 had a 95% response, Sample 2 had a 91% response, and Sample 3 had a 93% response.

Discussion

Having a strong discussion is critical for successful research writing, hence Derntl includes it on his list of features for successful publications (2003). It is here that the writer explains why their findings are important. Hurried readers may skip the Literature Review, Methodology, and Results, moving directly to the Discussion. Day (1988) cautions that many authors will write too much for their Discussions, so it is best to focus on the most important or interesting aspects of the study. Some journals will request that the Discussion is combined with either the Results or the Conclusion, or that it stand alone.

A synthesis of several suggested structures (Goldbort, 2006; Katz, 2006; Peacock, 2002; Yang, 1995, p.93-94; Day, 1988, p.44) yields the following outline. Some writers may choose to go through the outline once for each research question or main finding, using sub-headings to delineate.

A model for Discussions

I. **Introduction**

1. **Review findings**: If the Discussion is separate from the Results it is sometimes, but

	not always, useful to remind readers of key findings.
and/or	
2. **Discuss outcomes**:	Were the research questions answered? What were the answers? How can the findings be used to answer the research questions? Were the findings expected, or were there some surprises?
and/or	
3. **Stake a claim**	How do the findings of this study contribute to knowledge in the discipline?
II. **Evaluation**	
1 **Analyze**:	What relationships or patterns can be identified? What generalizations or extrapolations can be made?
and/or	
2. **Offer explanations**	Possible reasons to account for the findings, including abnormalities.
and/or	
3. **Reference the literature**:	Compare and contrast your results with other relevant studies. How, and why, do your findings differ?
and/or	
4. **State implications**:	What affect will the findings have on existing theories? In what ways can the findings be applied to real-world situations?

III. **Conclusion**

1. **Recommendations** — Suggest possible directions for future research following from this study.

and/or

2. **Limitations:** — Point out any flaws that you are aware of regarding the research, including assumptions which have been made.

In my personal experience, novice authors may begin with a research question, objective, or set of hypotheses, but somehow fail to mention them in the discussion. If the purpose of the research is to learn something specific, or to test a hypothesis, the outcomes of the research should be discussed with regard to these. One student went so far as to state twelve hypotheses in their introduction, with valid justification for each, but then failed to clearly establish the relevant outcomes or evaluation.

A final note on evaluating data, it is important to consider the strength of any claims. Consider the two following statements:

It is likely that the results would be the same at varying temperatures.

and,

The results would be the same at varying temperatures.

The first sentence is not as 'strong' as the second, meaning the author allows for the possibility of being incorrect. The second sentence is given as a fact which is always true (c.f. **Hedging**, p. ?).

Conclusion

The last section in the main text, it is not unusual for Conclusions to be included with the Discussion. If your paper includes a comprehensive Discussion, there remains little else to write in the Conclusion. One possibility is a brief summary of the research, though if this has been done in the Abstract and Introduction it becomes quite redundant. Suggestions for action to be taken could also be written here.

Acknowledgements

It is a matter of basic courtesy to thank any person or organization that has made a contribution to your finished paper. Contributions are usually things like: financing, data, equipment, technical assistance, or mentoring. It is not necessary to use titles, however, full names and a description of the contribution should be given (Gustavii, 2008).

Before publication, you must obtain permission from the individuals (Gustavii, 2008; Day, 1988). This suggestion is due to the fact that contributors might not agree with your description of their contribution, or even that they object to something inside your paper!

Example Acknowledgements 1: Resilience of community forestry under conditions of armed conflict in Nepal (Karna, Shivakoti, & Webb, 2010).

ACKNOWLEDGEMENTS
We gratefully acknowledge the financial support provided by a Ford Foundation grant (950–1160–2) awarded to Elinor Ostrom, PI at International Forestry Resources and Institutions, Indiana University, and an Asian Institute of Technology fellowship awarded to Birendra K. Karna. We also acknowledge the support provided by Mukunda Karmacharya, Lila N. Sharma and Dr Ambika Gautam of the Nepal Forest Resources and Institutions research programme. We thank Drs Harini Nagendra and George Varughese and the anonymous referees for their useful comments on earlier drafts of this paper. Special thanks to the villagers and committee members from the seven CFUGs.

Example Acknowledgements 2: Machine learning approach to automatic exudate detection in retinal images from diabetic patients (Sopharak, Dailey, Uyyanonvara, Barman, Williamson, Nwe, & Moe, 2010).

Acknowledgments
We thank Thammasat University Hospital for the images used in these experiments, and we thank Thammasat University medical doctors for providing ground truth data. This research was supported by the Thailand National Electronics and Computer Technology Center (NECTEC) and by Thailand Research Fund grant MRG4780209 to MND.

References

We have already introduced referencing as an important aspect of scientific writing (c.f. **Sources and referencing: The reference list**, p.?). Details on formatting a reference list will vary depending on the journal's requirements (c.f. **With [academic] style**, p.?).

Appendices

The appendices are supporting materials, often tables or figures, which are included with the paper but separate from the main text. While appendices are useful for including details which would interfere with the text, be sure not to use them unnecessarily. Details on Appendices are, again, specific to the journal of publication; remember to check the instructions for authors because some journals will expect no appendices whatsoever.

Biography

Also known as a 'vitae', some journals will require an academic biography with the journal article. Your vitae will list academic qualifications, such as: previous posts, a summary of publications, or professional affiliation. Refer to your self in the third person.

Look at example biographies within your target journal for ideas and examples for writing your own vitae.

The following example is a copy of my modest vitae. Notice that, even with a relatively sparse academic background, it is not difficult to complete a few lines.

> Tylor Burrows has worked as a lecturer and instructor at universities in China, Saudi Arabia and Thailand. He has taught academic and research writing in a university preparation setting, as well as at the bachelor, master, and doctoral levels. His professional interests include teacher development, e-learning, and research writing.

6. With [Academic] Style

The way people communicate typically depends on the context that they are in. Most speakers will not use the same language to speak with close friends that they would use in, for example, a job interview. Academic writing follows a formal style, the rules for which are expected to be followed. Writers who do not use an academic style, and especially those who ignore the style guides, should not expect their submissions to be accepted. The prestigious journal *Nature* suggests that potential authors read a few articles in their journal in order to become familiar with the correct style (Nature, 2010). Since there is some variation in what is considered acceptable style, we will first introduce style guides and manuals as the best place to find answers, followed by a few selected topics.

Using style manuals and guides

Perhaps the most important tools to be aware of when writing professionally are style manuals and style guides. These are books, or websites, which help authors to write in a style suitable for the publication of their choice. By using style guides, publications can be consistent from author to author, and writers can find answers for questions like these:

How should I reference a pamphlet?
How should I write numbers?
Should I use British or American spelling?
How long should my abstract be?
What headings should I use for my research article?
How do I use abbreviations?

There are basically three kinds of style guide:

1. A publisher, such as a newspaper or book publisher, will have a guide which is specific to their publication.

2. General manuals, such as the 'Yahoo! Style Guide' for digital content, can answer a wide variety of style-related questions.

3. Finally, organizations have style guides. These can include specific journals (i.e. Proceedings of the Royal Academy of Sciences), universities (i.e. AIT), or professional associations (i.e. the American Psychological Association). Even Wikipedia has a manual of style.

For researchers wishing to publish academic articles it is probably the organizational guide which is the most important. In fact, early in the writing process it is sensible to choose a target journal and visit their webpage to determine the style they would like you to use. While writing it may be necessary to return to the style guide, and before submission it is sensible to check your final draft against the instructions. The amount of guidance provided will vary with the journal.

The cross-disciplinary journal *Psychology and Marketing*, for example, stipulates very few requirements (2010). In this case, since they require the use of American Psychological Association (APA) style for referencing, it is sensible to assume that the APA Publication Manual can be used to answer most questions of style not answered on their website.

The prestigious journal *Nature*, on the other hand, has a detailed page for author information; it includes items such as which dictionary to use for spelling, and also has links to detailed requirements for items such as the description of chemical structures. The *Proceedings of the National Academy of Sciences USA*, a scientific journal, provides a lot of stylistic information before directing readers to the manual

from the Council of Science Elders (CSE) as the appropriate, comprehensive guide for authors (2010).

To sum up, every journal will tell you what is important to them and their author instructions should be referred to frequently during the writing process. If you have a question which is not answered on their website then use an appropriate manual, such as APA or CSE. When in doubt, the best place to look for answers and examples will be previously published issues of the journal to which you submit your article.

The following examples have been taken from the websites of well-known scientific publications.

Science (http://www.sciencemag.org/site/feature/contribinfo/prep/index.xhtml)

Preparing Your Manuscript for Initial Submission

The *Science* Contributors FAQ
Quick answers to frequently asked questions on *Science*'s manuscript criteria, review process, and embargo policies, formats for figures and supporting online material, and more.

General information for authors
Categories of papers, manuscript selection criteria, conditions of acceptance, and other important data for scientific contributors.

Preparing your initial manuscript
Your initial submission should combine text, tables, figures, and most supporting online material in a single (preferably Word or PDF) document. Here's information on the acceptable file formats, naming conventions, and generally how to set things up before submitting. [Authors preparing their PostScript or PDF file for submission from TeX or LaTeX sources should also see our discussion on ensuring legible output from these sources.]

Preparing efficient figures for initial submission
Some tips on preparing illustrations, to keep the size of your upload managable.

Additional resources
Some general style guidelines for *Science* manuscripts and a review of the journal's reference style, along with a list of commonly used journal abbreviations for references.

Preparing Your Revised Manuscript (after Peer Review)

License-to-publish and authorship/conflict-of-interest forms
Information on our publication license agreement with authors and our authorship and COI disclosure policies, and downloadable PDF versions of the relevant forms.

Preparing your text and tables -- using Word or WordPerfect
General guidelines for manuscript preparation using the popular word-processing packages. We prefer to receive manuscripts in this format at the revision stage.

Preparing your text and tables -- using LaTeX
Although we prefer to receive revised manuscripts in Word or WordPerfect, we will also accept LaTeX-formatted papers. Please carefully follow our instructions for setting up your TeX.

Preparing your art and figures
At the revision stage, figure files are uploaded separately from the manuscript text. Here are guidelines for preparing, formatting, and uploading figures at the revision stage. [**Important note:** We **cannot** accept art in Microsoft PowerPoint or Word format at the revision stage! Please adhere to the formatting guidelines here.]

Preparing your supporting online material
Acceptable file formats and procedures for figures, tables, movies, sound clips, and other material to supplement your paper online.

The American Society of Civil Engineers

(http://www.asce.org/Audience/Authors,--Editors/Journals/Authors/Resources-for-Authors/)

Submitting a Journal Article

- Submission guidelines
- Types of journal content
- Length of journal submissions
- Parts of a journal article
- Writing style
- Author-date references
- Obtaining permissions

Review Process

- Review Process and Decision Descriptions

Preparing a Final Manuscript

- Final submission of accepted papers
- Preparing tables for journal articles
- Preparing mathematics for journal articles
- Preparing figures for journal articles
- Quick guide to preparing figures
- Creating PDF figures
- LaTex User Guide
- Publication process

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In This Section

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- Richard R. Torrens Award
- Submission Guidelines
- Forms
- Staff Contact
- Call for Papers
- Author Query Instructions

Academic, un-academic, and technical words

As mentioned earlier, academic writing uses formal or technical language, which can be a problem for non-native users of English. Language such as slang, colloquialisms, and clichés, are considered inappropriate for research writing (Hubbuch, 1996).

Slang expressions are words and phrases which are usually popular with a certain group and regularly used in informal situations. For example, young people might use words like *cool* (meaning 'excellent'), *grubby* (meaning 'not clean'), or *hot* (meaning either 'popular' or 'physically attractive'). Slang words can come in and out of fashion over time.

Colloquial language, which is similar to slang, is also informal language commonly used in speech. Norris (2010) provides many examples, including the suggestion that 'give' (verb) be rewritten as: supply, furnish, offer, provide, or yield.

Cliches are expressions such as *tried and true* or *sooner or later* which are easy to understand, but are too commonly used in everyday speech and not always necessary or even accurate. Idioms, similar to clichés, should also not be used. Idioms are expressions which are frequently used, but whose meaning is difficult to understand from simply knowing the vocabulary. Some examples of idioms are:

> *Don't throw out the baby with the bathwater* (meaning, just because a part of something is not good, do not discard those good things which are connected)
>
> *Its raining cats and dogs* (meaning it is raining very hard, but no animals are falling from the sky)

Technical words are sometimes needed in research writing, although it is best to avoid them where possible. Also known as 'jargon', Hubbuch suggests that the writer consider the audience when using these words; if there is a chance the reader will not understand, then give them a definition.

The active and passive voices

Active sentences are those where the subject is performing an action. Passive sentences are those where the subject is being acted upon. Both sentences contain the same information, so the main differences are the focus and the length. Consider the following two examples:

Dr. John wrote the paper in the morning.

and,

The paper was written in the morning, by Dr. John.

The first sentence, which is active, focuses on the writer and is shorter. Here, the active voice is preferred because it makes the writing shorter, more interesting to read, clearer, and less distant from the author (Bem, 2003; Epstein, Kenway, & Boden, 2005).

The second sentence shifts the focus to the object, and also needs more words to give the same information. Novice writers may employ the passive because it sounds more 'academic', however, excessive use of the passive voice has fallen out of style for most journals.

The only time that the passive voice is preferred is when describing the methodology, where it is sensible to focus on the procedures, equipment, and so on. In this case, the writer would usually omit the one performing the action. So, our above example becomes:

The paper was written in the morning.

Writing clearly and concisely

Of paramount importance in writing for journals is to write clearly and concisely (Young, 2006, p.12; Katz, 2006; Bem, 2003; Epstein, Kenway, Boden, 2005, p.42).

The following suggestions can help to make your writing more succinct. Do not worry about memorizing these before you write, but keep the list nearby while you revise.

- Use an active voice (c.f. **With [academic] style: The active and passive voices**, page 70).

- Try not to begin sentences with the word 'it'.

  Do not write: It was decided that the experiment should be conducted on a random sample.

  Write: The experiment was conducted on a random sample.

- Do not write unnecessary words, as in the following examples borrowed from Goldbort (2006):

  • many *in number*
  • hydroxylation *reaction*
  • eliminate *completely*
  • small *in size*
  • scrutinize *closely*
  • blue *in color*
  • conical *in shape*
  • the reason *why*
  • at this *moment*[or *point*] *in* time
  • exact *same*

- Focus on your key points and delete any text that is not necessary to understand the study.

- Use common, but not colloquial words (c.f. **Academic, un-academic, and technical words**, p. 69).

- Use transitions and signposts (c.f. **Reading research: Useful words and phrases**, p. 16).

- Use precise language. My personal pet peeve is the word 'nowadays', which is old-fashioned and gives no specific information. Katz (2006) suggests defining adjectives with specific numbers, saying "*tall* should be *greater than 2 m* [and] *heavy* should be *greater than 10 kg*."

- Do not use nouns when you can use the verb form of the word, for example:

  Do not write:
  We gave much consideration to the various means of distributing the questionnaire.

  Write:
  We considered various means of distributing the questionnaire.

- Put references to sources, appendices, tables, and figures at the end of the sentence as often as possible (c.f. **Writing your paper: Results: Text**, p. 56).

Numbers

Although the rules for numbers may, like everything else, vary between journals, this is an area which creates a great amount of confusion and deserves some attention in this document.

These suggestions are a combination of suggestions from Goldbort (2006) and the notable publishing house Emerald (2010):

Use words when:

- The number is between one and ten.
  This paper reviews ten previous studies, which were conducted in institutes of higher education in Thailand, over a period of three years.

- The number is at the beginning of a sentence.
  One-hundred and twenty-four of the students polled revealed that they would not choose to recommend their program of study to friends or relatives.

- The number is included with another word (five kilometers, fifty percent).
  Ninety-nine percent of the respondents would choose to do a second degree, but only on the condition that they were on full scholarships. This means that only one percent would be interested in using their own money to attend the program.

- Making a generalization (tens of thousands of trees).
  The cascade effect of higher education in science and technology initially led to improvements for hundreds of thousands of people.

- Writing simple fractions (one half).
  Good teaching is one third knowledge, one third preparation, and one third performance.

- Referring to millions, billions, etc.
  The cost of faculty salaries was millions of Baht every month.

Use numerals when:

- The number is included with an abbreviated unit of measure (2cm) or a symbol (20%). Do not, however, do this at the beginning of a sentence.

- Writing complex fractions (ie. $4\ ^{1}/_{16}$).

- Referring to a specific page or chapter (page 5, Chapter 3).

- Writing a Likert scale.

Of course, in the field of computer technology, it is also acceptable to use short forms such as K and MB when referring to the appropriate numbers (i.e. memory, processor speed, etc.).

Hedging

Hedging is the use of language to make a statement less certain, or, weaker. Consider the following statements, where the underlined hedging device changes the meaning slightly.

Technology improves people's lives.

1. *Technology might improve people's lives.*
2. *Technology seems to have improved people's lives.*
3. *Technology has improved many people's lives.*

4. *Technology has <u>influenced</u> people's lives.*

Hyland (1995) suggests three main reasons for why hedging is a central part of scientific writing:

- writers can more accurately convey information when they do not have absolute certainty,
- writers can safeguard their reputation in case they have made an incorrect conclusion,
- writers can show respect to the reader by using a more deferential style and providing space for disagreement and negotiation.

Four techniques for weakening statements involve: probability, distance, generalization, and use of weaker verbs (Swales and Feak, 2001), as illustrated in the above four example sentences.

Of course, hedging can be used too much, making the text difficult to read.

> *Based on the data available, there is a possibility that, for some people, technology may be able to improve certain lives, although to varying degrees.*

Other ways in which hedging can be dangerous are when it causes misunderstanding in the text, leading to the possibility of fraud, or when it weakens the strength of the argument unnecessarily (Roland, 2007).

Ethics in publishing

'Ethics' is a branch of philosophy which examines the concepts of right and wrong. A journal will likely refuse to publish research, or writing, which they feel are not to an acceptable ethical standard.

Ethics in science publishing refers to both the experiment and the written account. In terms of the experiment, publishers want to know that the researcher did not mistreat animals or human beings during the course of the study. Further to this, the writing is expected to be a truthful and honest account of the experiment. Finally, authors are expected to uphold a high standard of ethics by abstaining from any form of plagiarism.

Interestingly, the United States National Academies begins their third edition of *On Being a Scientist: A Guide to Responsible Conduct in Research* with the statement, "The scientific enterprise is built on a foundation of trust" (2009). Not factual information, but trust that the information is indeed factual.

Appendix I: Suggested samples

These papers were generously suggested by AIT faculty as suitable examples for their fields.

Geotechnical and Earth Resources Engineering

Giao, P.H., Dung, N.T., & Long, P.V. (2008). An integrated geotechnical–geophysical investigation of soft clay at a coastal site in the Mekong Delta for oil and gas infrastructure development. *Canadian Geotechnical Journal, 45,* 1514-1524.

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Transportation Engineering

Kanitpong, K., Boontob. N., & Tanaboriboon, Y. (2008). Helmet Use and Effectiveness in Reducing the Severity of Head Injuries in Thailand. *Journal of the Transportation Research Board,*66-76.

Islam, M.B. & Kanitpong, K. (2008). Identification of Factors in Road Accidents through In-Depth Accident Analysis. *The International Association of Traffic and Safety Sciences (IATSS) Research, 32*(2), 58-67.

Mechatronics

Bui, T.T., Parnichkun, M., & Le, C., H. (2010). Structure Specified H∞ Loop Shaping Control for Balancing of Bicycle Robots: A Particle Swarm Optimization Approach. *Journal of Systems and Control Engineering, Selected Papers from Proceedings of the Institution of Mechanical Engineers, Part I,* 1-17.

Sukontanakarn, V., & Parnichkun, M. (2009). Real-time optimal control for rotary inverted pendulum. *American Journal of Applied Sciences, 6*(6), 1106-1115.

Computer Science

Dailey, M.N., Joyce, C., Lyons, M.J., Kamachi, M., Ishi, H., Gyoba, J., & Cottrell, G.W. (2010). Evidence and a computational explanation of cultural differences in facial expression recognition. In press, *Emotion*.

Sopharak, A., Dailey, M. N., Uyyanonvara, B., Barman, S., Williamson, T., Nwe, Khine Thet and Moe, Yin Aye. (2010). Machine learning approach to automatic exudate detection in retinal images from diabetic patients. *Journal of Modern Optics, 57*(2), 124-135.

Remote Sensing and Geographic Information Systems

Ines, A.V., Honda, K., Das, Droogers, P., & Clemente, R. S. (2006). Combining remote sensing-simulation modeling and genetic algorithm optimization to explore water management options in irrigated agriculture. *Agricultural Water Management*, *83*(3), 221-232.

Ines, A.V. & Honda, K. (2005). On quantifying agricultural and water management practices from low spatial resolution RS data using genetic algorithms: A numerical study for mixed-pixel environment. *Advances in Water Resources, 28*, 856–870.

Agricultural Systems and Engineering

Karna, B.K., Shivakoti, G.P., & Webb, E.L. (2010). Resilience of community forestry under conditions of armed conflict in Nepal. *Environmental Conservation, 37*(2), 201-209

Shivakoti, G. P. & Bastakoti, R.C. (2006). The robustness of Montane irrigation systems of Thailand in a dynamic human–water resources interface. *Journal of Institutional Economics, 2*(2), 227-247.

Gender and Development Studies

Kusakabe, K. (2003). Women's involvement in small-scale aquaculture in Northeast Thailand. *Development in Practice, 13*(4), 333-345.

Kusakabe, K. (2004). Women's work and market hierarchies along the border of Lao PDR. *Gender, Place & Culture: A Journal of Feminist Geography*, *11*(4), 581-594.

Appendix II: Coxhead's academic word list (2000)

Sublist 1 – most common academic words

analyze	constitute	establish	indicate	occur
role	approach	context	estimate	individual
percent	section	area	contract	evident
interpret	period	sector	assess	create
export	involve	policy	significant	assume
data	factor	issue	principle	similar
authority	define	finance	labour	proceed
source	available	derive	formula	legal
process	specific	benefit	distribute	function
legislate	require	structure	concept	economy
identify	major	research	theory	consist
environment	income	method	respond	vary

Sublist 2

achieve	community	design	institute	potential
restrict	acquire	complex	distinct	invest
previous	secure	administer	compute	element
item	primary	seek	affect	conclude
equate	journal	purchase	select	appropriate
conduct	evaluate	maintain	range	site
aspect	consequent	feature	normal	region
strategy	assist	construct	final	obtain
regulate	survey	category	consume	focus
participate	relevant	text	chapter	credit
impact	perceive	reside	tradition	commission

culture	injure	positive	resource	transfer

Sublist 3

alternative	convene	emphasis	interact	philosophy
circumstance	coordinate	ensure	justify	physical
shift	comment	core	exclude	layer
proportion	specify	compensate	corporate	framework
link	publish	sufficient	component	correspond
fund	locate	react	task	consent
criteria	illustrate	maximise	register	technical
considerable	deduce	immigrate	minor	rely
technique	constant	demonstrate	imply	negate
remove	constrain	document	initial	outcome
scheme	valid	volume	contribute	dominate
instance	technology	partner	sequence	sex

Sublist 4

access	communicate	error	internal	parallel
resolve	adequate	concentrate	ethnic	investigate
parameter	retain	annual	confer	goal
job	phase	series	apparent	contrast
grant	label	predict	statistic	approximate
cycle	hence	mechanism	principal	status
attitude	debate	hypothesis	obvious	prior
stress	attribute	despite	implement	occupy
professional	sum	civil	dimension	implicate
option	project	emerge	code	domestic
impose	output	promote	summary	commit

integrate	overall	undertake	subsequent	regime

Sublist 5

academy	consult	evolve	licence	orient	style
adjust	contact	expand	logic	perspective	substitute
alter	decline	expose	margin	precise	sustain
amend	discrete	external	medical	prime	symbol
aware	draft	facilitate	mental	psychology	target
capacity	enable	fundamental	modify	pursue	transit
challenge	energy	generate	monitor	ratio	trend
clause	enforce	generation	network	reject	version
compound	entity	image	notion	revenue	welfare
conflict	equivalent	liberal	objective	stable	whereas

Sublist 6

abstract	capable	exceed	incidence	migrate	recover
accurate	cite	expert	incorporate	minimum	reveal
acknowledge	cooperate	explicit	index	ministry	scope
aggregate	discriminate	federal	inhibit	motive	subsidy
allocate	display	fee	initiate	neutral	tape
assign	diverse	flexible	input	nevertheless	trace
attach	domain	furthermore	instruct	overseas	transform
author	edit	gender	intelligent	precede	transport
bond	enhance	ignorant	interval	presume	underlie
brief	estate	incentive	lecture	rational	utilize

Sublist 7

adapt	contrary	empirical	identical	phenomenon	submit
adult	convert	equip	ideology	priority	successor
advocate	couple	extract	infer	prohibit	survive
aid	decade	comprehensive	innovate	publication	thesis
channel	definite	finite	insert	quote	file
chemical	deny	foundation	intervene	release	transmit
classic	differentiate	globe	isolate	reverse	ultimate
topic	dispose	grade	media	simulate	unique
comprise	dynamic	guarantee	mode	sole	visible
confirm	eliminate	hierarchy	paradigm	somewhat	voluntary

Sublist 8

abandon	clarify	deviate	induce	plus	tense
accompany	commodity	displace	inevitable	practitioner	terminate
accumulate	complement	drama	infrastructure	predominant	theme
ambiguous	conform	eventual	inspect	prospect	thereby
append	contemporary	exhibit	intense	radical	uniform
appreciate	contradict	exploit	manipulate	random	vehicle
arbitrary	crucial	fluctuate	minimise	reinforce	via
automate	currency	guideline	nuclear	restore	virtual
bias	denote	highlight	offset	revise	visual
chart	widespread	implicit	paragraph	schedule	detect

Sublist 9

accommodate	commence	duration	mature	preliminary
sphere	analogy	compatible	erode	mediate

subordinate	anticipate	concurrent	ethic	medium
qualitative	supplement	assure	controversy	found
minimal	relax	team	behalf	converse
inherent	mutual	restrain	temporary	bulk
device	insight	norm	revolution	trigger
cease	devote	integral	overlap	rigid
unify	coherent	diminish	intermediate	passive
route	violate	coincide	distort	manual
portion	scenario	vision	protocol	

Sublist 10 – least common academic words

adjacent	enormous	odd	albeit
forthcoming	ongoing	assemble	incline
panel	collapse	integrity	persist
colleague	intrinsic	pose	compile
invoke	reluctance	conceive	levy
so-called	convince	likewise	straightforward
depress	nonetheless	undergo	
encounter	notwithstanding	whereby	

Appendix III: Transitions and signposts

The following list of transitions is part of a comprehensive set from the website *smart-words.org*.

Agreement / Addition / Similarity

The transitional devices like *also*, *in addition*, and, *likewise*, add information, reinforce ideas, and express agreement with preceding material.

in the first place	not only ... but also	as a matter of fact
in like manner	in addition	coupled with
in the same fashion / way	first, second, third	in the light of
not to mention	to say nothing of	equally important
by the same token	again	to
and	also	then
equally	identically	uniquely
like	as	too
moreover	as well as	together with
of course	likewise	comparatively
correspondingly	similarly	furthermore
additionally		

Opposition / Limitation / Contradiction

Transition words and phrases like *but*, *rather* and *or*, express that there is evidence to the contrary or point out alternatives, and thus introduce a change the line of reasoning (contrast).

although this may be true	in contrast	different from
of course ..., but	on the other hand	on the contrary
at the same time	in spite of	even so / though

be that as it may	then again	above all
in reality	after all	but
(and) still	unlike	or
(and) yet	while	albeit
besides	although	instead
whereas	despite	conversely
otherwise	however	rather
nevertheless	regardless	notwithstanding

Examples / Support / Emphasis

These transitional devices (like *especially*) are used to introduce examples as support, to indicate importance or as an illustration so that an idea is cued to the reader.

in other words	to put it differently	for one thing
as an illustration	in this case	for this reason
to put it another way	that is to say	
with attention to	important to realize	by all means
another key point	first thing to remember	most compelling
evidence must be remembered	point often overlooked	to point out
on the positive side	on the negative side	with this in mind
notably		
including	like	to be sure
namely	chiefly	truly
indeed	certainly	surely
markedly	especially	specifically
expressively	surprisingly	frequently

significantly	in fact	in general
in particular	in detail	for example
for instance	to demonstrate	to emphasize
to repeat	to clarify	to explain
to enumerate	such as	

Cause / Condition / Purpose

These transitional words present specific conditions or intentions.

in the event that	granted (that)	as / so long as
on (the) condition (that)	for the purpose of	with this intention
with this in mind	in the hope that	to the end that
for fear that	in order to	seeing / being that
in view of	If... then	unless

when	whenever	since
while		

because of	as	since
while	lest	in case
provided that	given that	only / even if
so that	so as to	owing to
inasmuch as	due to	

Effect / Consequence / Result

Some of these transition words (*thus*, *then*, *accordingly*, *consequently*, *therefore*, *henceforth*) are time words that are used to show that after a particular time there was a consequence or an effect. Note that for and because are placed before the cause/reason. The other devices are placed before the consequences or effects.

as a result	under those circumstances	in that case
for this reason	for	thus
because the	then	hence
consequently	therefore	thereupon
forthwith	accordingly	henceforth

Conclusion / Summary / Restatement

These transition words and phrases conclude, summarize and/or restate ideas, or a indicate a final general statement. Also, some words (like *therefore*) from the Effect / Consequence category can be used to summarize.

as can be seen	generally speaking	in the final analysis
all things considered	as shown above	in the long run
given these points	as has been noted	in a word
for the most part	after all	in fact
in summary	in conclusion	in short
in brief	in essence	to summarize
on balance	altogether	overall
ordinarily	usually	by and large
to sum up	on the whole	in any event
in either case	all in all	

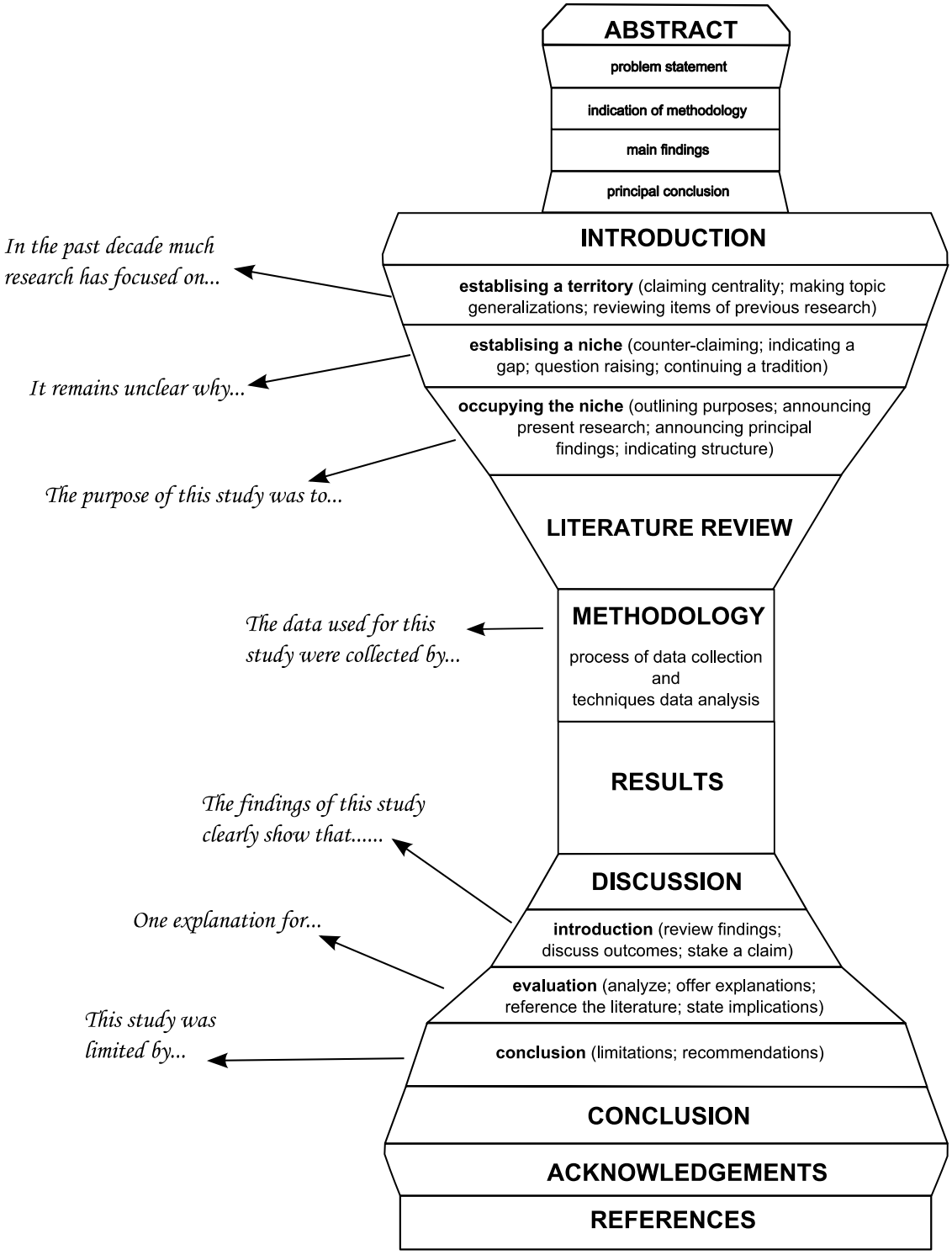
Time / Chronology / Sequence

These transitional words (like *finally*) have the function of limiting, restricting, and defining time. They can be used either alone or as part of adverbial expressions.

at the present time	from time to time	sooner or later
at the same time	up to the present time	to begin with
in due time	until now	as soon as

in the meantime	in a moment	without delay
in the first place	all of a sudden	at this instant
immediately	quickly	finally
after	later	last
until	since	then
before	hence	since
when	once	about
next	now	
formerly	suddenly	shortly
henceforth	whenever	eventually
meanwhile	further	during
first, second	in time	prior to
forthwith	straightaway	
instantly	presently	occasionally

Appendix IV: Typical research article structure



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