



生态仿真优化实验室  
Simulation Optimization Lab

# Academic Writing II – IMRAD

Prof. Dr. Tianjian Cao  
Northwest A&F University  
cao@nwafu.edu.cn



These should not be **too general** or **too detailed**

Even before the abstract, we read the title (Hall, 1998)

A poor title may result in immediate prejudice against your text.

The title should be **descriptive**.

It should tell only what the article is about, telling **neither why** you wrote it, **nor** what you **found**, **nor the conclusions** you reached.

stating the topic as **briefly** and **interestingly** as possible, not presenting its contents.



Justify the actual contribution of every author listed

Editors may require a declaration of participation stating each author's contribution (Original idea? Planning? Statistics? Text-writing?).

Often each author must sign a statement agreeing to be an author and accept responsibility for the article contents.

The days of automatically adding a professor's name to the end of every author-list are over.

"Contributors" at the end of the article include some not qualified to be authors. You can also Acknowledge some whom you eliminate from the author list.



## 1. **Informative** type of abstract

Includes all sections relevant to your work and contains results in tail, plus implications.

## 2. **Indicative** abstract

Merely introduces your work and describes what you did.

This type may be acceptable for **conferences** where you will orally present your results.

Moreover, a conference may require abstract very early, before any results are ready.

## 3. **Review** article abstract

Usually **commissioned** by a journal, systematically describes all that has been studies on one topic.



An abstract should reveal:  
why what was done was done  
what was done  
what was found  
what was concluded

An abstract must stand alone

Each full term plus its abbreviation goes into the abstract.

Always obey length restrictions.  
200 words, 150 unstructured, 250 structured

Write the first draft as structured



## The Article Abstract

1. objectives or hypothesis tested
2. study design and setting
3. sample or subjects
4. methods or intervention
5. measurements, statistics
6. results
7. conclusions
8. Implications

## Abstract Elements

B(background), P(purpose), M(method), R(results), C(conclusion).



Verb Tense in the Abstract

Background: **Present** tense

Principle activity: Past tense/present perfect tense

Methodology: **Past** tense

Results: **Past** tense

Conclusions: Present tense/tentative verbs/modal auxiliaries



# Article Sections

the acronym **IMRAD**



- **I**ntroduction tells what question you will be asking
- **M**ethods tell how it was studied
- **R**esults tells what you found
- **A**nd
- **D**iscussion explains what the findings mean

This produces the acronym **IMRAD**



### **Abstract:**

why what was done was done,  
what was done,  
what was found,  
what was concluded

**End the Introduction** with what you are seeking

**Begin the Discussion** with what you found



Establishing a context

General -> Specific

The five stages

I. the setting (Background, General->Specific)

II. already studied (Previous studies)

III. investigation needed (Gap)

IV. purpose (Your study)

V. value (?)



Move 1: Establish the field: assert briefly how significant, relevant, and important is your chosen topic.

Move 2: Summarize previous general research.

Move 3: Focus on your own research project. Indicate a gap in knowledge that should be filled.

Move 4: Introduce your own research: state the purpose of your research or outline what intend to do or what hypothesis you will test. This is the place for your research question.



**Linking ideas** through old and new information order  
this..., such..., etc.

General and specific noun phrases

article, a/an, the

uncountable/countable, singular/plural

criterion/criteria, phenomenon/phenomena, fungus/fungi, species, series

**Never** equipmentss, advicess, informationss

effect/impact, chapter/section, in print/in press

general or specific sense, countable or uncountable, Fig. 2.3, p.32



## Stage I: the setting

- Q1. Which sentences in the preceding introduction make obvious statements or statements that would be accepted as fact concerning the general area?
- Q2. Which sentence focuses on one subarea of the general area of study?
- Q3. Which sentence indicates the authors' topic?



## THE USES OF DUCKWEED IN WASTE-WATER TREATMENT

- 1 Clean water is a basic human need.
- 2 Its discovery, transport, and systematic renewal have always been crucial to all but the least densely populated societies.
- 3 Increasing population and industrial wastes, together with diminishing sources of easily available energy with which to manage them, are converging to emphasize that all the earth's resources are finite.
- 4 But the supply of clean water, thought also finite, is at least infinitely renewable.
- 5 Among the various approaches to improving present technologies for waste-water treatment, several involve the use of plants, which can remove pollutants and provide materials useful as animal feeds or energy sources.
- 6 Various aquatic plants are being proposed in such approaches, and the duckweeds in particular, an essentially unique group of higher aquatic plants, might be especially advantageous in such systems.



## Stage II: Literature view

Citation style, p.42

Citation order, p.46

Tense, p.50

**What is referencing?** Referencing is a standardized way of acknowledging the sources of information and ideas that you have used in your document.

**Why reference?** Referencing is important to avoid plagiarism, to verify quotations and to enable readers to follow up what you have written and locate the cited author's work.

## Citation style

Harvard style

Vancouver style



The “**Harvard Style**” is a generic author-date style for citing and referencing information in assignments and publications.

In an author-date style, in-text citations usually require the name of the author(s) and the year of publication.

A page number is included if you have a direct quote, paraphrase a passage or you want to direct the reader to a specific page. Page numbers may also be included if the you are referring to a long work and the page numbers might be useful to the reader.

In the **Vancouver Style**, citations within the text of the essay/paper are identified by Arabic numbers in round brackets or Arabic numbers in superscript. This applies to references in text, tables and figures.

The EndNote referencing style software uses the Arabic number in brackets eg. (2)

The identification of references within the text of the essay/paper may vary according to the preferred style of the journal



## Order of citations

**Location:** end, middle, or start?

Citations **grouped** by approach

One approach

another approach

still another approach

Citations ordered **from distant to close**

most distantly related to your study

most closely related

Citations ordered **chronologically**

earliest -> latest



Tense in information prominent citations  
present tense (information, scientific fact)

Tense in weak author prominent citations  
present perfect (several authors)  
General statements about the research  
present perfect (level of research activity)

Tense in author prominent citations  
simple past tense (findings of individual studies closely related to your own)

Attitude and tense in reported findings  
present tense (fact)  
past tense (specific study)  
past tense (tentative verbs) + modal auxiliary



- 1 Food expense is one of the largest recurring items in the budgets of most families.
- 2 Today, food purchases take more than one-sixth (17.8%) of the total consumer disposable income in the United States (3).
- 3 This expenditure includes money spent for meals away from home as well as for food bought for use at home.
- 4 Many demographic factors affect food-buying decisions, including age, education, income, and experience (10).
- 5 However, student wives are a specialized population group about which little is known.
- 6 The purpose of this study was to learn more about the food-buying practices of wives of university students.
- 7 It is hoped that information from this study maybe useful in identifying areas of weakness or lack of knowledge to those who are responsible for planning courses and programs in consumer education.



What is the function of sentence 5?

How does sentence 5 relate to the previous sentences in this introduction?

What connection exists between sentence 5 and sentence 6?

What is the author trying to suggest about the research in sentence 7?



Alternatives for **stage III**, P.67

**inadequate** -> an important aspect ... has been ignored

**unresolved conflict** -> theoretical or methodological disagreement

**an extension** -> raises a new research question



Which sentence in the introduction contains Stage III?

Does the entire sentence correspond to Stage III, or only part of the sentence?

What word helped you recognize the beginning of Stage III?



- 1 There is considerable current interest in methods of limiting the business risk to which farmers are exposed.
- 2 Some approaches to business risk modification involve insurance, government programs, weather modification, and innovations, and innovations of individual farmers.
- 3 It is recognized that the introduction or modification of risk in the production process affects the pattern of resource allocation and in turn the level of production (Dillon 1979).
- 4 We suggest that there is also a financial response to business risk modification.
- 5 The difference is important in that business risk and financial risk may well be trade-offs in the risk behavior of farmers.
- 6 Thus, a decline in business risk would lead to the acceptance of greater financial risk, reducing the effects of the diminished business risk on total risk.
- 7 While most of the literature on risk and risk response treats only production and price risk, we intend to introduce the notion of financial risk explicitly into the decision-making process.
- 8 In this paper we present a conceptual framework for linking production and investment decisions to the financing decision via a risk constraint.



**Report** orientation => the report **itself**

The purpose of this thesis

The aim of the present paper + is to ...

The objective of this report

**Research** orientation => research **activity**

The purpose of this study + was to ...

    this investigation

    this research

    the research reported here

**Verb tense**, p. 79

past => research

present / future => report



This paper describes the results of aerial survey and interviews conducted in Honduras to determine the distribution and status of manatees in that country.

In this paper we present a conceptual framework for linking production and investment decisions to the financing decision via a risk constraint.

The present study was made to determine whether or not genetic differences in germination at low temperature exist in pepper species, and to establish the magnitude of such differences.

The research reported in this paper was an attempt to develop an alternative analytical approach to machinery selection problems.

The purpose of this article is to give the most direct answer possible to the direct question of how long advertising affects sales.



Stage V, **Often omitted** => journal articles

Stage V => thesis, dissertation, proposal

Stage V => project reports

Introduction summary:

Establish a research **territory** (I, II)

Establish a **niche** for yourself (III)

**Occupy** the niche (IV/IV,V)



### **Elements** included in the MM section

Overview of the experiment

Population/sample

Location

Restrictions/limiting conditions

Sampling technique

Procedures

Materials

Variables

Statistical treatment



Referees seem to focus half their criticism here

Although they demand that you present sufficient data to allow others to replicate your work, in order to confirm your findings, **this section must be brief.**

Some journals reduce the font size for Methods or even restrict all methods to the text appearing under tables and figures.

They may print brief methods in the journal and refer readers to further details on the net.



Maintain the **past** tense

Write long,

and then **cut, cut , cut** out any wasted words

Stay **chronological**.

Report each step or event in a clear time-order, as events occurred.

Never say "X occurred after Y," or "We saw X after Y."

Say "Y occurred before X" and "We saw Y and then X."



**Answer** all the questions the reader will be asking

Seek aid from a **statistician**.

Do you say who did what to whom? When, and precisely how? **Define all terms:** For "high X," "delayed X," or "prolonged X," describe how high, long, or prolonged.

**Describe** any controls or control samples as **thoroughly** as you describe the study -- or test -- population.

**Avoid numbering groups** (A, B, C; 1, 2, 3); use names ("Milk, No-Milk," "Tall, Short.")

If you have complex populations with changes in numbers, or complicated results, consider adding a **flow-chart**.



Do not end with passive verbs  
hide them in the middle of the sentence  
or substitute adjectives or nouns

Avoid repeating words  
Avoid ending sentences with passives

Move them from sentence-end to -middle  
Change some passive verbs into adj.

Change the verb itself  
Patients (were operated ON) underwent surgery  
The (used) method (used/was used) served as a model



To X, some Y was added. ->  
Y was added to X

X could be seen. ->  
X was evident/apparent/visible

X was always used ->  
X was always useful

Children were enrolled at age six. ->  
The children enrolled were aged six.



Omit useless passive constructions

It has been found that X kills Y (Aho 2001)

-> X kills Y (Aho 2001)

Use inanimate agent (a non-human or non-living actor)

Table 3 shows..., Figure 5 illustrates...

Results indicate that...,

The hypothesis predicts X.

Opinions vary.

These mice were given injections ->

These mice received injections



## Categories, p.114

Laboratory equipment

field equipment

human or animal subjects

natural substances

fabricated materials

surveys, questionnaires and tests

computer models

mathematical models



Step A, **overview**: This step consists of one or two sentences that give a general idea of the material and the purpose for which it is intended.

Step B, **description** of principal parts: Here, each major part or characteristic of the material is described in logical sequence.

Step C, **functional description**: This last step shows how the various features described in Step B function together.



Step B, p.118

**Spatial** arrangement: Describe the features from top to bottom, front to back, left to right, from the center to the outside, or in some other spatial way. This arrangement is especially useful for describing equipment consisting of various connected parts.

**Functional** arrangement: Describe the principal features in the order in which they function, from beginning to end. This arrangement is best for describing parts that operate in a fixed sequence.



## Integrating materials with procedure

The materials used in a study are sometimes described separately from the procedures.

- several different pieces
- routine procedure

More commonly, however, materials and methods are described in an integrated form, often with both elements mentioned in each sentence.



## Verb tense and voice

samples: past tense, p124

populations: present tense,

conventional material: present tense, p.126

specially designed or modified materials, past tense

The passive voice is usually used when a human agent (the experimenter) is manipulating the materials.p.128

The active voice is usually used when no human is directly responsible for manipulating the materials -- i.e. when the materials operate "by themselves"

The passive voice may be used to describe an action involving a nonhuman agent, but a phrase must be include to indicate the agent.



do not **Double Document**

Results (the **statistical** significance), or Discussion (their **practical** significance)

past tense, limit passive voice

**do not evaluate**

end the Results **without any summary**

The Anglo-American Discussion now usually begins with a statement of your main findings.



Of the 366 staff responding, 92(25%) approved of the plan.

The Whammo Method was effective in less than one-third of the groups.

A four-fold increase in voting occurred in 1996 in districts with populations of less than 10,000; compared with the percentage of women voters aged over 50 in the same election three years previously, 1996 saw a rise in such voters of 56%.

That only a quarter of the staff approved of the plan seems surprising.

The Whammo Method's ineffectiveness may stem from its untested premises.

Such a large increase in voter participation in rural areas--with so many older women voting-- supports the suggestion of Smith (1999) that rural women of this age may take more interest in current events than do rural men.



Study the target journal's style, study many tables and figures in that particular journal.

### Use full sentences?

Use **telegraphic style** without unnecessary temporal verbs and articles?

Usually drop initial "The" and write  
"Countries joining the EU in 2004"  
"Level of reading ability in..."

Consider how **informative** your title or legend should be.

**Explain all abbreviations** in footnotes or in parentheses in title or column headings.



Omit from a table title word-for-word headings immediately appearing in that table

**Avoid repeating** the exact table title or figure legend in the text.

"Table 6. Condition of third molars assessed by Wibble Method."

The line "Table 6 shows the condition of third molars assessed by the Wibble Method"  
**wastes many words**

In the text, at the end of any description of or reference to data in a table or figure, it is efficient merely to give the table or figure number in parentheses, thus

"When tested by the Wibble method, conditions ranged from X to Y (Table 6)."



One table per **1000 words** is wise

with data laid out "**tall and narrow**," not "wide and flat."

Editors rarely will print tables across two pages; lines can become skewed.

**Avoid repetition** of words, phrases, abbreviations, or figures.

If your table includes **columns of many (>5?)** identical words or figures, re-think its layout.

Number all tables and figures in the order of their appearance in the text and be sure **to mention each one**, at least as "(Fig. 3 or Figs. 3-4)"



Each tables and figures must stand alone, independent of the text,

because **readers** usually study them **before** they read the text,

**define all terms** and abbreviations, usually in footnotes below table or figure, sometimes in the title or legend itself, as here:

"Figure 1. Population of fat (FP) and lean pigs (LP) across Finland, 2002."



state the number of items/subjects in every title or legend or in the table or on the figure itself, perhaps merely as "N=120)." Or does the journal use "n"?

be sure that **multiple-part figures** have clear numbers or letters (1,2,3, or A,B,C), and these are printed near each picture.

In figures, show your *symbols* in the legend, or print them right on the figure.

Say "**lines**", "**areas**" in the legend, or put right on the figure.

Otherwise, is this ■ a "filled", "black", or "solid" square? Is the symbol □ an "unfilled", "white," or "open" square?



These are only six of many confusing adjectives to describe such symbols.

If you must give names instead of examples for lines:

Write "broken" or "dashed" (---), "unbroken" or "solid" (—) lines, or "dotted" (...) lines.

A gray area is "shade".

A dotted area is "stippled"

Write "hatched" for *///////*

or "cross-hatched" for XXXXX.

in each table, be sure that each column is required and cannot be replaced by a footnote or by words in the table title itself.



### Pattern 1: **Ordering your information**

Element 1: Location of results

Element 2: Most important findings

Element 3: Comments

### Pattern 2: **Alternate short form**

Elements 1 and 2 (combined): statements that present the most important results and that indicate in parentheses the figure where they can be found.

Elements 3: statements that comment on the results.

Example: Caffeine was somewhat more potent than theophylline in preventing leaf-eating (Figs. 1-2). In contrast, caffeine has been reported elsewhere to be ten times weaker than theophylline as an adenosine antagonist (8).



- 1 A total of 53 samples were examined.
- 2 Direct microscopic examination of the samples showed 20 different fungal strains, which were isolated by culture and identified to the level of genus and/or species (Table 1).
- 3 These findings show that fungi can tolerate adverse environmental changes in the vegetative form.
- 4 Table 2 shows the results of the psychological tests applied to the isolates.
- 5 None of the fungi strains was able to grow in culture media with 500 to 5000 mg L<sup>-1</sup> of anionic surfactant.
- 6 An inhibitory effect on fungal growth and activity might be expected from the anionic surfactant level found in the ponds (Tomlinson and Williams, 1975)

Which sentence locates the figure where results can be found?

Which sentences present the most important results?

Which sentence comments on the results?

What is the function of the first sentence in the example?



Function 1: **generalize** from the results

Function 2: **explain** possible reasons for the results

Function 3: **compare** the results with results from other studies

Alternating pattern: R1 + C1; R2 + C2; R3 + C3

Sequential pattern: R1 + R2 + R3 + C

The **alternating** pattern is **best** if you have many individual results with specific comments about each result.

The **sequential** pattern is used when there are several individual results to which one general comment applies.

Your **professor or editor** may ask you to put all comments in a **separate section** called "Discussion."



Anglo-American writers

1. **claim** -- as the point of departure
2. give an **explanation**
3. **restate** their claim at the end

The discussion answers the question "**What do your findings mean?**"

Show how your findings relate to **existing knowledge**.

Explain what is **new** in your work  
and say **why** your results are important

what the next steps might be  
other results and hypotheses that are relevant to yours  
any possible **errors** or **limitations**



## Recipe for a Discussion

### Step 1. **Main message.**

This "answers the question posed in the Introduction  
includes the main supporting evidence  
Next, critique your own study

### Step 2. **Critical assessment.**

any shortcomings in study design, limitations in methods, flaws in analysis, or validity of assumptions

### Step 3. **Comparison with other studies**

Your findings. Other studies' findings

### Step 4. **So what?**

Conclusions, implications, further research



## General Advice for a Discussion

### **Avoid priority claims**

"This is the first report of ..."

"We are the first to do ..."

=>

To the best of our knowledge, this may be/ seems to be the first report of ...

### **Avoid promising to publish more**



### **First information** elements in discussion, p.162

1. A reference to the main purpose or hypothesis of the study
2. A review of the most important findings, whether or not they support the original hypothesis, and whether they agree with the findings of other researchers
3. Possible explanations for or speculations about the findings
4. Limitations of the study

### **Later information** elements in discussion

5. Implications of the study
6. Recommendations for future research and practical applications.



**1**The decremental theory of aging led us to infer that older workers in speed jobs would have poorer performance, greater absenteeism, and more accidents compared with other workers. **2**The findings, however, go against the theory. **3**The older workers generally earned more, were absent less, had fewer accidents, and had less turnover than younger workers. **4**One possible conclusion is that the requirements of the speed jobs in the light manufacturing industry under study do not make physical demands on the older workers to the limits of their reserve capacity. **5**The competence and experience of the older workers in these specific jobs may have compensated for their reduced stamina...**6**This study has taken a step in the direction of defining the relationship between age, experience, and productivity in one particular industry. **7**It is possible of course that other industries with a different complex of speed jobs and skill jobs may produce entirely different results. **8**In addition, it is important to emphasize that methodological problems in the research design limit our interpretations.**9**The approach outlined in this study should be replicated in other manufacturing plants, as well as in other occupational areas in light, medium, and heavy industries in order to construct a typology of older worker performance in a variety of jobs.



**Implications** A possible effect or result of an action or a decision

or

**Applications** the practical use of sth., esp. a theory, discovery, etc.



### Language Conventions

**Complex sentence** structure in discussion statements. p.168.

Main clause (researcher's position) + that + noun clause

We can conclude with certainty + that + both theories are able to explain significant amount variance.

**Expressions** indicating the researcher's position, p.174-5.

restating the hypothesis, explaining findings, suggesting implications

### First Elements

Simple past tense: referring to the purpose and hypothesis, restating the findings

Past, present, modal auxiliaries: explaining the findings, Limiting the findings

Present tense: Comparing findings

### Later Elements

Present, modal auxiliaries / tentative verbs: implications, recommendations, applications



Acknowledgements require politeness as well as good English and can be risky.

"I acknowledge the aid of NN", sounds like merely a cold nod of the head.

"NN serviced all my needs", sounds like master to servant.

"I want to/wish to thank N," which seems to mean, "but I cannot; he ran away with my wife!"

To avoid creating a dozen splendid phrases like:

heartfelt thanks.../deepest appreciation.../I am deeply indebted to... /  
I owe my sincere gratitude to... /I warmly thank...

collect into groups the people you will thank. Use one gratitude phrase at the beginning of each group-paragraph, and then say why you are grateful to each.



- Elsevier, 2007. How to Write a World Class Paper. Elsevier Author Workshop. 205 pp.
- Ethics Toolkit from Elsevier: [https://researcheracademy.elsevier.com/uploads/2018-02/ethics\\_a5\\_booklet\\_update260617\\_web.pdf](https://researcheracademy.elsevier.com/uploads/2018-02/ethics_a5_booklet_update260617_web.pdf)
- Norris, C.B., 2005. Academic Writing in English. Language Services. University of Helsinki. 70 pp.
- Online Research Ethics Course:  
[https://ori.hhs.gov/education/products/montana\\_round1/research\\_ethics.html](https://ori.hhs.gov/education/products/montana_round1/research_ethics.html)
- Swales, J.M., Feak, C.B., 1994. Academic Writing for Graduate Students -- Essential Tasks and Skills. The University of Michigan Press. 253 pp.
- Weissberg, R., and Buker, S. 1990. Writing up research: experimental research report writing for students of English. Prentice Hall, Inc. 202 pp.